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A Quantitative Study Identifying Adaptive Capacity and Its Impact on Response and Recovery in Communities Affected by Major Disaster

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A QUANTITATIVE STUDY IDENTIFYING ADAPTIVE CAPACITY AND ITS IMPACT ON RESPONSE AND RECOVERY IN COMMUNITIES AFFECTED BY MAJOR DISASTER

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Title: A Quantitative Study Identifying Adaptive Capacity and Its Impact on Response and Recovery in Communities Affected by Major Disaster

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The purpose of this study was to determine if a relationship exists between the development of adaptive capacity and disaster response and recovery outcomes. History informs of the devastation and loss of life that occur when disasters strike communities. National-level frameworks and doctrine support the development of community disaster readiness capabilities, or adaptive capacity, as the means to increase favorable outcomes in disaster response and recovery. There is a lack of research, however, to validate the relationship between adaptive capacity development and improved response and recovery outcomes.

Using a conceptual framework for establishing resilient communities through adaptive capacity development, this study employed a quantitative methodology, using a cross-sectional survey and existing community demographic data, to explore the development of adaptive capacity and its ability to predict disaster response and recovery outcomes in communities affected by major disaster in 2011. A total of 333 counties and parishes were included in the final sample.

Findings from this study indicate that development of adaptive capacity was statistically significant in predicting improved response and recovery outcomes. Additional findings demonstrated that pre-event planning along with response and recovery outcomes were predictors of recovery progression over time.

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The process of completing a Ph.D. has been a life-changing experience. I will admit that I did not expect it to be such. I have met incredibly inspirational people along the way and traveled to places I would never have imagined going to at this stage in my life. From the distant shores of Haiti to a briefing room in the nation's capital, all of this was made possible because I chose to pursue inquiry and scholarly activity in the area of disaster response and recovery.

This research is dedicated to the men and women involved in disaster preparedness, response and recovery at the local-level. These individuals are known to work silently behind the scenes, with often a single purpose – to save lives in the event of disaster. As I began the data collection phase of my study, I could not help but be amazed by the outpouring of support from this group of individuals. As soon as my first letters were received asking for participation, surveys began to arrive back coupled with emails and telephone calls offering to provide additional information if needed.

The decision to study disaster response and recovery in local communities was made based upon my admiration for Mr. Danny Sacco. Danny Sacco resides in Indiana Pennsylvania and is Director of Safety and Security at Indiana Regional Medical Center. What I found when I met Danny in 2007, was an individual who was dedicated to preparing a small rural community for disaster response and recovery. He does this, not due to formal job description or position, but because he believes it is the right thing to do. He has been so ahead of his time in so many ways. Always out there in the community, talking with others, coaching and supporting, and most of all informing anyone who would listen about the "common sense" strategies that would support the community in the event of disaster. I started this dissertation because I believed that what Danny was saying was true. However, I wanted the data to support the belief. Therefore, I

began a quest to see if I could support through data, what Danny believed and espoused. You are one of my heroes Danny. Thank you for your passion to local-level preparedness and response.

I would also like to thank the faculty in the Administration and Leadership Studies program at Indiana University of Pennsylvania. I have been changed by each of you. Lessons learned have been translated into real action in education, practice and policy. I consider you great mentors and will continue to use what I learned for years to come.

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CHAPTER I

INTRODUCTION

Introduction and Background Issues

Over the past 100 years, our nation has experienced disasters and public health emergencies due to wildfires, pandemics, hurricanes, floods, terrorist attacks and other catastrophic events that result in loss of life, damage to property, and consumption of resources that significantly affect our economy. History informs of the devastation and loss of life that occur when disasters strike our communities.

Prevention of all disasters is an idealistic, but unrealistic goal that our country and others would aspire to achieve. Over the last few years many newsworthy disasters have taken place including the terrorist attacks of September 11, 2001; the anthrax attacks in the fall of that same year, the Indian Ocean earthquake and tsunami in 2004, hurricanes Katrina, Rita, and Wilma in 2005, the Virginia Tech murders in 2007, Deep Water Horizon environmental disaster of 2010, the Haiti earthquake in 2010, the Oslo Norway shooting massacre in 2011, the Joplin Missouri tornados in 2011, Hurricane Irene and Tropical Storm Lee in 2011, the Tōhoku earthquake and tsunami (and resultant nuclear disaster) in 2011, and the Colorado movie theatre shooting in 2012. These disasters are arguably different in size, scope, and degree of disruption. What is similar, however, is that each of these disasters required response characterized by timely, efficient, and focused action to protect and save lives. Equally as important, the affected communities expected timely, efficient, and focused action in support of recovery. The outcomes of these disasters reflect varying degrees of success and failure. Despite technological and scientific advances, gaps continue to exist between capability and outcomes in disaster response and recovery.

The modern day approach to disaster management in this nation is a result of what has happened historically. Multiple failures have produced less than acceptable outcomes in disaster response and recovery. The Southern California fires of 1970 burned over 500,000 acres, and required the evacuation of more than half a million people. Mortality statistics from major hurricanes reveals the devastation and loss of life when response and recovery are less than adequate. The Galveston Hurricane of 1900 was responsible for at least 8000 deaths and Hurricane Katrina killed at least 1500 people (Blake, Rappaport, & Landsea, 2007). In addition to loss of life, the economic impact of an unfavorable outcome is staggering. Hurricane Katrina, as an example, was responsible for at least 81 billion dollars of property damage and is by far the costliest hurricane to date (Blake et al., 2007). Disaster response and recovery failures following Hurricane Katrina resulted in loud public outcry for change resulting in policy changes and renewed focus on the creation of disaster resilient communities (Berke & Campanella, 2006).

The United States is vulnerable to disaster. The September 11, 2001 terrorist attacks illustrate the vulnerability of the Nation to attack as well as the impact of a nation not prepared to respond (The 9/11 Commission Report, n.d.). The 9/11 Commission findings indicate that significant weaknesses emerged, within both the public and private sector, in the areas of national preparedness, public health security, and response. The Commission findings are now over a decade old, but gaps in response and recovery remain as evidenced by the failures in response and recovery illustrated so vividly in Hurricane Katrina.

National preparedness requires the building of disaster resilient communities by supporting and strengthening the institutions, assets, and networks that are already at work within the community (Federal Emergency Management Agency, 2011a). The release of Presidential Policy Directive PPD/8 calls for the building of core capabilities to confront disaster

and to measure and track progress (U.S. Department of Homeland Security, 2011a). These core community disaster readiness capabilities appear essential to the concept of resilience.

Recognizing the critical nature of the community in both response and recovery, the Federal Emergency Management Agency (FEMA) communications suggest a "whole of community" approach that emphasizes the importance of local government control and community engagement in all aspects of disaster response and recovery (Federal Emergency Management Agency, 2011a). Local government entities within defined jurisdictions carry out the majority of disaster response activities (Mothershead, 2006a). It reasons then, that a better understanding of what capabilities a local community uses in support of disaster response and recovery, and how this informs our understanding of the outcomes produced, will provide a better picture of what resiliency looks like following disaster. As will be addressed in more detail during the literature review, resilience is the ability of a community to use specific capabilities to produce better outcomes with disaster response and recovery.

Problem Statement

While the literature defines the adaptive capacity needed to increase favorable outcomes in disaster response and recovery, there remains a lack of research to validate the relationship between the development of this capability and improved outcomes in disaster response and recovery. Without an understanding of this relationship, a local community may encounter challenges in pursuing capability development due to resource constraints, leadership challenges, community characteristics, or a wide variety of other influences. Also, additional variables exist that may affect the ability of a community to effectively respond and recover from disaster. A better understanding of the relationship between the variables that create community adaptive

capacity and the resultant impact on disaster response and recovery outcomes will inform policy development, community decision-making, and national disaster framework design.

Significance of the Study

The literature review will point to the importance of specific capability development to improve disaster response and recovery outcomes. It will also provide a review of policy development, which has grown out of a national desire to affect better outcomes through the establishment of national frameworks (National Response Framework, National Incident Management System, National Disaster Recovery Framework) generated to guide all disaster response and recovery actions. Policy and the resultant national frameworks spell out what communities can do to be more resilient. A lack of research exists to explain the response and recovery outcomes achieved using this capability and public doctrine. Despite this, there is an assumption that these national frameworks result in improved response and recovery outcomes. These assumptions continue to drive decision-making at the federal, state, and local levels regarding standards of practice in emergency response and community planning. Resources are expended nationally in the areas of early warning systems, pre-disaster planning and mitigation, collaborative network development, training, simulation, and community engagement to name a few. Of course not all communities can or will expend resources to develop this capacity. Consider the case of New Orleans, Louisiana and Hurricane Katrina. Politicians and policymakers at all levels failed to act on predictions by physical and social scientists that a large hurricane would affect the human engineered levee system (Picou & Marshall, 2007). In this case, budget shortfalls and other priorities prevented the upgrading of levee systems to where they could withstand the force of a severe hurricane (Kennedy School of Government Case Program, 2006a). If community disaster readiness capability development influences outcomes,

then data supporting this will better inform communities and their decision-making processes. It is therefore critical to engage in scientific inquiry to better understand the impact of community capability development on response and recovery outcomes. Communities can then match resources to the appropriate need.

Researcher Position

My personal experience with this topic began in my early career as an officer in the United States Navy. As a military support force, preparation for mass casualty situations resulting from conflict and war was a necessary component of regular operations. Preparation for these situations required multiple drills and simulation activities. My responsibilities included instruction of hospital corpsman – the heart of medical response on the frontlines of war. My observations during these early years led me to believe that successful outcomes in response to mass casualty disasters were the result of capability development. However, I wondered if this type of capability development would be available outside a military framework. I questioned how this capability could translate from one setting to another.

Two events influenced my choice to pursue study of disaster recovery and response. The first occurred in 2001. The terrorist attacks of September 11 left many Americans stunned at the thought of our vulnerability. An entire workplace, with thousands of victims, relied on the effective and efficient response of firefighters, paramedics, and others. Their response saved some, but not all the victims. The second occurred in 2005. The devastation that rocked the Gulf Coast changed my perspective. Poor decision after poor decision affected hundreds of thousands of individuals. Response and recovery failures filled the evening news and the professional disaster literature. I questioned the nation's preparedness and the repeated failures in disaster response and recovery.

At the beginning of my doctoral studies, I made the decision to immerse myself in the phenomena of disaster response and recovery. Over the past five years, I participated in local, state, and national disaster response and recovery efforts as well as national policy development. As a part of my course of study, I participated in an independent study and subsequent field placement that explored the impact and implications of legislation and policy specific to disaster response and recovery. As part of that work, I conducted a policy investigation and analysis from a social science perspective specifically related to the Pandemic and All Hazards Protection Act of 2006 (PAHPA), Homeland Security Presidential Directive 21 (HSPD – 21), the National Health Security Act, the National Response Framework, and the National Incident Management System. I then served in a field placement aboard the USS Iwo Jima in support of Operation Continuing Promise 2010 and investigated military and civilian simulations to disaster while delivering care to patients in rural Haiti six months following the 2010 earthquake. I lived the experience by adopting a "boots on the ground" approach that allowed me to work side-by-side with medical providers delivering care in Port-de-Paix, Haiti. I observed first-hand the challenges to response and recovery that appeared related to lack of resources, unskilled responders, inadequate infrastructure, and overwhelming morbidity and mortality. In 2011, I did consultative work for the U.S. military regarding the response capabilities of medical providers during a military mission aboard the USNS Comfort. Observations during this activity broadened my awareness of response and recovery capabilities required of individuals, organizations, and communities in response to disaster and again highlighted the gaps that exist. The experience also highlighted the opportunity to improve response and recovery using research.

My experience has also included participation in many multi-agency disaster simulation exercises. One of these was the Red Rose Disaster Simulation in Fort Indiantown Gap,

Pennsylvania in May 2009. This exercise simulated an earthquake causing multiple bridge collapses, release of toxic agents, and large casualties. Teams of responders included local responders, health care facilities, multiple military forces, as well as local, state, and federal government agencies. The response scenarios and exercises allowed me to see the challenges that communities face in the wake of disaster. Gaps related to the ability of a community to adapt using limited capabilities were clear.

In 2010, I was an evaluator during the Collaborative Multi-Agency Exercise held annually in Washington, DC to exercise response capabilities in a mass-casualty event. Again, my observations led me to the conclusion that multiple gaps and challenges exist in effective and efficient response capability. This activity also revealed that some of the activities, such as establishing an incident command system with clear lines of communications, actually improved response outcomes. Anecdotal evidence suggests that practice (or exercise) allows networked capability among different groups.

In August 2012, I was invited to provide testimony to the Pennsylvania House of Representatives Subcommittee on Veteran's Affairs and Disaster Preparedness on proposed legislation related to the disaster response workforce. My testimony centered on the critical importance of maintaining adaptive capacity through the mobilization of registered nurse resources during disaster response. My testimony, combined with that of local and state emergency management directors, focused largely on the importance of improving disaster response and recovery outcomes. Case study examples and anecdotal accounts were the primary basis of all testimony heard that day. It would be safe to conclude that the lack of quantitative data in relation to adaptive capacity development weakens the arguments presented in such forums and lessons the impact on public policy in this area.

Based upon these experiences and the limited research that exists, I believe that we have a very long way to go in the development of disaster resilient communities with effective and efficient response and recovery. I believe that literature points to community disaster readiness capability as a means to ensure adequate disaster response and recovery. It also points to specific variables that support and/or challenge the adaptive capacity of communities. However, I believe that without validating the relationship between adaptive capacity and disaster response and recovery outcomes, we will never achieve national preparedness. Exploring adaptive capacity development and disaster response and recovery outcomes may explain the challenges that lie ahead in disasters similar to Hurricane Katrina. Data drives decisions. I believe that this study can provide some level of evidence related to the adaptive capacity of communities and the outcomes it produces in response and recovery following disaster. This study will not answer all of the questions, but is a starting point for understanding what elements of adaptive capacity exist within counties or parishes.

Purpose and Objectives

The purpose of this study is to determine if a relationship exists between community adaptive capacity and disaster response and recovery outcomes. The objectives include:

- Identifying the adaptive capacity variables that exist within local communities at the time of major disaster.
- Measuring the impact of adaptive capacity on disaster response and recovery outcomes within communities impacted by disaster.

Research Questions and Hypothesis

Based upon the purpose and objectives of this study, the following two research questions were derived for this study:

- Do communities that experienced major disaster declaration in 2011 evidence adaptive capacity?
- In local communities who have experienced major disaster, did adaptive capacity development produce improved response and recovery outcomes?

It is hypothesized that if communities develop of adaptive capacity, then response and recovery will be effective.

Assumptions and Definition of Terms

Disasters are not equal. As the literature review will show, disasters vary according to type, scope, degree of social disruption, amount of area/people affected, and duration (Fischer, 2008). To account for this variation, control variables for degree of disruption, extent of impact, and time of disruption were a component of the research design.

Additionally, the FEMA database of major disaster declarations provided the population from which the sample was obtained. FEMA uses a classification system with measureable criteria to allow governors of a state to request a presidential disaster declaration. The President uses preliminary damage assessments to make a decision regarding major disaster declaration and the Stafford Act (PL 93-288) details the trigger and response criteria for federal disaster assistance (McCarthy, 2011). By its definition, major disaster declaration is generally the result of a tragic and devastating incident that disrupts the lives of hundreds or thousands of families, individuals, communities, and states where they reside (McCarthy, 2011). It was assumed that these criteria were valid measures of the severity of disaster impact for the selected population.

This study assumed that the unit of analysis was the local community at the level of the county or parish within the United States. An additional assumption was that the unit of analysis would be counties or parishes affected by major disaster in 2011. FEMA declarations of major

disaster allow specification to the level of county or parish (Federal Emergency Management Agency, 2011b). Community was further defined in this study as an entity that has defined geographical boundaries and shared fate (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). Furthermore, communities consist of built, natural, social, and economic environments that influence one another (Norris et al., 2008). As such, county or parish seemed appropriate as the unit of analysis for this study. The unit of analysis was used in the past by other disaster researchers. For example, in constructing an index of social vulnerability to environmental hazards, Cutter, Boruff, and Shirley (2003) used counties within the United States to identify eleven key dimensions that increased vulnerability to natural hazard. Their results allowed for the creation of an index score reflecting social vulnerability for all counties and parishes in the United States. For this study, the local community was a county or parish within the United States (excluding the U.S. territories). Communities have different characteristics within the selected population and the study addresses the variability among counties by including mediator and control variables as well as an analytical model to address these differences.

A final assumption was that the local emergency management director was an appropriate informant related to the variables of interest in this study. Regardless of variations in their formal titles, emergency management directors are considered the individuals responsible for using knowledge, techniques, strategies, tools, organizational networks, and other community and external resources to reduce the occurrence of disasters and successfully deal with their impacts in order to protect people, property, and the environment (McEntire, 2007). Today many states have laws requiring local governments to designate an entity responsible for emergency management function. Access to a list of local emergency managers was not publically available, however, many local government websites included names addresses and contact information for

various public officials and a final database for the sample was constructed using this information.

Limitations and Delimitations

This study employed a quantitative approach using survey methodology and community demographic data from the 2010 U.S. Census to address the research questions. Although this was an appropriate methodology to measure adaptive capacity and the impact it produces on disaster response and recovery outcomes, it limited the measurement of certain quantitative indicators such as economic recovery, changes in tax base over time, specific time series data on housing, transportation, and business recovery to name a few.

A second limitation related to the decision to omit qualitative data within the research design. Although not a component of this study, the "lived experience" of the community is important and should be pursued in future research. During the course of data collection, the researcher received multiple communications via email and phone from emergency managers offering to tell their story, provide additional information, and espousing the willingness to share after action reports regarding disaster response and recovery operations. Further exploration of adaptive capacity using a multiple case study approach could build upon this quantitative approach by providing additional descriptive and exploratory data related to the lived experience of community leadership, emergency managers, and the disaster workforce in relation to response and recovery. Additionally, development of theories surrounding adaptive capacity using in-depth qualitative research would be of benefit. The researcher intends to pursue this in future studies.

A third limitation was the complexity introduced by the potential nesting effects of the sample. As the dataset was hierarchical in nature, individual counties (Level 1) were nested

within states (Level 2) and these in turn were nested within FEMA regions (Level 3). To account for nesting effects, additional analytical modeling was required to determine the effects of the nesting on the final regression model.

The final limitation involved the selection of the emergency management director as the individual to complete the survey on behalf of the community. Although this individual was appropriate to answer the questions based upon their knowledge, skills, and abilities, they rarely act in isolation. Success of the emergency manager relies upon the extent to which they involve other departments, planning committees, and other networks in disaster response and recovery activities (McEntire, 2007). Future research should include perspectives from a broader range of positions and associations. For the purpose of this study, the local emergency management director was vital in providing community-level data. The incorporation of clusters based on counties nested within FEMA districts into a random component within the model provided some control for variation by geographical area and political and bureaucratic functioning. Conducting research with additional informants will prove beneficial for future investigation.

This study was further delimitated by narrowing the population to communities within the United States affected by major disaster in 2011. This decision enabled generalizability to this population and not to the general population of all disasters. This snapshot in time, however, provided insight into actual adaptive capacity within local communities and its predictive capability in response and recovery outcomes.

Limiting the population to only United States major disasters and eliminating United States' territories was the final delimitation for this study. Disasters do cross territorial boundaries and impose response and recovery challenges globally. However, conducting this study globally would have required additional variables for consideration based upon variations

in legislative and policy initiatives. Replication of this research to include territories is recommended in the future, as they may provide insight into additional challenges faced by communities in response to major disaster.

Chapter Summary

This chapter describes the impact of disaster on human lives and the outcomes of inadequate response and recovery. Policy and emergency management doctrine within the United States has evolved based upon the challenges confronted during past disasters. Despite stated goals by federal, state, and local-level governments to create disaster resilient communities through the development of specific capabilities or adaptive capacity, little research exists to demonstrate a relationship between adaptive capacity and disaster response and recovery outcomes. The research questions established for this study allowed descriptive analysis and hypothesis testing to identify the relationships between adaptive capacity development and response and recovery outcomes by communities impacted by disaster.

CHAPTER II

LITERATURE REVIEW

Historical Background of the Problem

Disasters cause unprecedented damage to property, significant human suffering, death, and displacement of populations for prolonged periods. History reminds us of the potential impact that disasters have on morbidity and mortality in this country and others. In 1931, massive flooding of China's Yellow and Yangtze rivers led to over 3 million deaths from drowning, disease, and starvation (Harnsberger, 2006). Although not given as high a media profile, flooding yields the greatest economic burden and claims more lives than other disasters (Brody, Zahran, Highfield, Vedlitz, & Vedlitz, 2008; Mileti, 1999). Beyond the initial impact of these disasters, reports of disaster linked disease and illness may continue to years beyond the initial event contributing to the overall burden of disaster on human lives (Armenian, Meldonian, & Hovanesian, 1998; Noji, 1996).

History that is more recent reinforces the negative impact of disaster. In 2010 alone over 300 million people worldwide were impacted by natural disasters (Ferris & Petz, 2011). The United States did not make the top ten countries in disaster deaths, but reported over 9.2 billion dollars in total damages from natural disasters alone and came in fourth in the total number of events reported (Guha-Sapir, Vos, Below, & Ponserre, 2011). According to Samenow (2011), the National Oceanic and Atmospheric Administration (NOAA) documents that through mid-June 2011, an unprecedented eight extreme weather events have become billion-dollar disasters in the U.S. No other year on record (since 1980) has experienced this many such disasters year-to-date. Samenow (2011) reinforces the devastating losses of 2011 by reminding us of the following less well-publicized disasters in 2011, which resulted in billions of dollars in expenditure. These

include: ‘Groundhog Day Blizzard’ Jan 29-Feb 3; Southwest/Midwest tornadoes April 8-11; Midwest/Southeast Tornadoes April 14-16; Southeast/Ohio Valley/Midwest Tornadoes April 25-30; Midwest/Southeast Tornadoes May 22-27; Texas Drought & Wildfires Spring-Summer 2011; Mississippi River Flooding Spring-Summer 2011. In total, there were over 1500 communities receiving major disaster declarations in the United States in 2011 (U.S. Department of Homeland Security, 2011b)

The magnitude of disaster morbidity and mortality can be difficult to quantify and may in fact be worse than the actual statistics reveal. Definitions of what constitutes a death or injury caused by a disaster often vary (Bourque, Siegel, Kano, & Wood, 2007). This was evident in the reporting of deaths during the Chicago heat wave of 1995. Often overlooked, this disaster was reported to be the likes of an urban inferno in which 739 more Chicago residents died than in a typical week, with the city reporting only 485 heat-related deaths (Klinenberg, 2002). Regardless of the reasons for reporting discrepancies, disasters can affect large numbers of people with devastating results.

Disaster can take many forms from observable torrential winds to unseen microscopic viruses. The Spanish Flu of 1918 swept the globe and caused an estimated 50 million deaths with the highest mortality in healthy persons between the ages of 15 to 35 years of age (Bartlett, 2006). In 2009, the United States began preparing for the possibility of the first influenza pandemic in more than 3 decades (Subbarao, Robinson, & James, 2009). The virus (H1N1) began to spread through North America and disproportionately affected children (Sills et al., 2011). The nation began to brace for major widespread mortality. The literature suggests that control of a pandemic that could kill millions depended upon access to hospitals and acute care. Sills, et al. (2011) examined the effect on children’s hospitals’ resources during the fall 2009

when pandemic influenza was active and modeled the outbreak of a more virulent influenza virus based upon historical comparisons. Findings from this study suggest that children's hospitals routinely operate so close to capacity that little available reserve exists. While Subbarro, et al. (2009) suggest that response to the pandemic demonstrated resilience of the medical and public health communities as they have risen to meet and overcome this challenge, findings from Sills et al. (2011), illustrate that hospitals may not be able to handle occupancy surge for prolonged periods. Fortunately, the virus did not spread as aggressively as expected. In this case, disaster was thought to be imminent, but avoided. These findings suggest that response to pandemic would likely have been ineffective and without available hospital resources, greater mortality was a likely outcome.

Internationally, disaster response and recovery challenges have caused concern. The literature documents large-scale morbidity and mortality during the Haiti earthquake response and after-math. This major disaster killed over 300,000, affected over 3.7 million, and displaced over 1.8 million (Ferris & Petz, 2011). The recent Tohoku earthquake and subsequent tsunami in 2011 caused widespread destruction, intense local and international response, as well as intense concern over the potential impact of a nuclear event (Dunbar, McCullough, Mungov, Varner, & Stroker, 2011). These large-scale disasters often overshadow the thousands of disasters that affect the United States annually, but the desired outcomes are the same - improved response and recovery in order to save and protect lives.

Disaster recovery worldwide costs an average of 67 billion per year (Guha-Sapir, Hargitt, & Hoyois, 2004). This is a 14-fold increase since the 1950's. The developing world in particular has seen sharp increases in poverty resulting from disaster (Skoufias, 2003). In the United States between 1989 and 1994, federal disaster assistance made available to affected communities cost

the U.S. Treasury over 34 billion dollars (Federal Emergency Management Agency, 1997). Hurricane Katrina affected the economy and infrastructure of Louisiana, Mississippi, and Alabama, with one model estimating over 156 billion in damage (Burton & Hicks, 2005). It must be noted however, that economic losses are less frequently reported due to problems related to damage assessment and the lack of a standard method for assessing these losses (Guha-Sapir, et al., 2004). As a result, we may have a much greater economic impact from disaster than the numbers actually show. These issues reinforce the need to produce improved outcomes in disaster response and recovery.

Unfavorable disaster response outcomes create destruction, morbidity, mortality, and increased drains on the economy. To date, the focus of inquiry and research has been on the consequences of disaster rather than a focus on the evidence surrounding actual response practice (Britton, 2007). Drabek (1986) notes that there continues to be a void of empirical data concerning disaster planning and response on the national level. Measures of effective disaster response rest primarily in theoretical realm and remain largely untested. Despite the lack of empirical evidence, local communities continue to be asked to support national frameworks for response such as the National Incident Management System (NIMS) and the Incident Command System (ICS). Questions remain as to how effective these resources are at the local level when response is required. Both NIMS and ICS impose a rational organizational structure and expect the translation of this structure to local response (Buck, Trainer, & Aguirre, 2006). Criticism has emerged relative to the ability of these frameworks to translate from one agency to another, and from one region to another (Wenger, Quarantelli, & Dynes, 1990). This study will explore this concept in an effort to gather empirical data on the effectiveness of these national frameworks as well as community capabilities that theoretically support effective disaster response.

Along these same lines, few empirical studies of community recovery exist. However, research following Hurricane Katrina illustrates disparities in recovery suggesting that the degree of disruption coupled with high social vulnerability impacts recovery (Finch, Emrich, & Cutter, 2010). Unemployment, disruption of business continuity, crime, and overall increase in poverty continue to be of concern in areas impacted by Hurricane Katrina (Frailing & Harper, 2007). According to Frailing and Harper (2007), economic decline, the disappearance of higher-wage jobs, and growth only in low-wage service jobs, produced increases in poverty in New Orleans following Hurricane Katrina. According to social scientists, this manifested in looting and loss of salvageable resources, increased criminal behavior, massive displacement of over 1.7 million people, loss of tax revenues, loss of cultural resources, absolute disruption of daily norms and expected behaviors, and increases in reported cases of depression, suicide, domestic violence and alcoholism (Picou & Marshall, 2007). Clearer understanding of the relationship between effective disaster recovery, community disaster readiness capabilities, and community characteristics is needed.

National Level Policy

Despite the lack of empirical data, national level policy guides communities in their response and recovery efforts. These policy initiatives, as well as national disaster response and recovery frameworks, support a stated goal of improving community resilience to disaster in the United States. Presidential Policy Directive/PPD-8 directs the development of an all-of-Nation, capabilities approach that is the responsibility of all levels of government, the private and nonprofit sectors, and individual citizens (U.S. Department of Homeland Security, 2011a). According to PPD/8, core capabilities in response and recovery include such things as planning, public information, warning systems, operational coordination, infrastructure, and situational

assessment. The accompanying national frameworks further delineate the capabilities that are necessary to support resilience.

The National Response Framework (NRF) describes specific authorities and best practices for managing disasters that range from the serious, but purely local, to large-scale terroristic attacks or catastrophic natural disasters (U.S. Department of Homeland Security, 2008a). The NRF incorporates two other widely discussed national frameworks, the National Incident Management (NIMS) and the Incident Command System (ICS). Developed by the Department of Homeland Security in 2004, NIMS enables responders at all jurisdictional levels and across all disciplines to work together more effectively and efficiently by focusing efforts in five areas: preparedness, communications, resource management, command/management, ongoing management / maintenance (Federal Emergency Management Agency, 2008). The ICS is specifically designed to offer structure to the command and management function of NIMS and is considered by FEMA as a best practice for command and management functions. Its successful use by the Arlington County, Virginia fire department following the terrorist attached on September 11, 2001 served as a catalyst for a later mandate by DHS requiring the use of NIMS to qualify for federal preparedness funding (Anderson, Compton, & Mason, 2004). While a lack of research exists concerning whether or not these activities can help to predict the ability of a community to effectively respond and recover from disaster, policy suggests it will improve outcomes.

The newest framework to emerge is the National Disaster Recovery Framework (NDRF). It asserts that recovery begins with pre-disaster preparedness and planning, and that the ability of a community to accelerate recovery through pre-disaster preparedness, mitigation, and recovery capacity building results in a resilient community with an improved ability to withstand, respond

to and recover from disasters (U.S. Department of Homeland Security, 2011c). The NDRF suggests that development of core capability results in successful recovery outcomes. These capabilities include: pre-disaster recovery planning, proactive community, business, and leadership engagement; and development of collaborative networks to aid in rapid recovery. No studies to date exist exploring the relationship between the development of these capabilities and disaster recovery outcomes. This research will explore the relationship between the capabilities suggested by these frameworks and disaster response and recovery outcomes.

Conceptual Framework

Resilience in Disaster

The idea of building community resilience to improve outcomes related to disaster response and recovery is a common theme in disaster literature (Boin, 2010; McEntire, Fuller, Johnston, & Weber, 2002; Paton & Johnson, 2006; Rose, 2004). This literature asserts that resilience begins with pre-disaster preparedness and planning, and ends with the ability of a community to recover effectively following disaster. Pre-disaster preparedness, mitigation, and recovery capacity building results in a resilient community with an improved ability to withstand, respond to and recover from disasters (U.S. Department of Homeland Security, 2011a).

In describing an international strategy for disaster reduction, the United Nations describes resilience as the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure (United Nations, 2005). Resilience is further defined as the capacity of a system to return to normal after a major stressor (Norris, et al., 2008). The ability of a system to successfully respond and recover is a measure of its resilience. In the case of a community

experiencing disaster, resilience is demonstrated when effective disaster response and recovery outcomes are obtained using capacities that are naturally a component of the community, or capability that has been built. This conceptual framework delineates and characterizes elements associated with community resilience. It builds upon literature from the fields of psychology, sociology, ecology, geography, anthropology, public health, organizational theory, and management sciences. Resilience in this model is viewed in a similar manner as espoused by other disaster researchers, as those capacities that sustain and enhance the social-ecological system to adapt, cope with, resist, and recover from disaster impact (Adger, Hughes, Folke, Carpenter, & Rockstrom, 2005; Wisner, Blaikie, Cannon, & Davis, 2004). This definition can be enhanced somewhat with the inclusion of Norris et al.'s (2008) definition that resilience is a process linking a set of adaptive capabilities to a positive trajectory of function and adaptation after a disturbance. Furthermore, the literature points to specific variables that seem to comprise adaptive capacity. These aspects of the model will be explored in more detail.

Resilience to disaster must be differentiated by focus and the level of analysis to which it applies, i.e., physical, ecological system, social, city, community, and individual (Norris et al., 2008). Disaster response matrices in the United States place significant responsibility for disaster planning at the local level, decentralizing preparation and planning, and placing primary responsibility on small jurisdictions (Kahn & Barondess, 2008). As such, for the purpose of this study, the unit of analysis is the local county or parish and the conceptual framework developed and described will exist within the context of this unit. According to Norris et al. (2008), community resilience to disaster emerges from a set of networked adaptive capacities. These adaptive capacities enable the community to move from disruption to equilibrium. In their model, networked adaptive capacities provide a roadmap for enhancing community resilience to

disaster and fall into four broad categories to include: economic development, social capital, community competence, and communication (Norris et al., 2008). There is a lack of research, however, documenting the outcomes achieved by the use of specific adaptive capacities. The conceptual model presented for this study will allow the researcher to collect data regarding specific adaptive capacity and the resilience achieved by the presence of this capacity.

A unique model of resilience provides the conceptual framework for this study. It has been developed based upon a comprehensive review of the literature and review and critique of the individual elements suggested by the national recovery and response frameworks accepted as best practice by federal, state, and local emergency management authorities. Figure 1 illustrates the overall capability that the literature points to when describing those elements that are necessary to respond and recover from disaster. The model frames the dimensions of resilience as having two measureable criteria: effective disaster response and effective disaster recovery. The model is shown on the next page.

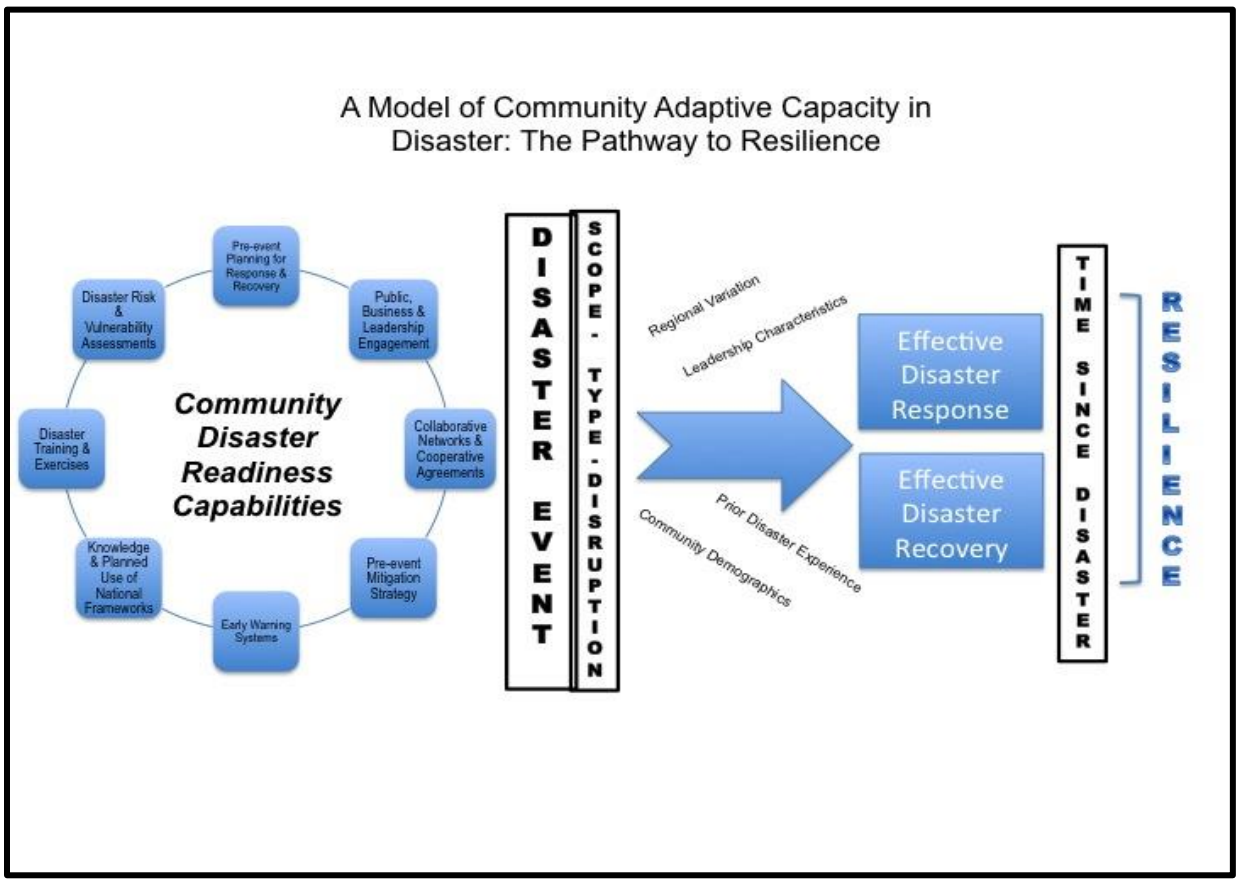

Figure 1. Resilience as an outcome of adaptive capacity

Effective disaster response and resilience. According to the U.S. Department of Homeland Security (2008a), local leaders and emergency managers prepare their communities to manage incidents and ensure a coordinated response across agencies and jurisdictions. As such, these are key indicators within the conceptual model for this study. Additionally, disaster scholars and national frameworks cite the critical importance of communication in obtaining positive outcomes during disaster response (Boin, 2010; Kahn & Barondess, 2008; Norris, et al., 2008; U.S. Department of Homeland Security, 2008a). Resources are required in disasters to save lives, protect property and the environment, and meet basic human needs (U.S. Department of Homeland Security, 2008a). As such, the importance of obtaining resources for response has been cited by scholars and is included in this model (Boin, 2010; Harrald, 2006; Yi & Ozdamar, 2007).

Effective disaster recovery and resilience. According to the U.S. Department of Homeland Security (2011c), recovery from disaster, similar to response, requires effective communication and coordination among stakeholders. Recovery begins with pre-event planning and continues at different rates depending upon the extent of the disaster and the time since disaster occurred. According to the National Response Framework, in addition to communication and coordination, successful outcomes are measured by the ability of a community to mobilize resources to support recovery, reconstruction of infrastructure, economy, health, social and community services, and government functions (U.S. Department of Homeland Security (2011c)

Adaptive Capacity

Disaster scholars argue that disaster opens up new possibilities and can be a catalyst for change (Paton & Johnston, 2006). In this argument, resilience is a measure of how well people and societies can adapt to a changed reality and capitalize on the new possibilities offered (p.8). Although adaptation is a theme throughout the resilience literature (Comfort, Oh, Ertan, & Scheinert, 2010; Keim, 2008; Ronan & Johnston, 2010; Yohe & Tol, 2002), little empirical evidence is available to explore this concept of adaptation to disaster or as this conceptual model describes as adaptive capacity development. In looking closer at the Paton and Johnston's (2006) interpretations however, they argue that the essence of resilience is the conscious effort on the part of people, communities, and societal institutions to develop and maintain the resources and processes required to ensure that adaptation can happen and that it can be maintained over time. Using the conceptual model developed for community adaptive capacity and resilience, key dimensions of adaptive capacity are described. This study will then seek to explore the possible relationships among the dimensions.

Validating the elements of adaptive capacity that exist in communities affected by disaster will inform our understanding of resilience and the choices made by leadership in advance of disaster. The literature suggests that community discourse surrounding adaptive capacity translates into beliefs and behaviors that lay the foundation for sustaining response and recovery operations (Paton & Johnston, 2006). Using this conceptual framework to guide inquiry into activities that affect effective disaster response and recovery as measures of resilience is an important next step in furthering science in this area.

According to national response and recovery frameworks, resilience relies on local community efforts supporting effective response and recovery (U.S. Department of Homeland Security, 2008a, 2008b, 2011a, 2011c). Organizations responsible for public safety, public security, public health, and infrastructure save lives, preserve property, and identify and rebuild essential services for the population (Mothershead, 2006b). In the United States, little variation exists among the states with regard to the emergency management structure with a state emergency manager, county emergency managers, and local (city or township) emergency managers. However, local jurisdictions either have systems in place for emergency response or band together with neighboring communities to provide overall emergency management to a large constituency (Mothershead, 2006b). Theoretically "emergency management capacity is built from the ground up" (Waugh & Streib, 2006, p. 133) and consists of specific actions including pre-event risk / vulnerability assessment. Additionally, the development of networks and community engagement to support disaster response and recovery, along with the implementation and exercise of core capabilities, is critical (Waugh & Streib, 2006).

Ecology, social environment, geography, economics, and education shape the determinants of resilience (McEntire et al., 2002; Paton, 2000;). Review of the disaster literature

reveals characteristics of processes that seem to support the ability of communities to adapt and these are included in the conceptual model. These characteristics include: (a) the way communities are organized to minimize disaster effects and enhance recovery processes (Tobin, 1999); (b) advance planning and preparation of emergency responders (Peek & Mileti, 2002); (c) the minimization of losses and damages when a disaster occurs (McEntire et al., 2002); (d) prevention or anticipation of disturbance (Zschau & Kuppers, 2003); and (e) more broad mitigation efforts to include, but are not limited to land use planning, warning systems, building codes, public policy (Paton & Johnston, 2006).

Community disaster readiness capability. Community disaster readiness capabilities identified in the literature include: resources for safety and continuity of core functions; competencies to mobilize, organize, and use resources; planning and development strategies; mechanisms to ensure sustained availability of resources (Paton & Johnson, 2006). Resilience ties to social learning, diversity of adaptations, promotion of social cohesion, and mechanisms for collective action. Based upon a comprehensive review of the literature, the conceptual model includes core readiness capabilities that constitute adaptive capacity.

Pre-planning for response and recovery. Comfort (1999) argues that resilience must take into consideration the disaster management capabilities that create an effective strategy for risk reduction and response. In other words, pre-event planning for capability development improves disaster response and recovery outcomes. Other scholars have drawn similar conclusions. Using case study, Adger et al. (2005) provides data to demonstrate how coastal zones are transforming into systems that are more resilient and adaptive to a rising incidence of large disturbances. In the first case, the 2004 Asian tsunami, they show that social-ecological resilience is an important determinant of both the impacts of the tsunami, as well as the reorganization by communities

after the event. This case demonstrated that reducing vulnerability to the effects of the tsunami, coupled with a rapid positive response (and a response that could be sustained for a long period of time), were important determinants in the minimizing the impacts of this disaster. Additionally, social resilience, including institutions for collective action, robust governance systems, and a diversity of livelihood choices assisted in buffering the effects and promoted social reorganization in the recovery phase.

A second case study focused on the Cayman Islands in the Caribbean and followed the economic and ecological impacts of three major hurricanes: Gilbert in 1988, Mitch in 1998, Michelle in 2000, and Ivan in 2004 (Adger et al., 2005). Changes within the community related to pre-event planning improved outcomes.

Disaster training and exercises. Local leaders and emergency managers have a defined role in preparing communities to manage incidents (U.S. Department of Homeland Security, 2008a). Exercises and drills are mechanisms for education, experience, and evaluation of response and recovery from disaster (Cope, 2003; Gebbie, Valas, Merrill, & Morse, 2006; Ronan & Johnston, 2010;). According to FEMA, training and exercise of response and recovery plans provides communities with the knowledge, skills, and abilities needed to perform (U.S. Department of Homeland Security, 2012a). Table 1 contains the FEMA components and definitions within its Comprehensive Exercise Program (U.S. Department of Homeland Security, 2012b).

Table 1

FEMA's Comprehensive Exercise Program

Training Type	Description
Orientation Seminar	An overview of introduction to familiarize participants with roles, plans, procedures, or equipment.
Drill	A coordinated, supervised activity, normally used to test a single specific operation or function. (No attempt to coordinate organizations or fully activate the EOC)
Tabletop Exercise	A facilitated analysis of an emergency situation in an informal, stress-free environment
Functional Exercise	A fully simulated interactive exercise that tests the capacity of an organization to respond to a simulated event.
Full-Scale Exercise	An exercise designed to evaluate the operational capability of emergency management systems in a highly stressful environment that simulates actual response conditions. It requires the mobilization and actual movement of emergency personnel, equipment, and resources.

Variation will exist in the strategies selected by local leaders and emergency managers. Understanding of the impact of the strategy selected on the perceived effectiveness of response and recovery will inform our understanding of adaptive capacity.

Mitigation strategies. Efforts to contain or minimize disaster enhance resilience. Mitigation includes projects instituted well in advance of disaster that reduces susceptibility to loss (Paton & Johnson, 2006). For example, the literature surrounding earthquake response references community seismic resilience as the ability of social units (e.g. organizations, communities) to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future earthquakes (Bruneau et al., 2003). Bruneau et al. (2003) argue that a resilient system is one that is quantitatively shown to reduce failure probabilities, reduce consequences from failure in terms of lives lost, damages, and negative economic and social consequences, and to reduce time to recovery (p. 736). Early warning systems have demonstrated the ability to provide a level of

mitigation, but no system offers 100% reliability (Sorensen, 2000). Bruneau et al. (2003) offer the recommendation that having scales to measure these items would be useful in identifying ways to improve, designing new research to drive improvements, evaluating the contribution of different loss-reduction measures, and helping to select measures that achieve desired levels of resilience reliably and at the least cost. This study will not attempt to develop a scale to measure mitigation strategies, but will instead focus on the whether a mitigation strategy had been developed prior to the actual disaster and its perceived effectiveness.

Risk and vulnerability assessment. The introduction of any hazard introduces a system to stress, regardless of the nature of the hazard. Longstaff (2005) provides insight into this issue and its implications for disasters. She emphasizes the unpredictability of dangers that inherently affect community planning (Longstaff, 2005). Longstaff uses the concept of "surprise" to capture the discrepancy between what is expected and what is experienced. This is certainly evident in the literature surrounding response related to Hurricane Katrina. Certainly one cannot live in a coastal community that exists below sea level and be "surprised" by the need to evacuate when a monster storm targets a direct path into your community. But as was illustrated in the Kennedy School of Government Case Study program (2006a, 2006b), the community and its leadership appeared to be taken by surprise and many residents were on little league ball fields when they could have been making plans for evacuation. Longstaff (2005) reveals that a crisis is what occurs when a surprise reveals a failure of rules, norms, behavior, or infrastructure to handle that type of surprise (p.16). Therefore, vulnerability results when the stress response of a community cannot accommodate the level of stress created by an event. An ideal outcome following crisis, according to Norris et al. (2008), is resistance. Resistance blocks the stressors created by the crisis and dysfunction disappears (Norris et al., 2008). Pre-event planning to include strategies to

identify and plan for populations already vulnerable appears key. Additionally, a means to address and mitigate the vulnerability outcomes produced during the recovery phase is important.

FEMA's Comprehensive Preparedness Guide (U.S. Department of Homeland Security, 2010) focuses on the conduct of risk assessments so that communities understand the risks they face and can use it to guide preparedness planning. Luhmann (1993) suggests that the evaluation of risk and the willingness to accept risk are not only psychological problems, but are key social problems. Therefore, having and using a vulnerability risk assessment are two potentially separate concepts. For example, in New Orleans, it was widely accepted that the majority of residents would not evacuate even in light of mandatory evacuation orders (Kennedy School of Government, 2006a). Key government officials indicated in follow-up reporting that there was little means to evacuate the city (Kennedy School of Government, 2006a). The lack of specifics witnessed in New Orleans's delayed evacuation plan seems to suggest an existence of, but non-use of, the risk assessment for potential threats.

Luhmann (1993) explains that the willingness to takes risks depends on how firmly we believe ourselves capable of keeping precarious situations under control, of checking a tendency towards causing loss, or maintaining our coverage by means of help, insurances, and the like in the event of losses occurring (p. 112). For example, as detailed in the Kennedy School of Government Case Program (2006a) examining the multiple failures during Hurricane Katrina, leadership avoided issuing a mandatory evacuation of the city of New Orleans that in retrospect had serious implications and by all accounts resulted in additional morbidity and mortality. A clearer understanding of the link between pre-event risk assessment, pre-event planning, and pre-event mitigation efforts on effective disaster response and recovery is needed.

Use of national frameworks. The use of the National Incident Management System (NIMS) and the Incident Command System (ICS) are accepted as best practices in response to disaster (U.S. Department of Homeland Security, 2008a). NIMS standardize incident management for all-hazards across all response groups (Anderson et al., 2004). ICS provides an organizational structure for incident management and guides the process for planning, building, and adapting that structure (U.S. Department of Homeland Security, 2012c). Theoretically, use of these frameworks improves disaster response capability.

Community engagement. Paton and Johnston (2006) argue that emergency managers should be trained and prepared to anticipate the need for collaboration and develop a role in the local consensus-building effort. Building a common agenda with other community institutions and leaders is one way to accomplish this goal. In addition, Paton and Johnson (2006) suggest that emergency managers and leadership define the technical components of each emergency management function (risk assessment, mitigation, preparedness, response and recovery) as part of a holistic system. Finally, they recommend that all policies necessary to promote the sustainability of communities, including emergency management policies, must be linked or integrated in the process of community planning (Paton and Johnson, 2006). Accepting this argument for sustainable development brings a focus to the critical role of emergency managers and others who will ultimately lead efforts relative to preparedness, response, and recovery. It is evident from the lack of research in the field that a better understanding of how what they do, or not do, informs our understanding of community resiliency.

Disaster Specific Influences

Disaster is a serious disruption of the functioning of a society, causing widespread human, material, or environmental losses that exceed the ability of the affected society to cope

using only its own resources (United Nations, 2002). According to Ciottone (2006), an event in a rural area with small numbers of casualties is a disaster due to the limited resources that may affect response. Perry (2007) argues that the definition of disaster varies by what we are seeking to accomplish. For the purposes of this research, the degree of disruption and the need for re-adjustment within the community defines disaster. By focusing on disruption and need for re-adjustment, it allows us to understand the human responses that are created in response to its occurrence. By viewing disaster from this perspective, Perry (2007) concludes that we set the stage from a social scientist point of view for knowledge accumulation and theory construction. Moving away from the hazard-disaster tradition of "agent centered" focus, to one that places people and social relationships at the core of disaster study, is preferred (Perry, 2007). The conceptual and theoretical framework for this study will support Perry's argument. The methods section of this proposal addresses criteria used to select disaster-affected communities for this study.

Disaster classification has changed over time and is inconsistent throughout the literature. Dynes (1974) summarizes disaster conceptualizations as the following: the physical agent that caused the disaster, the physical consequences of the disaster, and the social disruption and social changes brought about by the disaster. This is not to say that the type of disaster, i.e. tornado, hurricane, chemical spill, etc., can be ignored. Disaster type may influence the choices made by communities relative to their capability development. According to Drabek (1985), the disaster agent determines the set of responding organizations and the specific tasks that these organizations will confront. With this in mind, descriptive data regarding disaster type was collected and reported.

For many years, taxonomy differentiated disasters. For example, the disaster literature of the past most commonly classified disaster by either natural or technological (human error or technological failure), natural-technological (combination effects such as occurred in Hurricane Katrina), and terrorism (Picou & Marshall, 2007). Disaster scholars suggest less concern with disaster taxonomy to prevent confusion due to the nomenclature (Perry, 2007; Picou & Marshall, 2007; Quarantelli & Dynes, 1977). Additionally, Burkle and Greenough (2008) argue disaster taxonomy has missing elements and are not fully sensitive to spectrum of public health emergencies that are in themselves disasters. They also reference work by Green and McGinnes (2002) that expands the taxonomy to include conflict-based disasters. This study will not differentiate disaster based upon taxonomy, but will focus instead on disaster in more general terms. This is not to say that all disasters are equal. As Fischer (2008) argues, the use of a disaster scale focused on scale, scope, and time or duration, will provide researchers with assistance in delineating the applicability and limitations of their findings. As such, this study will seek to actively control for these factors by using Fischer's scale as a guide to delineate size, scope and degree of disruption as control variables.

Community Demographics

Factors influencing the vulnerability of populations fall into four classifications defined by their physical, social, environmental, and economic factors (Guha-Sapir et al., 2004). To varying degrees, all communities are vulnerable to the impact of disaster. However, some communities are more vulnerable than others due to economics, location, or extent of the destruction. For example both Haiti and Chile experienced earthquakes in 2010. The magnitude of the earthquake which hit Chile was significantly greater than that in Haiti (7.0 vs. 8.9), however, reports from Chile demonstrate much less physical, social, environmental, and

economic impact. Adding to vulnerability is the fact that the frequency and severity of disasters have increased over the last 15 years partially due to climate pattern changes (Bourque et al., 2007). On top of this, impact has also increased due to the dramatic shift in population to cities and geophysical vulnerable areas since 1950 in both developed and developing countries (Bourque et al., 2007). Important to an understanding of adaptive capacity is an understanding of what creates vulnerability in some communities. Community demographics and characteristics play a role in adaptive capacity. Disasters disproportionately affect vulnerable populations stemming from social, class, gender, race, or economic circumstance (Bolin, 2007). Donner and Rodriquez (2008) examined population growth, composition, and distribution and its impact on disaster risk and vulnerability. They emphasize the critical importance of emergency managers, planners, and other policymakers keeping a pulse on the demographics of communities. As such, community demographics are contained in the conceptual framework of community adaptive capacity. Specifically, this study will use the following variables: urban vs. rural designation; population density; age of the population; race; and economic disadvantage (income below the poverty level).

Leadership Characteristics

As supported earlier in the literature review, all disaster response is ultimately a local responsibility. As such, local governance influences the choices made by communities in response to real or potential disaster risks (Mothershead, 2006b). Thus, the conceptual framework includes the critical role of community leadership in effecting resilience outcomes. The literature suggests that there is wide variation in activities surrounding community resilience and that leadership influences the direction that is taken in light of what is known about the

impact of prevention, preparedness, response, recovery and mitigation (Comfort et al., 2010; Paton & Johnston, 2006; Ronan & Johnston, 2010; Wolensky & Wolensky, 1990).

Choice and decision-making by those in leadership positions is relevant to the model of adaptive capacity presented here. Previous past experience and understanding of the impact of disasters plays a role in individual decisions related to the implementation of disaster readiness capabilities (Kunreuther, 1979; Quarantelli, 1984). As such, tenure of the emergency manager, along with prior past experience will be treated as a control variables in this model.

Prior Past Experience

Theoretically, a community, like any organization, collects what Schein (2005) describes as accumulated shared learning covering behavioral, emotional, and cognitive elements. In its relation to adaptive capacity development, this could offer an explanation as to why leadership made decidedly controversial decisions in the wake of Hurricane Katrina. It also may explain why leadership may elect to focus on prevention strategies as opposed to preparedness, response, recovery or mitigation strategies. Prior past experience with disaster may create what Schein (2005) describes as a pattern of shared basic assumptions that the group finds has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to these problems. When viewing community from this perspective, it is clear that the influence of the social environment in identification of adaptive strategies must be considered. Prior past experience may serve to explain some of variation in adaptive capacity development at the community level.

Regional Variation

Hurricane Katrina illustrates the vulnerability of a community to a major hurricane (Blake et al., 2007). Furthermore, using this disaster as a case study illustrates the potential loss

of life that can result when a community that is already vulnerable, based upon geographical and socioeconomic factors, faces a major disaster. It seems natural to assume that there is the potential for large losses of life when a hurricane affects an area that has a dense population. The literature references the increasing vulnerability of areas that are susceptible to hurricanes and are experiencing significant population growth, such as those along the coastal regions of the United States (Blake et al., 2007). Additionally, low hurricane experience levels are a serious problem and could lead to future disasters (Hebert, Taylor & Case, 1984; Jarell, Hebert & Mayfield, 1992). It has been suggested that it would be a difficult proposition to change where people are moving to because it is likely that people will always be attracted to live along the shoreline (Blake, et al., 2007). Instead, solutions need explored in the areas of education, preparedness, policy, and planning (Blake et al., 2007). The danger of not preparing for disaster seems certain to limit the possibilities of adaptation in the event of real disaster.

Bill Proenza, spokesman for the National Weather Service hurricane warning service and current Director of National Hurricane Center (NHC), as well as former NHC Directors, have repeatedly emphasized the great danger of a catastrophic loss of life in a future hurricane if proper preparedness plans for vulnerable areas are not formulated, maintained and executed (Blake, et al., 2007). These regional variations along with community demographics may play a role in understanding and explaining community adaptive capacity. As such, this study will look at communities within each of the ten FEMA regions within the United States.

Time Since Disaster

Consideration of the time since disaster occurred within the context of the trajectory of recovery from disaster is important. Data comparisons over time would allow for interpretations of nature of recovery and the extrapolation of the patterns that emerge. The methodology

proposed does not allow for time series data collection. As such, time since disaster was used as a control variable in this research.

Theoretical Placement for This Research

The literature reveals the importance of the human element and the social nature of disaster (Godschalk, 2003; Harrald, 2006; Kick, Fraser, Fulderson, McKinney, & De Vries, 2011; Kreps, 1985; Perry, 2007; Quarantelli & Dynes, 1977). This research will be set within a sociological and human ecology theoretical framework to help the researcher explain or predict the complex human interactions surrounding adaptive capacity development within a community.

Sociological Perspectives

Structural-functionalism. Two macro-level sociological perspectives provide a theoretical basis for understanding the differences that may exist at the community level in relation to adaptive capacity development. The first is the structural-functionalist perspective offered by Parsons. According to Parsons (1961), a social system engages in complex processes requiring interchanges with a larger environment that includes differences in culture, personalities, behaviors, and other aspects of organisms. The structure, then, of a community would consist of what Parsons refers to as institutionalized patterns of normative culture (Parsons, 1961). In terms of adaptive capacity, it is important to understand that the choices made by communities, or systems, may not always appear logical or consistent with the structures put in place within the larger society. With this in mind, it would be wrong to assume that communities have adopted national frameworks such as ICS and NIMS.

A social system uses its functional categories to respond to environmental conditions and maintain equilibrium. According to Parsons (1961), the system either comes to terms with

exigencies imposed by a changing environment, without changing its own structure, or fails to come to terms and undergoes structural change. Hence, communities may indeed elect to accept their potential vulnerability to disaster and do nothing. Alternatively, they may impose structural changes in response to a changing environment. The primary premise of the theory surrounds the concept that all organizations carry out a set of functions in order to ensure survival. These functions include: (a) adaptation - those things that must be done to meet basic needs; (b) goal attainment - those objectives it must achieve in order to meet its ongoing needs; (c) integration - how it coordinates with groups; and (d) latency - how it sustains and reproduces itself over time (Jaffee, 2001).

When examining adaptive capacity development within a community, structural-functionalism informs as to the range of possible findings. For example, community variations may exist in the adoption of the National Incident Management System (NIMS) or the Incident Command System (ICS). When looking at variation from a structural-functional standpoint, variation in community practices related to adaptive capacity development may reflect the dynamic tension between what the community believes it needs, and what others (such as policy-makers and disaster response and recovery experts) suggest it needs. Parsons' theory assumes that form follows function in the sense that structural change will emerge when the structure no longer meets new needs. The greater the awareness of disparity between values and common patterns of behavior, the more likely patterns of behavior will chance in the direction consistent with core values (Powers, 2004). Arguably, this might be the reason we continue to experience failures in the face of disaster response and recovery. Creation of new structures not aligned with community function, or community core values, may not be effective in producing successful adaptation. For this reason, this research will not focus solely on the development of adaptive

capacity and the outcomes that it achieves. To do so would limit the inquiry to what Merton (1957) calls manifest functions. The data produced and analyzed from this study should also address an examination of those factors that are latent, i.e. unexpected. For example, the research may show that no difference in outcomes associated with adaptive capacity despite significant investment in pre-disaster activities aligned or not aligned with the national frameworks. Irrespectively, the results will inform the field of disaster research.

Conflict theory. Conflict theory offers another lens by which to examine the concept of adaptive capacity. Issues of class, special interests, stratification, and power emerge in the disaster literature. Socioeconomic status has been demonstrated to affect a community's ability to absorb and recover from loss due to income, power, prestige, and other resources tied to wealth (Blaikie, Cannon, Davis, & Wisner, 1994; Cutter, Mitchell, & Scott, 2000; Platt, 1999). As Donner (2008) points out, "It is very important that further research on hazardous events attaches equal weight to human and natural systems, but it must do so while paying strong attention to the power and inequality between social groups" (p. 299). Predictor variables associated with socioeconomic status will be included in this study and will be explored in depth as a part of the data analysis.

Theoretical perspectives offered by Karl Marx and Max Weber offer additional insights into the issue of adaptive capacity development within a community. Marxist theory would lend itself to an interpretation that conflict arises at the community-level in response to an increased focus on capitalistic pressures on communities to adopt national frameworks without the ability to afford the implementation of those other capabilities, such as public disaster education and training exercises. Weber would expect conflict as an outcome of the ideal bureaucracy that serves to increase efficiencies and rules that drive communities to make these choices. For

example, FEMA mandates that communities adopt NIMS and ICS in order to qualify for preparedness grants.

Conflict theory provides the researcher perspective on the inherent tensions that may promote or inhibit the choice of disaster readiness capabilities within a community, and offer a means to interpret findings. Additionally, the use of predictor variables that relate to community demographics and other variables associated with sociological vulnerability will inform our understanding of adaptive capacity and resilience.

Human Ecology and Adaptation

When looking at community adaptive capacity and factors influencing its development, a human ecology model provides a sound approach for inquiry. Human ecology is concerned with the relationships and interactions among humans, their cultures, and their physical environments (Sutton & Anderson, 2010). To better understand adaptive capacity at the community level it is important that we understand how and why a community makes decisions relative to subsistence and sustainability. How communities understand their environments may influence the selection of adaptive strategies. Donner (2008) argues that a case study of emergency managers in Oklahoma demonstrates a need to consider more carefully the forces that shape organizational decision-making processes (p. 299). Addressing adaptive capacity from a human ecology framework allows exploration of findings within the social context. Relationships and interactions between variables influencing adaptive capacity development inform our understanding of adaptive capacity.

The human ecology concepts of change and adaptation frame the inquiry into community resilience. Disaster creates disequilibrium. Disequilibrium occasioned by a significant alteration in the environmental relationship opens a possibility for evolutionary change in which system

adaptation is required (Hawley, 1986). Hawley further argues that a system is not naturally adaptive. This may account for the wide variations in disaster response outcomes during major disaster. This study seeks to identify those facets that may act as driving or retraining forces in adaptation to disaster. If a system is not naturally adaptive as Hawley suggests, then all communities, regardless of characteristics or inherent vulnerabilities, are potentially non-resilient to disaster. Therefore, informing our understanding of adaptive capacity, informs our understanding of resilience.

Rational Choice

Rational choice frames the expected response of a community in relation to adaptive capacity development. We expect leaders to establish the right processes and protections to ensure the ability of a community to adequately respond and recover from disaster because it seems rational. Rational choice provides explanation for the establishment of national frameworks, such as the National Response Framework and the National Recovery Framework. Although largely untested, these frameworks seem to make sense. A convincing argument that these frameworks will improve outcomes exists.

Theoretically, the idea of rational choice as a component of resiliency brings up some interesting concepts especially as it relates to analyzing decision-making and choice. Fuchs (2001) argues that a culture is rational when it adheres to scientific and technological principles, and reengineers itself as it learns from its mistakes and seeks to improve. From what we know about the science of disasters and the lessons learned from past failures, is it not safe to assume that rationality will drive resilient actions by decision-makers. Case study demonstrates that decisions are made which are not seemingly "rational". For example, as detailed in the Kennedy School of Government Case Program (2006a, 2006b) examining the multiple failures during

Hurricane Katrina, leadership avoided issuing a mandatory evacuation of the city of New Orleans. In retrospect, this most likely led to serious implications and possibly additional morbidity and mortality. Additionally, this case also illustrates the distinctive impact of agency upon decision-making. Leadership delays in seeking help and resources from those outside the state could have further complicated an already delayed and by all accounts, ineffectual response. Coupled with the vulnerabilities created by the geography of New Orleans, decision-making certainly complicated the response to Hurricane Katrina. Reasoning and decision-making were seemingly irrational and not in alignment with the expectations relative to the disaster cycle. According to Fuchs (2001), rationality improves, not as a function of increased alternatives and information, but as an option as more and more of the world is being held constant as a given and already decided (p.134). Rational choice provides an argument that the National Response Framework, the National Incident Management System, and the National Recovery Framework provide the scientific and technological principles inherent in a disaster resilient system and that some level of evaluation relative to a communities' practices in relation to these systems will provide a measurement of resilience in the event of actual disaster. Using this as theoretical grounding for this research, findings are expected to that suggest that communities are using these frameworks, are selecting strategies to improve their capacity for response and recovery, and are satisfied with the outcomes that are achieved as a result of using these systems.

Summary of Theoretical Perspective

In summary, sociological theory, human ecology, and rational choice theory provide a theoretical foundation to explore the relationship between adaptive capacity development and disaster response and recovery outcomes. Communities, by their nature, are complex systems with a wide

variation in resources available, as well as wide variations in the factors influencing the choice of adaptive strategies. In addition, variation exists in the leadership and decision-making capability of those in positions within communities to influence choices made relative to response and recovery from disaster. The theoretical framework assists in understanding the challenges that arise when adaptation is required and the importance of exploring the variables that affect outcomes.

Literature Review Summary

In summary, the historical background illustrates the negative impact of disasters and the strong desire of a nation to improve disaster response and recovery outcomes. Published national frameworks describe mechanisms that support community resilience through the development of adaptive capacity (U.S. Department of Homeland Security, 2008a, 2008b, 2011a, 2011c, 2012a, 2012b). However, it becomes clear when reviewing the literature that little empirical data exists establishing a relationship between the development of specific capability and these outcomes. Case study supports the development of adaptive capacity as a means to develop a disaster resilient community and improve outcomes (Adger, et al., 2005; Comfort, 1999; Comfort, et al., 2010; Keim, 2008; Norris, et al., 2008; Ronan & Johnston, 2010; Yohe & Tol, 2002;). Questions remain regarding the willingness or ability of communities to develop these capabilities. An improved understanding of the relationship between adaptive capacity and disaster response and recovery will advance understanding in this area.

The literature also provides us with an understanding of the definition of resilience and the importance of capabilities that drive the development of adaptive capacity at the local level. Informed by the literature, these capabilities are identified as: pre-event planning; development of networks and community engagement to support disaster response and recovery;

implementation and exercise of core capabilities to respond and recover from disaster; early warning systems; mitigation planning to include vulnerability and risk assessment, use of NIMS and ICS; and resource mobilization.

Using the literature and theoretical framework, a conceptual framework of community resilience to disaster was presented asserting that a disaster resilient community is one that uses networked adaptive capacity to produce improved response and recovery outcomes. The literature supporting the conceptual framework for this study implies that complex sociological and ecological forces, although necessary for resilience, simultaneously affect adaptive capacity development. Inquiry from a quantitative perspective should inform our understanding of its existence within communities impacted by actual disaster.

Research Questions and Expected Findings

The purpose of this study is to determine if a relationship between community adaptive capacity and disaster response and recovery outcomes exists. Specifically, the first objective involves identifying the adaptive capacity (i.e., both community disaster readiness capabilities as well as other variables influencing capacity) that exists within local communities at the time of major disaster. The second objective involves measuring the impact of adaptive capacity on disaster response and recovery within communities. To address these objectives, the following research questions were generated for this study:

- Do communities that experienced major disaster declaration in 2011 evidence adaptive capacity?
- In local communities who have experienced major disaster, did adaptive capacity development produce improved response and recovery outcomes?

In response to the research questions, it is hypothesized that at least some elements of the conceptual model will be evident in communities impacted by disaster. Possible explanations for the existence of differing dimensions of adaptive capacity may be determined through an exploration of findings from this study and the theoretical placement of this research. It is further hypothesized that a relationship between adaptive capacity and disaster response and recovery outcomes exists.

CHAPTER III

METHODS

Introduction

This chapter details the research method used to address the research question and study objectives. A detailed description of the methodology, research design, sampling frame, data collection process, survey instrument, and variables that are included and their definitions (including independent, dependent, and control variables) are contained in this chapter. This chapter reviews the overall approach to data analysis, describes validity and reliability, and addresses ethical considerations.

Research Methodology

The purpose of this study was to determine if a relationship exists between the development of disaster readiness capabilities and disaster response and recovery outcomes. The research questions for this study are: were derived for this study:

- Do communities that experienced major disaster declaration in 2011 evidence adaptive capacity?
- In local communities who have experienced major disaster, did adaptive capacity development produce improved response and recovery outcomes?

To address these questions, the researcher identified the adaptive capacity within local communities at the time of major disaster and then measured the impact of that capacity on disaster response and recovery. A quantitative approach using cross-sectional survey methodology and existing community data available in the U.S. Census Report for 2010 was selected as an appropriate design to explore the research questions.

Unit of Analysis

Disaster response is ultimately the responsibility of the local community. In the United States, county or parish emergency management is responsible for managing disaster response and recovery (Mothershead, 2006b). U.S. counties or parishes impacted by major disaster in 2011 are the unit of analysis for this study.

Survey Design Overview

Cross-sectional survey design was appropriate to address the research question and meet the research objectives. Survey methodology by its design allows for systematic gathering of information from the sample for the purpose of constructing quantitative descriptors of the attributes of the larger population of which the entities are members (Groves et al., 2009). The objective of the study was to understand the relationship between adaptive capacity development and response and recovery outcomes and in so doing enlisted the use of statistical analysis tools (both descriptive and inferential) to explore relationships between the study variables.

Sampling Frame, Design, and Size

The target population for this study included counties or parishes within the United States who experienced major disaster in 2011 (Federal Emergency Management Agency, 2011b). The researcher used major disaster declarations during 2011 as the population to allow for recent memory of the actual event, as well as time for some element of recovery to have occurred.

The researcher surveyed emergency management directors to obtain information about the county or parish. Emergency managers were selected as the key informant based upon the literature review indicating that the knowledge, skills, and roles that these individuals play within the county or parish made them the best choice to provide information necessary to address the research questions (McEntire, 2007).

The sampling frame for the survey consisted of communities that were in an area that triggered initiation of the Robert T. Stafford Disaster Relieve and Emergency Assistance Act (Stafford Act) in 2011. Random appropriate to size stratified sampling was employed using the ten Federal Emergency Management Agency (FEMA) regions within the United States as strata. Figure 2 shows the FEMA regions included in the sample design.

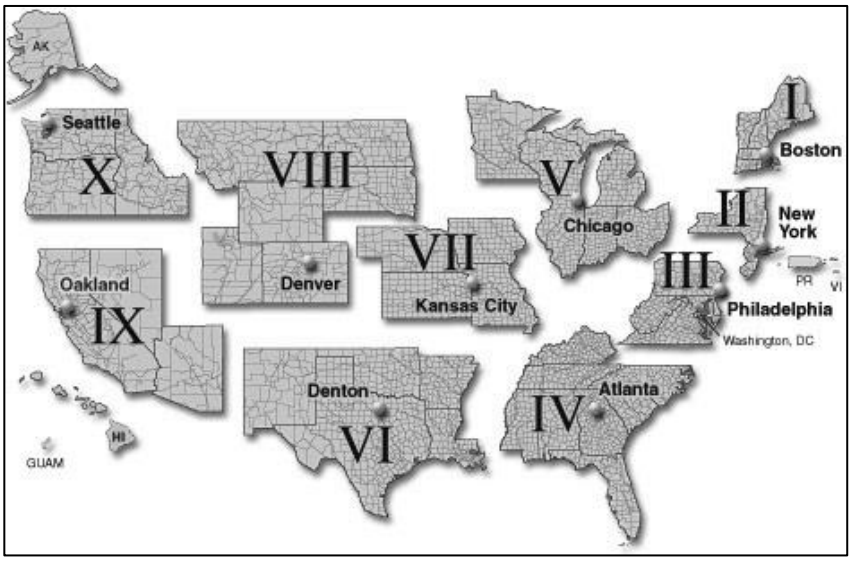

Figure 2. FEMA regions. Source: U.S. Department of Homeland Security. (2013). FEMA regional operations. Retrieved from http://www.fema.gov/regional-operations. Written permission obtained from FEMA for use of graphic on 3/16/13.

The researcher selected this sampling frame based on the critical role that FEMA plays in disaster preparedness, response, and recovery**.** FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards (U.S. Department of Homeland Security, 2013a). Each FEMA region has commonalities relative to types of disasters experienced, FEMA leadership in responding to and communicating priorities, and potential education initiatives led by regional leadership at the federal-level. Regional diversity exists based upon geography and other community characteristics make areas of the

nation more prone to specific disasters. FEMA regions provide a method to stratify the sample in a way that will account for regional variations. Due to the prevalence of some disasters within a specific FEMA region, such as hurricanes in FEMA Region IV, leadership approaches and decision-making related to adaptive capacity may differ. This in turn may influence choices made at all points in the disaster cycle. Stratified sampling accounts for these differences and reduces the chance of sampling error.

There are coverage issues with this sampling frame. Under-representation concerns are present with the use of this sampling frame. There may be FEMA regions that have few disasters in the given time period selected for this study. To account for this, the researcher oversampled in all strata to reduce under-representation. Ineligible units did exist within the sampling frame but did not affect coverage based upon the over-sampling strategy. Ineligible units included those counties or parishes selected for inclusion using random sampling that failed to qualify for inclusion based upon the criteria that the survey respondent was in an emergency management leadership role within the selected community at the time of the 2011 Major Disaster. A total of 22 respondents were excluded from the study based upon exclusion criteria.

Alternative target populations for this study could have included elected officials who served in a community leadership role during the time of the 2011 major disaster. However, the researcher received an excellent return by on the selection of the county or parish emergency management director. This "informed experience" was felt to be critical based upon an assessment of the structures supporting disaster response at the community-level and the roles and responsibilities identified in the National Response Framework (U.S. Department of Homeland Security, 2008a). According to this framework, the local emergency manager has the

day-to-day authority and responsibility for overseeing emergency management programs and activities (p. 16).

A stratified proportionate random sampling process reduces sampling error and allows generalization to the population. According to Fowler (2009), when a sample is drawn from a larger population there is some chance by chance alone, that the final sample will differ from the population (p 12). For the purposes of this study, an additional consideration in selection of the sample was the importance of ensuring inclusion of respondents from regions of the United States that have actually experienced a large-scale disaster. It was felt that respondents in these areas may identify priorities differently based upon this experience and thus may answer differently than a respondent who is in a region where this exposure has not occurred. FEMA establishes criteria for declaration of major disaster and has a published listing of declared major disaster areas in 2011 as the population for this study.

The sample design for this survey was a stratified proportionate random sample of communities affected by major disaster in 2011. FEMA regions were used to create strata by placing each eligible community into their respective FEMA region. A web-based random number generator was used to select a proportionate sample. Using a random selection process, communities in each stratum had equal chance of selection. Table 2 illustrates the strata for this study.

Table 2

Strata by FEMA Region

FEMA Region	States Included
1	Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont
2	New Jersey, New York
3	District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, West Virginia
4	Alabama, Florida, Georgia, Kentucky, Mississippi, N. Carolina, S. Carolina, Tennessee
5	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
6	Arkansas, Louisiana, New Mexico, Oklahoma, Texas
7	Iowa, Kansas, Missouri and Nebraska
8	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
9	Arizona, California, Hawaii, Nevada
10	Alaska, Idaho, Oregon and Washington

Note. U.S. territories excluded based upon research design.

Since some communities appeared on the list more than once, the researcher excluded duplicates from the list of 2011 major disasters, keeping only the most recent disaster as an eligible unit. The researcher also excluded U.S. territories from the total population due to the assessment that language barriers and governance issues may confound the data. Respondents excluded by indicating that they were not in an emergency management role at the time of the 2011 disaster were replaced using random selection within the affected strata.

Having a final sample of respondents that mirrored the population was important. To support the probability of this, a sizable number of sample elements were necessary. Since simple random selection may result in a sample that omits respondents with critical experience that could inform the research objectives of this study, oversampling was part of the sampling design. Table 3 reflects the final sample size calculations and the oversampling plan used to try to achieve and appropriate final sample for the study:

Table 3

Sample Size Determination & Sampling Plan

Region	Total Possible	% of the Total	90% C.I.	95% C.I.	99% C.I.	Oversampling Plan
1	114	8%	17	23	35	42
2	101	7%	15	20	31	37
3	138	9%	21	28	42	50
4	341	22%	52	69	104	125
5	205	14%	31	41	62	75
6	200	13%	30	40	61	73
7	185	12%	28	37	56	68
8	187	12%	28	38	57	69
9	16	1%	2	3	5	16
10	30	2%	5	6	9	30
Totals	1517	100%	229	305	462	585

Note. Sample excludes disasters occurring in U.S. territories.

According to Groves et al. (2009), sampling errors stem from surveys measuring only a subset of the population. The use of the stratified proportionate to size random sampling method to select a sample reduced sampling error for this research.

Mode of Data Collection

The study allowed both telephone and internet-based surveys to collect data. Past research has found that telephone and face-to-face interviews yield similar results (Groves, et al., 2009). However, based upon the prevalence of Internet use by individuals in leadership positions within communities and emergency management, use of a web-based survey improved results of completion.

To avoid situations of unit non-response, the researcher sent an introductory letter to each participant via postal mail requesting their participation. It introduced the participant to the researcher and encouraged their participation. It also stated the objectives or the research and included a website link to allow for completion of the survey. The following steps were followed in administration of the survey to human subjects:

1. When the survey participant navigated to the website link, they were taken to the online survey tool created using SurveyMonkey®. For the purposes of this study, the researcher has subscribed to SurveyMonkey® professional. This version enables SSL encryption. The following level of encryption was provided: VeriSign certificate version 3 with 128 bit encryption. Respondent IP addresses were masked from the researcher to provide protections to the survey respondents.
2. The internet survey tool contained an informed consent cover letter on the first page of the survey. Attachment B contains a sample of this informed consent cover letter.
3. If survey participants did not complete the internet-based survey within two weeks, a reminder was sent by postal mail or by email. Additional correspondence was sent via email as a final reminder.
4. Following a final reminder letter, if no response was received, the researcher attempted to contact the subject by phone. If no response was received with a second call, the researcher removed the subject from participation.
5. If the subject was reached by phone, the researcher affirmed that they had read and understood the informed consent cover letter that was sent via postal mail. If for any reason they had not received the informed consent cover letter, the researcher agreed to email or fax another copy to the subject. Following affirmation of receipt, participants were verbally informed that by continuing with the telephone survey they were indicating that they had read the consent from, they were voluntarily agreeing to participate, and they were at least 18 years of age. They were also informed that they could decline participation at any time.

The researcher conducted all telephone surveys without the assistance from additional support personnel. Both the web-based and telephone surveys were structured in a way to prevent item non-response. Questions skipped were revisited at the end of the survey. The researcher used probing questions to elicit a response to each survey item.

The data collection mode for this study was based on the research objectives, characteristics of the sample, cost, timeline, and the desire of the researcher to increase coverage of eligible respondents. Based upon the numbers of surveys completed, the researcher was satisfied that the decisions were sound and procedures were successful in obtaining a representative sample of the population.

Design of the Instrument

To guide survey development, key constructs were identified to guide question development. Appendix A includes the interview questions supporting the conceptual framework construct. In order to ensure that the instrument measures the identified constructs, a topic map reflecting each major area was created to guide questionnaire development. The literature review provided the basis for developing a 24-item questionnaire to collect community-level data from the survey respondent.

The researcher pre-tested the instrument within three communities not selected for inclusion in this study. Minor revisions to the questionnaire were made following cognitive testing of the instrument.

Validity and Reliability

Linking each question to the conceptual and theoretical frameworks, supports content validity. Additionally, a large sample size and stratified proportionate random sampling theoretically reduce measurement error associated with the design. Expert review of the survey

questions allowed further assessment of content as appropriate for measuring the dimensions of adaptive capacity and response and recovery outcomes. The researcher used cognitive interviewing during the pre-test to provide an opportunity to administer draft questions, probe respondents to understand how they understood the questions, and gained knowledge of how they formulated their answers thereby creating a theoretically reliable instrument. The pre-test of the tool enabled questionnaire revision based upon critique of questions related to problems they had in answering questions and any reading difficulty they had. Later in the analysis, items forming indices to measure the constructs of interest were subject to factor analysis and measures of internal consistency thereby ensuring reliable measures. The final analysis provided evidence of construct validity and the primary independent variables (dimensions of adaptive capacity) and dependent variables (dimensions of resilience in terms of response and recovery outcomes) operated as logically anticipated.

Strengths, Weaknesses, and Ethical Considerations

The strength of the employed methodology rests in its ability to generate quantitative data from a large sample of communities within the United States that have experienced a relatively recent disaster of significant scope. Informed experience provides data to demonstrate the relationship between adaptive capacity and disaster response and recovery outcomes.

A minor weakness in the design rests in the inability to generalize findings beyond the population selected for this study. United States counties and parishes impacted by major disaster in 2011 were the selected population. Findings will be generalizable only to the county or parish level, but it is argued that this is where the majority of local disaster response authority and accountability lies in the United States (Mothershead, 2006b). Use of the selected population should provide a foundation upon which to test additional hypotheses using alternative

populations in future research. Additionally, this study did not collect qualitative data. The researcher intends to pursue this methodology in future studies.

This methodology offered low risk to survey participants. However, Babbie (2008) suggests that all research presents some risk, although in this case it appeared minimal. Participants may have been uncomfortable recalling disaster details that had unfavorable outcomes, yet the respondents were themselves person trained and designated as disaster response officials. Nonetheless, to address even this minimal risk, the researcher informed participants that they could withdraw from participation at any time or refuse to answer the survey. The researcher provided assurance of confidentiality and anonymity to study participants and Appendix B contains the informed consent letter used in this study. Additionally, Indiana University of Pennsylvania Institutional Review Board (IRB) approval occurred before initiation of the study. Appendix C contains the IRB approval letter as well as the approval to conduct the study as authorized by the School of Graduate Studies and Research. During the course of the research, the researcher, dissertation supervisor, or IRB received no complaints.

Variables and Their Definitions

Dependent Variables

The outcome variable for this study was community resilience to disaster. However, based upon the literature review and an analysis of the national frameworks for disaster response and recovery, the researcher further defined resilience as having the dimensions of effective disaster response and effective disaster recovery. Factor analysis was used to further determine these dimensions, and the factors that comprised each dimension. The disaster response and recovery literature, as well as current practice, allowed the researcher to relate survey questions to the constructs being measured.

The first dimension of the dependent variable resilience is *Effective Disaster Response* as measured by the following facets:

Disaster Response Performance: This refers to the perceptions of the survey respondent on their satisfaction with actual response performance of key agencies, the public, and the first responder community. A Likert scale collected ordinal level data with 1 equaling extremely dissatisfied and 5 equaling extremely satisfied.

Collaboration and Cooperation: This refers to the perceptions of the survey respondent regarding the effectiveness of interagency and interagency collaboration and cooperation during the 2011 disaster. A Likert scale collected ordinal level data with 1 equaling extremely ineffective and 5 equaling extremely effective.

Communication: This refers to the perceptions of the survey respondent regarding the effectiveness of communication during the 2011 disaster. A Likert scale collected ordinal level data with 1 equaling extremely ineffective and 5 equaling extremely effective.

Adequacy of Resources: This refers to the perceptions of the survey respondent regarding the adequacy of resources for response. A Likert scale collected ordinal level data with 1 equaling extremely unsatisfied and 5 equaling extremely satisfied.

The second dimension of the dependent variable resilience in this study is *Effective Disaster Recovery* as measured by:

Communication: This refers to the perceptions of the survey respondent regarding the effectiveness of stakeholder communication during recovery from the 2011 disaster. A Likert scale collected ordinal level data with 1 equaling extremely ineffective and 5 equaling extremely effective.

Collaboration and Cooperation: This refers to the perceptions of the survey respondent regarding the effectiveness of stakeholder collaboration and cooperation during recovery from the 2011 disaster. A Likert scale collected ordinal level data with 1 equaling extremely ineffective and 5 equaling extremely effective.

Recovery Progression: This ordinal level data represents the survey respondent's perception of how well the community has progressed in its recovery from disaster in the areas of return to permanent housing, return of transportation systems, return of displaced businesses, re-building of damaged infrastructure, and return of social structures. A Likert scale ranks progression in each from 1 equaling not progressing at all to 5 equaling restored to better than pre-disaster level.

Adequacy of Resources: This refers to the perceptions of the survey respondent regarding the adequacy of resources to assist in disaster recovery. A Likert scale collected ordinal level data with 1 equaling extremely unsatisfied and 5 equaling extremely satisfied.

Predictor Variables

The independent variable for this study was adaptive capacity. However, the literature review and national frameworks for disaster response and recovery support adaptive capacity as a construct with multiple dimensions. Factor analysis was used to further determine these dimensions, and the facets that comprise each dimension. The disaster response and recovery literature, as well as current practice, allowed the researcher to relate survey questions to each variable so that it could be measured. The following predictor variables were defined for this study:

Pre-event Risk & Vulnerability Assessment: This refers to whether the county or parish within which the 2011 disaster occurred had conducted a pre-event risk / vulnerability assessment

before the event. This was designed as a scale variable with 5 indicating an extremely well developed and complete plan and 1 indicating a minimally developed plan.

Pre-event Mitigation Plan: This refers to whether the county or parish within which the 2011 disaster occurred had a pre-event mitigation plan before the event. This was designed as a scale variable with 5 indicating an extremely well developed and complete plan and 1 indicating a minimally developed plan.

Pre-event Disaster Response & Recovery Plan: This refers to whether the county or parish within which the 2011 disaster occurred had a pre-event disaster response and recovery plan before the event. This was designed as a scale variable with 5 indicating an extremely well developed and complete plan and 1 indicating a minimally developed plan.

Early Warning System: This refers to whether the county or parish established an early warning or detection system specific to the type of disaster that affected the community in 2011. This was designed as a scale variable with 5 indicating an extremely well developed and complete plan and 1 indicating a minimally developed plan.

Pre-disaster Public Engagement: This refers to the perceptions of the survey respondent on the level of engagement of community residents in disaster planning efforts. This was designed as a scale variable with 5 equaling highly engaged and 1 equaling highly disengaged.

Pre-disaster Elected Official Engagement: This refers to the perceptions of the survey respondent on the level of engagement of elected officials in disaster planning efforts. This was designed as a scale variable with 5 equaling highly engaged and 1 equaling highly disengaged.

Pre-disaster Business Engagement: This refers to the perceptions of the survey respondent on the level of engagement of local businesses in disaster planning efforts. This was designed as a scale variable with 5 equaling highly engaged and 1 equaling highly disengaged.

Pre-disaster Training Exercises/Frequency: This refers to the reported times a community has conducted pre-planned disaster response exercises before the 2011 disaster. The survey used FEMA accepted and published categories of training exercise (orientation seminar, drill, tabletop exercise, functional exercise, full-scale exercise).

Collaborative Networks and Cooperative Agreements for Response & Recovery: This refers to whether the county or parish within which the 2011 disaster occurred had an established collaborative networks and cooperative agreements for disaster response and recovery before the event. This was designed as a scale variable with 5 indicating an extremely well developed and complete plan and 1 indicating a minimally developed plan.

Use of National Frameworks/NIMS & ICS: This refers to the perceptions of the survey respondent on the use, effectiveness, and likeliness to adopt NIMS and ICS for future use. A scale variable was created with 5 equaling strongly agree and 1 equaling extremely strongly disagree.

FEMA Region: Regions designated by the Federal Emergency Management Agency of the United States Department of Homeland Security. FEMA regions are categorical from 1 to 10.

Urban / Rural Designation: Two scales were used to calculate a designation for urban or rural. Both scales are discussed in detail in Chapter 4. The first scale used a dummy variable where 1 indicates predominately urban and 0 indicates predominately rural. The second scale creates a scale from 1 to 6 that moves from urban to rural as the scale ascends.

Percentage of the Population Residing in a Rural Location: The percentage of the population living in rural locations was reported in the 2010 Census documentation for each county or parish.

Population Density: This refers to the measure of the number of people per land area as measured in square miles for each county or parish. The 2010 U.S. Census provided this data for each county or parish included in the study.

Population by Age: This refers to the percentage of county residents who fall into one of two categories, either children (as defined by under the age of 18) or older adults (as defined as over the age of 65). The 2010 U.S. Census provided this data for each county or parish included in the study.

Population by Race: This refers to the percentage of the population that falls into the following categories within the 2010 U.S. Census data: 1) White, 2) Black, 3) Asian,
4) American Indian and Alaska Native, 5) Native Hawaiian and Pacific Islander, 6) Hispanic, or 7) Other (this will include those who identified with two or more). The 2010 U.S. Census provided this data for each county or parish included in the study.

Economic Disadvantage: This refers to the percentage of the population in the county or parish in which income falls below the poverty level using the 2010 U.S. Census data. The 2010 U.S. Census provided this data for each county or parish included in the study.

Per Capita Income: This refers to the average income for persons residing within the county or parish. The 2010 U.S. Census provided this data for each county or parish included in the study.

Median Household Income: This variable divides the county or parish into two parts, with have the population being above and half below the median. The 2010 U.S. Census provided this data for each county or parish included in the study.

Emergency Manager Tenure: This refers to the length of time the survey respondent had been in an emergency management role.

Prior Disaster Experience/Leader: This refers to whether the emergency manager within the county or parish at the time of the 2011 disaster had experienced any other major disaster in an emergency management or first responder capacity. This variable is a dummy variable with 1 indicating prior experience and 0 indicating no experience.

Prior Disaster Experience / Community: This refers to whether the county or parish within which the 2011 disaster occurred experienced any prior disasters. The number of prior declaration of major disaster within the county or parish over a ten-year period was calculated for each county or parish within the sample.

Disaster Type: This is the FEMA declared major disaster category assigned to the 2011 disaster within the county or parish. This is a nominal level variable.

Disaster scale: As no scale existed for categorizing this per county or parish impacted, the literature was used to establish three variables to assess disaster scale. They are:

Degree of disruption

Percentage of county or parish affected

Total time of disruption

Time Since Disaster: This ratio-level variable reflects time since disaster. It was calculated based upon the time stamp of survey completion and date of disaster declaration.

Data Analysis

Chapter Four details the analysis of data. Statistical analysis will show descriptive and inferential data. Descriptive statistics are provided to explore the presence of community disaster readiness capabilities within the sample. Unique dimensions were identified using factor analysis and Cronbach's α (alpha) for each set of questions by dimension.

Multi-level multiple regression modeling was used to assess relationships between the independent, dependent, and control variables. Specifically, communities are situated within the model's random component thereby establishing a random intercept model. The incorporation of the county, State, and FEMA region into the random component was further explored during data analysis.

Summary of Methods Chapter

To address the research questions the researcher used a cross-sectional survey and existing community demographic data contained in the 2010 U.S. Census database. This method produced data to demonstrate the effects of adaptive capacity on disaster response and recovery outcomes. A final sample of 333 communities obtained by stratified proportionate random sampling provides a 95% confidence interval with a 5% margin of error. Using best practices for survey research procedures, an overall return rate of 56.9% was realized and the study was conducted within the timeline and budget established.

CHAPTER IV

ANALYSIS AND FINDINGS

Introduction

This chapter reports on findings from the analysis of quantitative data collected using survey methodology. Data analysis using Stata 12 SE included: (a) Preliminary analysis, including frequencies, correlations and exploratory data analysis; (b) Factor analysis to define multiple-item scales; (c) Multiple and hierarchical regression to determine the influence of predictors on effective response and recovery outcomes as well as recovery progression; and (d) Regression diagnostics to evaluate Gauss-Markov assumptions.

As the dataset was hierarchical in nature, individual counties (Level 1) were nested within states (Level 2) and these in turn were nested within FEMA regions (Level 3). To account for nesting effects, additional analysis was conducted to select the best fitting model to address the research questions. Multilevel linear modeling using random intercepts was used in the analysis plan to ensure that the effects of clustering were appropriately addressed during analysis so that findings were interpreted within this context. However, testing the multilevel models indicated that the inclusion of a random component did not prove significantly better than a model with a fixed component only. Additional regression modeling using robust standard errors was necessary to evaluate the best fitting model in response to the research questions.

Research Questions and Hypotheses

The purpose of this study was to determine if a relationship exists between community adaptive capacity and disaster response and recovery outcomes. Specifically, the first objective involved identifying the adaptive capacity (i.e., both community disaster readiness capabilities as well as other variables influencing capacity) that exists within local communities at the time of major disaster. The second objective involved measuring the impact of adaptive capacity on

disaster response and recovery within communities. Using the conceptual and theoretical frameworks discussed in Chapter Two, the following research questions were generated for this study:

- Did communities that experienced major disaster declaration (per Stafford Act criteria) evidence adaptive capacity?
- In local communities who have experienced a major disaster declaration, did adaptive capacity development produce improved response and recovery outcomes?

To address the first research question, survey methodology was used to explore the amount of capability developed within the county or parish before the 2011 major disaster. Using a Likert-style design, questions were constructed to elicit the extent to which a capability had been developed. Data gathered by this method were intended to be descriptive in nature and to offer the quantitative data in the form of percentages and characteristics of adaptive capacity existing within counties or parishes.

To address the second research question, hypotheses were generated based upon the theoretical and conceptual framework and then tested statistically. The following hypotheses were tested:

- H1a: Adaptive capacity development will predict improved response and recovery outcomes.
- H1b: Adaptive capacity along with response and recovery performance outcomes will predict trajectory of recovery progression.

It was anticipated that study results would support both hypotheses and provide empirical data to further validate the conceptual framework for disaster resilience.

Description of the Sample

Sampling Frame, Target Population, and Sampling Method

The survey population for this research included counties or parishes in the United States affected by disaster in 2011. The population included only those counties or parishes that received a major disaster declaration and were included in the FEMA published database of major disasters (Federal Emergency Management Agency, 2011b). United States territories were excluded from the survey population.

Stratified proportionate random sampling was employed as the final sampling plan for this research. Theoretically, this design produces a sample that most closely approximates the population. Strata are defined as non-overlapping, homogeneous groupings of population elements (Heeringa, West, Berglund, 2010). For this study, it was determined that the ten FEMA regions were appropriate strata based upon the population.

Local emergency managers were targeted as the respondents to answer on behalf of the county or parish due to their informed experience relative to the research questions. Respondents completed a total of 355 surveys. 22 surveys were excluded from inclusion because they did not meet inclusion criteria based upon the survey respondent's role within the county or parish at the time of the major disaster declaration. A total of 3 respondents were deemed eligible for inclusion who were not in a designated emergency manager role, but who upon interview were found to have been in a role that would be equivalent to the decision-making role of the emergency manager. The final survey sample obtained was 333 counties or parishes in the United States that had received a major disaster declaration in 2011. Based upon the total population of 2011 impacted counties or parishes, this puts the response rate above the 95% confidence interval overall with a 5% margin of error. Using the Raosoft® sample size calculator

(Raosoft, 2012), the following table shows the total number of counties or parishes required to achieve the 90%, 95% and 99% confidence intervals along with the final sample of respondents.

Table 4

Study Sample With Associated Confidence Intervals

Region	Total Possible	% of the Total	90% C.I.	95% C.I.	99% C.I.	Final Sample
1	114	8%	17	23	35	12
2	101	7%	15	20	31	19
3	138	9%	21	28	42	33
4	341	22%	52	69	104	65
5	205	14%	31	41	62	62
6	200	13%	30	40	61	36
7	185	12%	28	37	56	45
8	187	12%	28	38	57	44
9	16	1%	2	3	5	7
10	30	2%	5	6	9	10
Totals	1517	100%	229	305	462	333

Undercoverage (below the 90% CI) is noted in FEMA region 1. This is attributed to the significant impact of Hurricane Sandy that was affecting this region at the time of data collection. Despite numerous attempts to gain access to respondents in this region using postal mail, email and telephone contacts, unit non-response occurred in this region and is acknowledged as a potential source of error in analysis.

In addition to nesting within FEMA regions, the counties and parishes represented within the sample are nested within States. Table 5 shows the states represented by the sample.

Table 5

Sample Counties / Parishes by State

State	# Responding	State	# Responding	State	# Responding
AK	1	AL	9	AR	9
AZ	1	CA	4	CO	1
CT	1	GA	4	HI	2
IA	7	ID	6	IL	21
IN	14	KS	10	KY	10
LA	4	MA	5	MD	3
ME	5	MN	16	MO	18
MS	11	MT	12	NC	13
ND	15	NE	10	NJ	7
NM	3	NY	12	OH	8
OK	8	OR	3	PA	15
RI	1	SD	4	TN	18
TX	12	UT	6	VA	15
WI	3	WY	6		

The counties and parishes within the sample generally had past experience with disaster. Table 6 shows the number mean disaster experience of the counties or parishes included in the sample.

Table 6

Frequency of Prior Disasters (Past 10 Years)

Number in Past 10 Years	Counties Reporting	Percent
0	24	7.21
1	42	12.61
2	56	16.82
3	53	15.92
4	39	11.71
5	41	12.31
6	35	10.51
7	23	6.91
8	8	2.40
9	6	1.80
10	0	0
11	2	0.60
12	3	0.90
13	1	0.30
Total	333	100

Only 24 counties or parishes had no prior disaster experience before the 2011 major disaster declaration.

Survey respondents (emergency managers) were experienced in past disasters as well. Table 7 shows the past disaster experience of the county or parish emergency management director.

Table 7

Summary of Emergency Manager Experience

Tenure in Emergency Management	Prior Disaster Experience		
	No	Yes	Total
0 – 5 Years	18	79	97
6 – 10 Years	10	92	102
11 – 15 Years	1	49	50
16 – 20 Years	0	25	25
Over 20 Years	0	59	59
Total	29	304	333

This supports the study assumption that the "informed experience" of the emergency manager allows for evaluation of county or parish performance during the 2011 disaster. Additionally, less than a third of the respondents were novices in the emergency management role. The table also shows the breakdown of emergency management tenure and shows that the majority of respondents had significant tenure in their role.

Disaster Type

The counties and parishes included in this study experienced a variety of disaster types. Disaster type was coded as it appeared in the FEMA database of declared major disasters for 2011 (Federal Emergency Management Agency, 2011b). Table 8 includes a summary of disaster type for the final sample.

Table 8

2011 Disaster Types

Disaster Type	Frequency	Percent
Earthquake	2	.60
Wildfire	17	5.71
Flooding, Landslides, Mudslides	6	1.80
Floods	43	12.91
Hurricane Irene	42	12.61
Severe Storms	9	2.7
Severe Storms & Flooding	40	12.01
Severe Storms, Flooding, & Landslides	6	1.80
Severe Storms & Tornadoes	1	0.30
Severe Storms, Tornadoes, & Flooding	34	10.21
Severe Storms, Tornadoes, & Straight Line Winds	1	0.30
Severe Storms, Tornadoes, Straight Line Winds, & Flooding	71	21.32
Severe Winter Storms	4	1.20
Severe Winter Storms, Flooding, & Mudslides	3	0.90
Severe Winter Storms & Snow	23	6.91
Tropical Storm Irene	5	1.50
Tropical Storm Lee	20	6.01
Tsunami Waves	5	1.50

Based upon the obvious overlap in types, and lacking a formal standard categorization system, disaster type is used as descriptive data only and not used in any component of analysis as a control or mediator variable. Future research, however, should explore the value of a disaster classification system.

Disaster Scale

Equally as challenging to the ability to differentiate disaster type, was the ability to clearly establish a disaster scale. Disasters vary according to type, scope, degree of social disruption, amount of area / people affected, and duration (Fischer, 2008). The amount and type of demographic data available to the researcher did not allow for any clear methodology in

establishing a meaningful disaster scale. Therefore, based upon the literature, the survey obtained information related to degree of disruption, extent of the impact, and total time of disruption. Table 9 shows the degree of disruption experienced by the county or parish for this particular disaster.

Table 9

Degree of Disruption

Reported Degree of Disruption	Frequency	Percent
High Degree	63	18.98
Moderate Degree	147	44.28
Low Degree	105	31.63
No Disruption	17	5.12
Total	332	100

Note. 1 missing value.

Within the sample surveyed, the majority of disasters were of moderate to low degree of disruption, while still maintaining a classification as a major disaster.

Table 10 shows the reported extent of disaster impact within the county or parish.

Table 10

Extent of Impact

Reported Extent of Impact	Frequency	Percent
76% - 100%	54	16.22%
51% - 75%	37	11.11%
26% - 50%	84	25.23%
0% - 25%	158	47.45%
Total	333	100%

As seen by the table, the majority of local counties or parishes reported less than 50% of their community was impacted by the disaster.

Time of disruption has been shown to be of particular importance when it comes to determining overall scale of a disaster. "The greater the scope and scale of disruption, the more likely the time for recovery will be extended" (Fischer, 2008, p. 5). Table 11 shows the total time that the county or parish was disrupted by disaster.

Table 11

Total Time of Disruption

Length of Time	Frequency	Percent
Over 15 Months	27	8.11%
12 – 15 Months	19	5.71%
8 – 11 Months	24	7.21%
4 – 7 Months	47	14.11%
0 – 3 Months	216	64.86%
Total	333	100%

Keeping in perspective that the entire sample was composed of only those counties or parishes that had a major disaster declaration, the relatively low length of disruption is possibly explained by the mobilization of resources that occurs following a major disaster declaration. Following the guidance of the Stafford Act (1988), counties or parishes that received a major disaster declaration have demonstrated that the disaster is of such a severity and magnitude that effective

response is beyond the capabilities of the state and local governments (U.S. Department of Homeland Security, 2011b). Mobilization of resources allows for recovery.

Lacking a better indicator for disaster scale, all three variables were used as controls within the analytical model. Correlations of the three variables along with tests for multicollinearity revealed that the three variables were unique. As such, the researcher believed that treating the three variables as predictors in the regression model provided the best available indicator of disaster scale available at the time.

Urban and Rural Demographics

The conceptual model for this study suggests that there are community demographics that influence resilience to disaster. The literature suggests that spatial variations in disaster resilience exist and are evident in the urban / rural divide (Cutter, Burton, & Emrich, 2010). Random sampling within each FEMA region resulted in a final study sample that has an almost equal number of rural and urban communities. To establish this, county/parish demographics were evaluated using two urban/rural classification systems. Variable "*ombrurl*" was constructed using the White House Office of Budget Management Classification System (Office of Management and Budget, 2010). This system designates counties/parishes as metropolitan, micropolitan, or neither. If a county/parish is neither, it is considered rural. Both metropolitan and micropolitan are considered urban and are designated using the number one. If neither, the county is designated as zero or rural. Table 12 shows the sample population as designated by the OMB classification system and demonstrates that the sample included a fairly even representation of both urban and rural communities.

Table 12

Rural / Urban Designation by OMB Classification System

Urban / Rural Designation	Frequency	Percent
Rural	195	58%
Urban	136	41%
Total	331*	

Note. Tribal territories are not included.

To further explore the concept of rurality and its impact on resilience, a second variable was created "*nchsurbrurl*". This variable was constructed using the National Center for Health Statistics (NCHS) 2006 NCHS Urban-Rural Classification Scheme for Counties. This classification system indexes all U.S. counties and county-equivalents into six levels – four for metropolitan and two for non-metropolitan (Ingram & Franco, 2012). This continuous variable progresses from one equaling the most urban to six being the most rural. Table 13 shows the sample population as designated by this classification system.

Table 13

Urban Rural Designation Using the 2006 NCHS Classification Scheme

Urban / Rural Designation	Frequency	Percent
1: Large central metro of 1 million or more	7	2.11
2: Large fringe metro of 1 million or more	55	16.62
3: Medium metro of 250,000 – 999,999	37	11.18
4: Small metro of 50,000 to 249,999	40	12.08
5: Micropolitan statistical area (contains a city of 10,000 or more)	68	20.54
6: Not within a micropolitan statistical area (without a city of 10,000 or more)	124	37.46
Total	331*	

Note. Tribal territories not included.

This scale appears to better differentiate counties or parishes by a composite of factors that define it as urban or rural. As the data were analyzed further, this scale was used to control for community demographics related to this indicator.

Economic Description of the Sample

Economic indicators of disaster resilience vary widely (Cutter et al., 2010). Economic factors impacting community resilience to disaster are complex and include conceptual, operational, and policy elements (Rose, 2004). The conceptual framework of resilience presented in this study does not include a model to analyze this aspect of resilience in any detail. Future work on the model will naturally include this area. However, the conceptual model does include community demographics that potentially mediate disaster response and recovery outcomes. As

such, broad economic variables were included as control variables and included in regression models with the intent to identify a baseline, albeit limited, assessment of economic indicators that were potentially influential. This study included the following variables: (a) percent of the population below the poverty line (*econ_disadv*); (b) per capita income (*inc_percap*); (c) median household income (*inc_medianh).* Table 14 displays the descriptive statistics of the sample relative to each of these variables.

Table 14

Baseline Economic Indicators of the Sample

Variable	Obs	Median	Mean	Std. Dev	Min	Max
econ_disadv	331*	13.90%	14.49%	5.978841	3.7	43.2
inc_medianh	331*	$44,961	$47,339.23	11910.78	$21,798	$104,914
inc_percap	331*	$23,387	$24,029.26	5412.88	$11,966	$49,873

Note. Tribal data not available.

To further illustrate sample characteristics, Figure 3 shows the distribution per indicator.

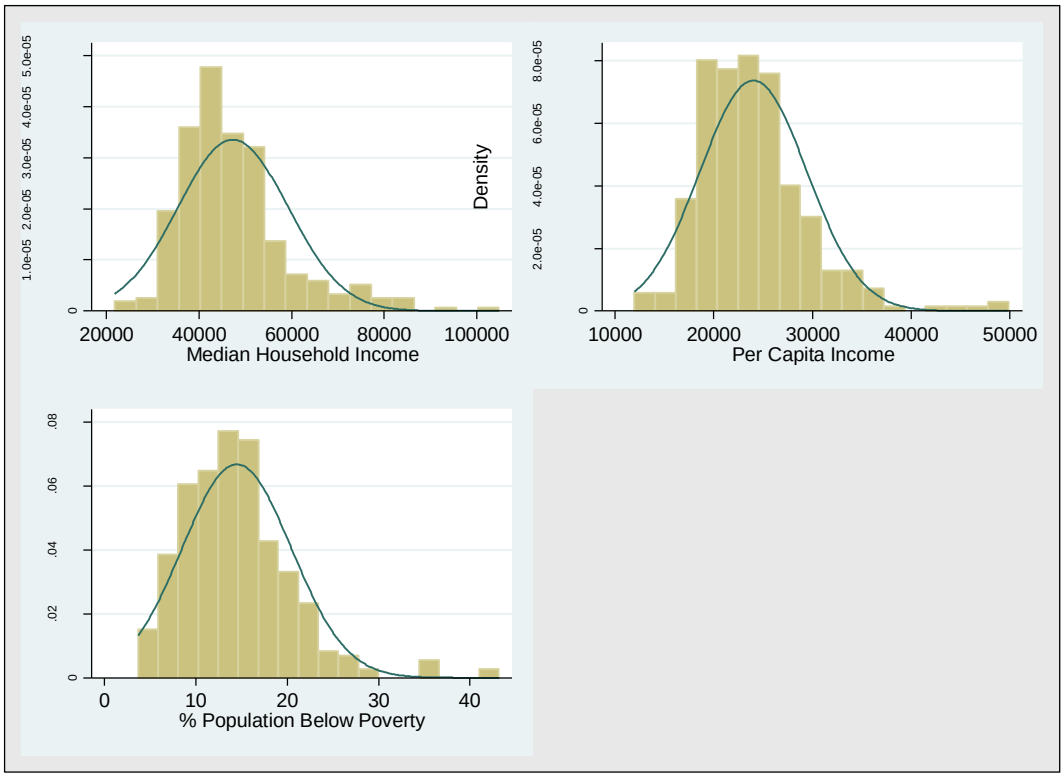

Figure 3. Sample economic indicators.

Despite the positive skew of these descriptors, the mean percentage of people following below the poverty level in the sample (14.49%) corresponds well to the mean poverty level of the population within the United States (14.30%) in 2011 (U.S. Census Bureau, 2013). Additionally, the U.S. Census Bureau (2011) indicates the median household income declined in 2010, along with increases in the poverty rate.

Sample Race & Age Demographics.

The sample demographics of age and race are largely reflective of the population of the United States. Figure 4 shows the sample demographics.

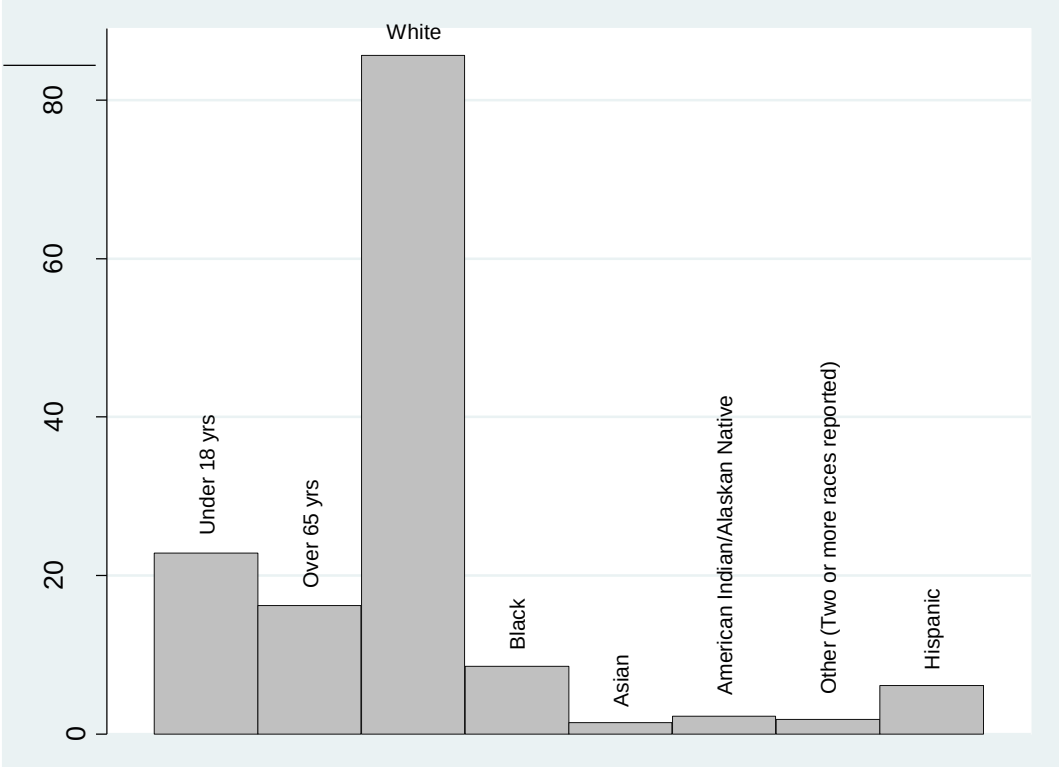

Figure 4. Sample age and race demographics.

To further understand how the random sample drawn for participation compares to the overall population, U.S. Census data were used to compare the sample with the overall population. Table 15 shows a comparison of the sample to the U.S. population.

Table 15

Sample Compared to U.S. Population

Demographic	Sample	United States
% Under 18 yrs.	22.8	23.7
% Over 65 yrs.	16.2	13.3
% White	85.7	78.1
% Black	8.5	13.1
% Asian	1.4	5.0
% American Indian/Alaskan Native	2.2	1.2
% Hispanic	6.1	16.7
% Other	1.8	2.3

Note. All data obtained from the U.S. Census Bureau: State and County Quick Facts, 2010.

Both race and age variables were included as control variables in the analytical models for this study. However, none proved statistically significant and were dropped from the final model.

Research Question One

The first research question was exploratory in nature and asks the following: *Did communities that experienced major disaster declaration (per Stafford Act criteria) evidence adaptive capacity?*

As was noted in the literature review, a lack of quantitative research exists related to the existence of adaptive capacity within communities impacted by disaster. Thus, Tables 16 through 25 are intended to address the first research question by describing the adaptive capacity characteristics and frequencies existing within the sample.

Table 16

Pre-event Risk and Vulnerability Plans: Characteristics & Frequencies

Characteristic	n	%
Pre-event Risk & Vulnerability Plan		
Not Developed	5	1.50
Minimally Developed	5	1.50
Low-level of Development	10	3.00
Moderately Developed	63	18.92
Highly Developed	129	38.74
Completely Developed	121	36.34
Pre-event Risk & Vulnerability Plan – Specific to Disaster		
Not Developed	10	3.00
Minimally Developed	9	2.70
Low-level of Development	18	5.41
Moderately Developed	69	20.72
Highly Developed	117	35.14
Completely Developed	110	33.03

Table 17

Pre-event Mitigation Plans: Characteristics & Frequencies

Characteristic	n	%
Pre-event Mitigation Plan		
Not Developed	13	3.90
Minimally Developed	5	1.50
Low-level of Development	14	4.20
Moderately Developed	52	15.62
Highly Developed	112	33.63
Completely Developed	137	41.14
Pre-event Mitigation Plan – Specific to Disaster Type		
Not Developed	16	4.80
Minimally Developed	15	4.50
Low-level of Development	17	5.11
Moderately Developed	62	18.62
Highly Developed	121	36.34
Completely Developed	102	30.63

Table 18

Pre-event Response Plans: Characteristics & Frequencies

Characteristics	n	%
Pre-event Disaster Response Plan		
Not Developed	4	1.20
Minimally Developed	3	0.90
Low-level of Development	10	3.00
Moderately Developed	45	13.51
Highly Developed	113	33.93
Completely Developed	156	46.85
Pre-event Disaster Response Plan – Specific to Disaster Type		
Not Developed	10	3.00
Minimally Developed	11	3.30
Low-level of Development	13	3.90
Moderately Developed	68	20.42
Highly Developed	111	33.33
Completely Developed	119	35.74

Note. 2 missing values for pre-event response plan and 1 missing value for pre-event response plan specific to disaster type.

Table 19

Pre-event Recovery Plans: Characteristics & Frequencies

Characteristics	n	%
Pre-event Disaster Recovery Plan		
Not Developed	25	7.51
Minimally Developed	23	6.91
Low-level of Development	38	11.41
Moderately Developed	78	23.42
Highly Developed	98	29.43
Completely Developed	69	20.72
Pre-event Disaster Recovery Plan – Specific to Disaster Type		
Not Developed	33	9.91
Minimally Developed	28	8.41
Low-level of Development	42	12.61
Moderately Developed	87	26.13
Highly Developed	89	26.73
Completely Developed	53	15.92

Note. 2 missing values for pre-event disaster recovery plan and 1 missing value for pre-event disaster recovery plan specific to disaster type.

Table 20

Pre-event Planning to Use NIMS & ICS

Characteristic	n	%
Pre-event Planning to Use		
Not Developed	5	1.50
Minimally Developed	6	1.50
Low-level of Development	6	3.00
Moderately Developed	47	18.92
Highly Developed	102	38.74
Completely Developed	166	36.34

Note. 1 missing value.

Table 21

Collaborative Networks

Characteristic	n	%
Response		
Not Developed	2	0.60
Minimally Developed	11	3.30
Low-level of Development	10	3.00
Moderately Developed	53	15.92
Highly Developed	110	33.03
Completely Developed	144	43.24
Recovery		
Not Developed	8	2.40
Minimally Developed	13	3.90
Low-level of Development	27	8.11
Moderately Developed	69	20.72
Highly Developed	117	35.14
Completely Developed	99	29.73

Note. 3 missing values for response category.

Table 22

Early Warning Systems

Characteristic	n	%
Early Warning System Development		
Not Developed	27	1.50
Minimally Developed	18	1.50
Low-level of Development	23	3.00
Moderately Developed	52	18.92
Highly Developed	107	38.74
Completely Developed	106	36.34

Table 23

Overall Community Engagement in Disaster Planning

Characteristic	n	%
Public		
Highly Disengaged	20	6.01
Somewhat Disengaged	59	17.72
Neither Engaged or Disengaged	114	34.23
Somewhat Engaged	104	31.23
Highly Engaged	36	10.81
Businesses		
Highly Disengaged	19	5.71
Somewhat Disengaged	57	17.12
Neither Engaged or Disengaged	124	37.24
Somewhat Engaged	104	31.23
Highly Engaged	29	8.71
Elected Officials		
Highly Disengaged	9	2.70
Somewhat Disengaged	25	7.51
Neither Engaged or Disengaged	77	23.12
Somewhat Engaged	128	38.44
Highly Engaged	94	28.23

Table 24

Training & Exercises

Characteristic	n	%
Orientation Seminars		
Never	76	22.82
One time	84	25.23
Two times	80	24.02
Three times	42	12.61
Four or more times	51	15.32
Drills		
Never	57	17.12
One time	111	33.33
Two times	73	21.92
Three times	42	12.61
Four or more times	48	14.41
Tabletop Exercises		
Never	36	10.81
One time	104	31.23
Two times	102	30.63
Three times	45	13.51
Four or more times	46	13.81
Functional Exercises		
Never	94	28.23
One time	134	40.24
Two times	53	15.92
Three times	30	9.01
Four or more times	22	6.61
Full Scale Exercises		
Never	116	34.83
One time	142	42.64
Two times	37	11.11
Three times	20	6.01
Four or more times	18	5.41

Note: 2 missing values for drills.

Table 25

Use of National Frameworks

Characteristic	n	%
National Incident Management System		
Strongly disagree	7	2.10
Somewhat disagree	27	8.11
Neither agree or disagree	56	16.82
Somewhat agree	103	30.93
Strongly agree	127	38.14
Not applicable	13	3.90
Incident Command System		
Strongly disagree	7	2.10
Somewhat disagree	20	6.01
Neither agree or disagree	35	10.51
Somewhat agree	93	27.93
Strongly agree	169	50.75
Not applicable	9	2.70

The descriptive data collected as a part of this research clearly indicates that communities have embraced the ideas espoused by national-level frameworks and doctrine and have incorporated these capabilities into local-level planning for response and recovery. The larger question remains, however, as to whether or not these capabilities can predict effective response and recovery. Adaptive capacity variables will be discussed in more detail as research question two is addressed.

Research Question Two

The second research question required hypothesis testing. The research question addressed was the following: In local communities who have experienced a major disaster declaration, did adaptive capacity development produce improved response and recovery outcomes? The following hypotheses were generated:

- H1a: Adaptive capacity development will predict improved response and recovery outcomes.

- H1b: Adaptive capacity along with response and recovery performance outcomes will predict trajectory of recovery progression.

The dependent variables for this study were created using the conceptual and theoretical models described earlier. According to these models, response and recovery outcomes are measured by the effectiveness of the following: (a) management of the response & recovery process; (b) collaboration of the community agencies required for response & recovery; (c) communication among the diverse entities involved in response & recovery; (d) resource mobilization and access; (e) post-disaster progress in the following: housing, transportation systems, business continuity, infrastructure repair, and return of social structures.

Scale Development: Dependent Variables

A basic theoretical assumption is that all disasters are different and vary by type, scope, degree of disruption, amount of area affected, number of people affected, and duration (Fischer, 2008). As such, the survey tool was developed to allow for variation between communities by using composite measures related to each response and recovery outcome. This enabled the researcher to account for variation and summarize those indicators into a single numerical score. A multiple-item scale was then created to reflect the underlying construct. According to Babbie (2008), quantitative researchers often use scales to measure constructs with many dimensions. He states:

> Single indicators of variables seldom capture all the dimensions of a concept, have sufficient validity to warrant their use, or permit the desired range of variation to allow ordinal rankings. Composite measures such as scales or indexes solve these problems by including several indicators of a variable in one summary measure (Babbie, 2008, p. 195).

Scale development for this study increased the researcher's ability to capture the complexities associated with the outcome variables by creating indicators that included items reflecting the constructs that were grounded in both theory and experience. Table 26 summarizes the scales created to reflect the outcome indicators.

Table 26

Outcome Variables: Scale Development

Scale Name	Variable Name	Survey Question #
Disaster Response Management	*respsat*	Question 15
Disaster Response Collaboration	*rescoll*	Question 16
Disaster Response Resources	*resresr*	Question 17
Disaster Response Communication	*rescom*	Question 18
Disaster Recovery Management	*recpsat*	Question 19
Disaster Recovery Collaboration	*reccoll*	Question 20
Disaster Recovery Communication	*reccom*	Question 21
Disaster Recovery Progression	*recprog*	Question 22
Disaster Recovery Resources	*recresr*	Question 23

Factor analysis. Factor analysis was used to provide an understanding of the relationship between variables. Table 27 illustrates the results of factor analysis.

Table 27

Factor Loadings For Dependent Variable Survey Scale Indices

	Factors					
Variables	1	2	3	4	5	Uniqueness
Disaster Response Management	0.815					0.239
Disaster Response Collaboration	0.812					0.260
Disaster Response Resources	0.715					0.416
Disaster Response Communication	0.892					0.154
Disaster Recovery Management	0.875					0.165
Disaster Recovery Collaboration	0.872					0.150
Disaster Recovery Communication	0.882					0.191
Disaster Recovery Progression	0.299	0.211	0.167	0.072	0.093	0.823
Disaster Recovery Resources	0.760					0.322
Eigenvalues	5.606	0.294	0.206	0.130	0.039	
Proportion of the Total Variation	0.949	0.049	0.034	0.022	0.006	

Results of the factor analysis indicate that approximately 95% of the variance is explained by the presence of 1 factor. In order to provide a visual representation of factor loadings, a scree plot of eigenvalues was obtained. Figure 5 illustrates the findings.

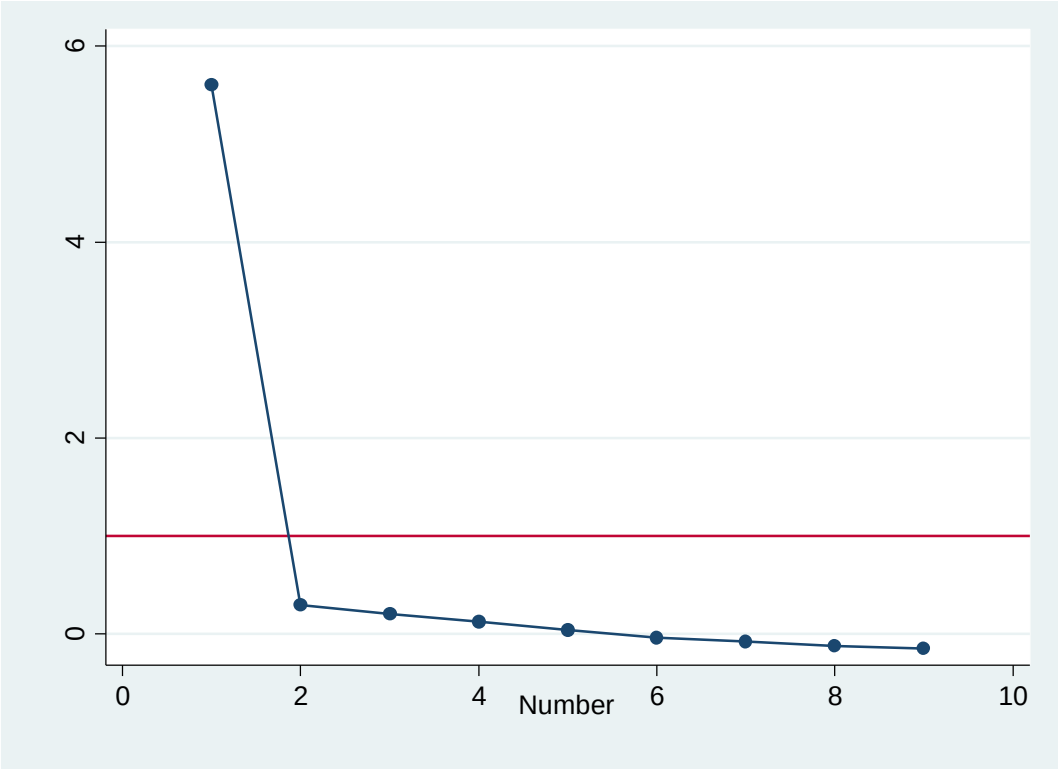

Figure 5. Scree plot following factor analysis: Outcome variables.

A pattern matrix was examined to provide understanding of the relative uniqueness of these factors. As shown, variable *recprog* causes concern relative to a uniqueness score of 0.823. To further validate the findings, orthogonal and oblique rotation was conducted and yielded confirming results. Overall, results of factor analysis demonstrate that there is clearly a single factor involved, but that *recprog* must be treated separately. This seems theoretically sound as recovery progression relies upon the outcomes obtained in response and recovery. The factor analysis was repeated using just the retained variables and all loaded as expected on a single factor.

Cronbach's alpha. The internal consistency or reliability of the items used to measure the outcome variables was assessed using Cronbach's Alpha. Based upon differences in the sizes of scales, the researcher selected to standardize the scales using STATA's std option. Table 28 summarizes the results.

Table 28

Cronbach's α: Outcome Variables

Item	Result
Average interitem correlation	0.6813
Number of Items in the Scale	8
Scale Reliability Coefficient	0.9447

Note. Test scale = mean (standardized items).

This measure of the internal consistency reliability coefficient at a .94 value indicates how well the tool reflects the concept of interest and is consistent across the subparts, i.e. *respsat, rescoll, resresr, rescom, recpsat, reccoll, reccom, and recresr.* Additionally, the high interitem correlation provides further support of scale reliability.

Based upon both a theoretical and a statistical analysis of the constructs, two dependent variables were created for this research: (a) overall response and recovery performance (*dv_resrec*); and (b) recovery progression (*recprog*). Both are described in additional detail below.

Univariate Analysis: Overall Response and Recovery (dv_resrec)

This dependent variable was created as an additive index using the scores obtained for the construct subparts *respsat, rescoll, resresr, rescom, recpsat, reccoll, reccom, and recresr.* By definition, it is the overall response and recovery performance outcome (management,

collaboration, communication, and resources) of the community in relation to that particular county or parish's disaster. Table 29 reflects the summary statistics for this scale variable.

Table 29

Summary Statistics for Variable dv_resrec

Variable	N	M	SD	Mdn	Skew
dv_resrec	333	6.213	1.217	6.31	-1.658

The data reveals a negative skew. The following Figure 6 contains a histogram, box plot, symmetry plot, and quantile normal plot for the variable. As shown, the variable *dv_resrec* has a negative skew with an elongated lower tail as seen in the histogram with normal curve overlay. The histogram, box plot, symmetry plot, and quantile normal plot also provide evidence of a negative skew.

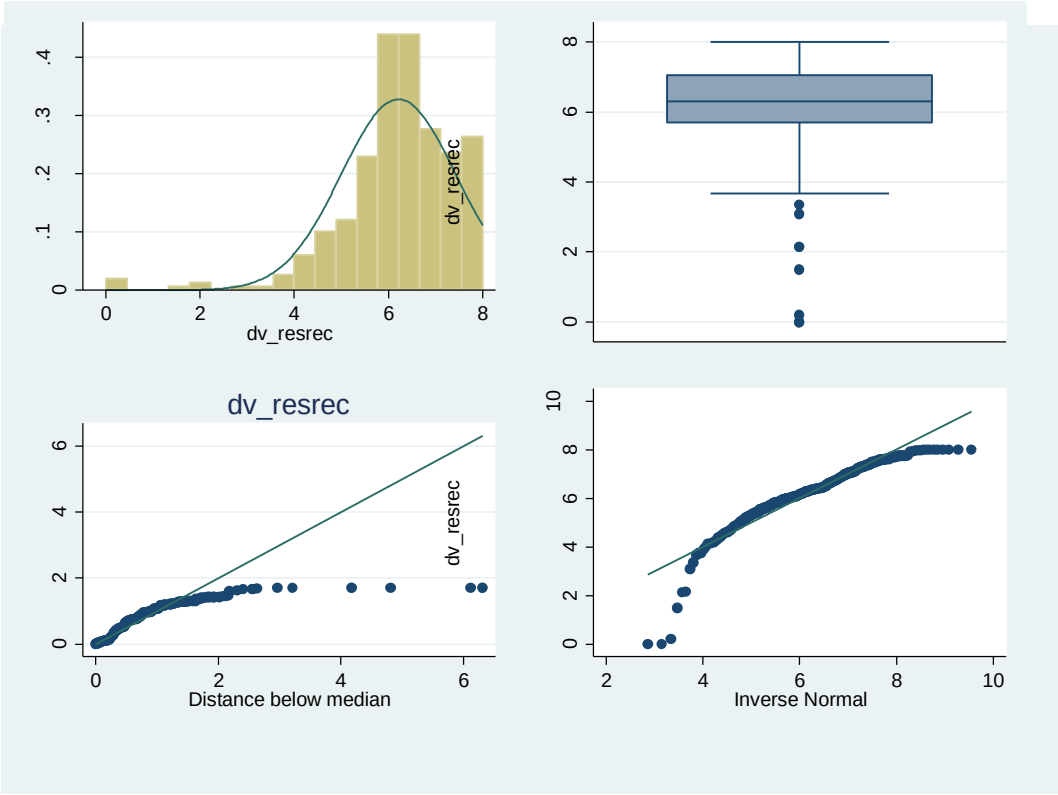

Figure 6. Graph of outcome variable: Overall response and recovery.

In order to make the distribution more symmetrical and more closely approximate a normal distribution, a power transformation was applied to the variable. As shown in Figure 7, cubing each value in the distribution generated a distribution that far better approximated a normal distribution.

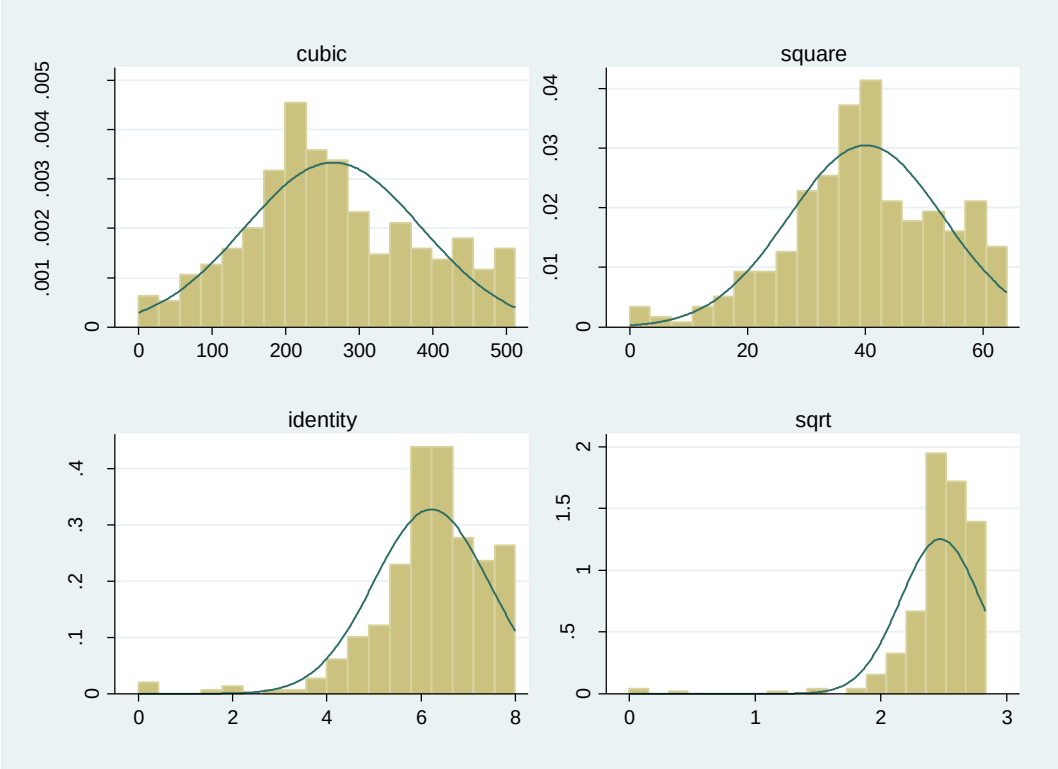

Figure 7. Overall response and recovery histograms by power transformation.

The new transformed variable *dv_tresrec* has a more symmetrical distribution. Table 30 displays description statistics for this variable.

Table 30

Transformed Dependent Variable dv_tresrec

Variable	N	M	SD	Mdn	Skew
dv_tresrec	333	264.40	119.74	251.24	.196

Regression diagnostics discussed later in this chapter were employed to determine if the use of the transformed variable provided for a better unbiased linear estimate.

Univariate Analysis: Recovery Progression (recprog)

By definition, this variable reflects the county or parish post-disaster progress in the following areas: (a) return of residents to permanent housing; (b) return of transportation systems; (c) return of displaced businesses; (d) re-building of infrastructure; and (e)) Return of social structures (theatre, art, entertainment). By its design, this variable was created to be a scale reflecting the differing levels of progress for each element of the construct. Table 31 reflects the summary statistics for this variable.

Table 31

Summary Statistics for Variable recprog

Variable	N	M	SD	Mdn	Skew
recprog	333	.720	.207	.80	-2.10

Like the other dependent variable, this data reveals a negatively skewed distribution. Figure 8 below contains a histogram, box plot, symmetry plot, and quantile normal plot for the variable *recprog* and each plot highlights the negative skew.

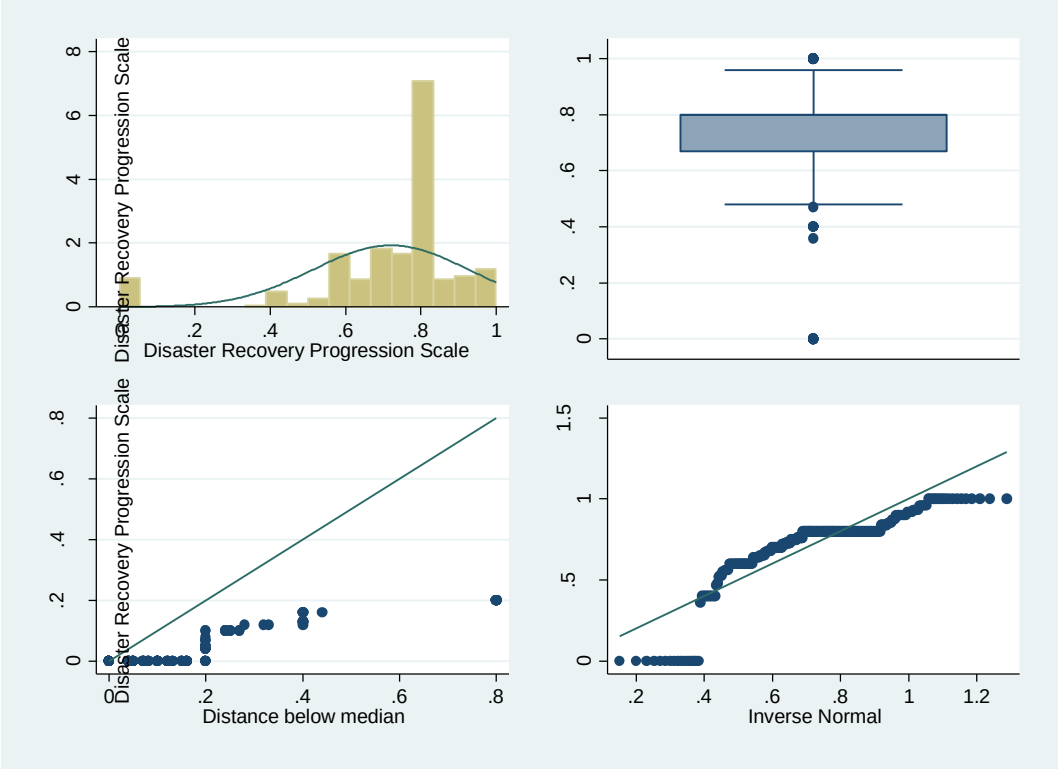

Figure 8. Outcome variable recovery progression (*recprog*) graphs.

In order to make the distribution more symmetrical and more closely approximate a normal distribution, a power transformation was applied to the variable. Figure 9 provides insight into the approximate power transformations that would be used to more closely approximate a normal distribution.

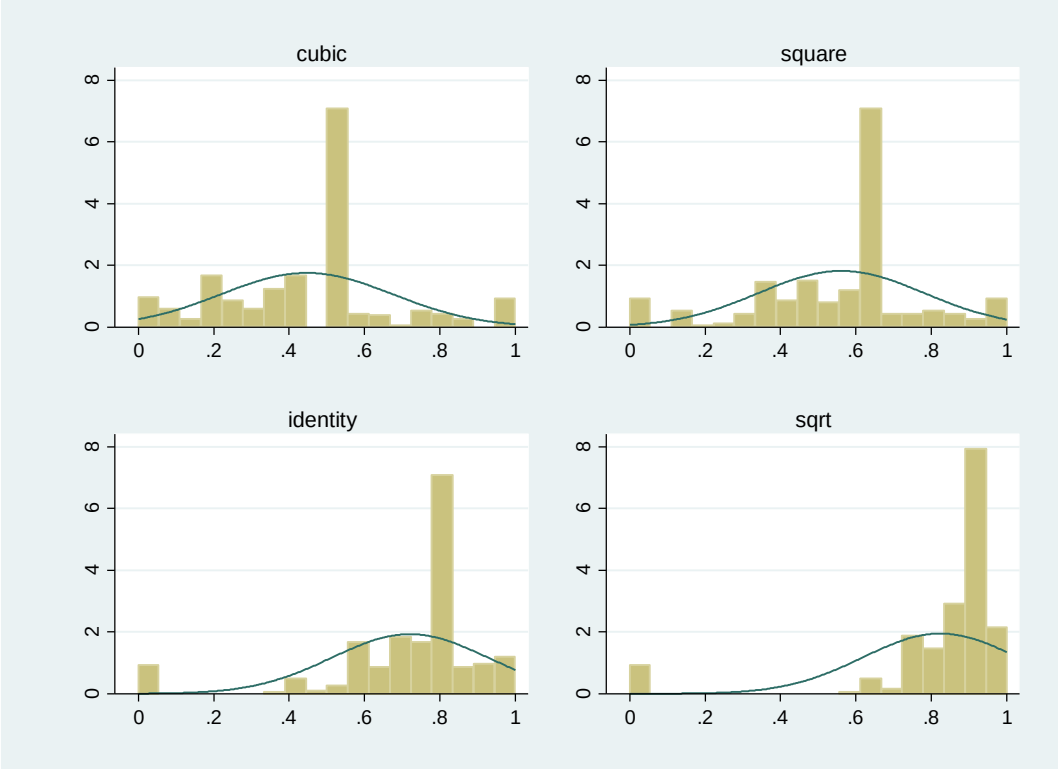

Figure 9. Graphical display of outcome variable transformation (*recprog*).

Based upon the cubic and square transformation appearing equally as good, the qladder command was used to produce quantile normal plots of the transformation. Figure 10 provides the results from this command.

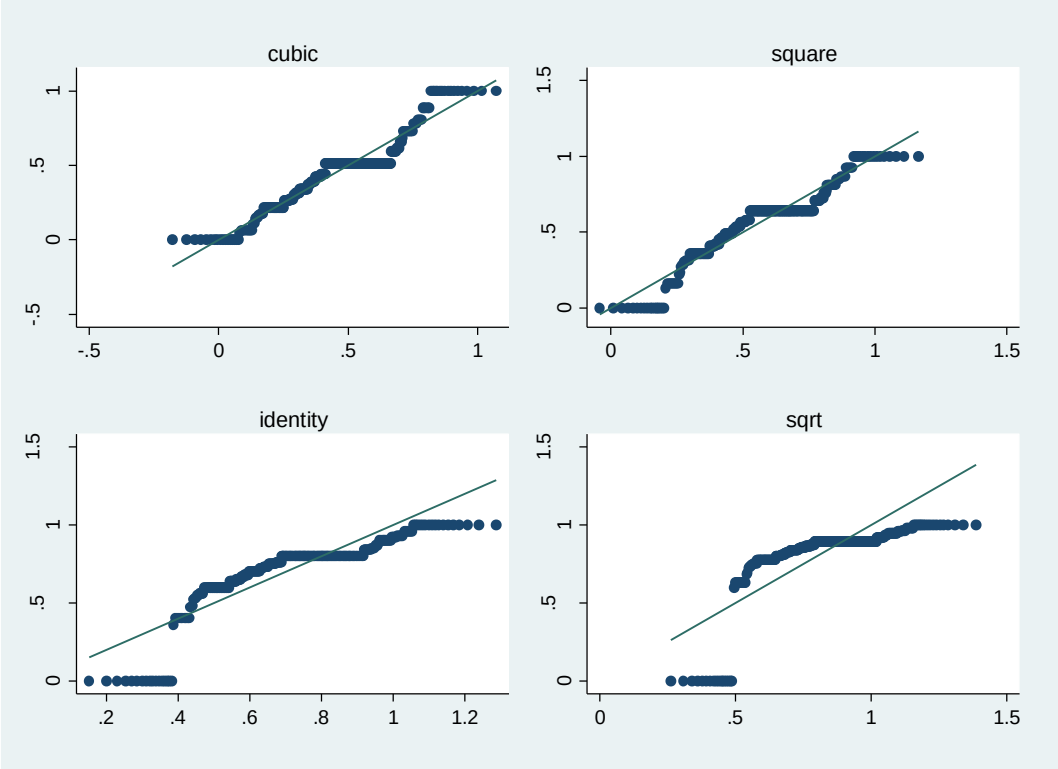

Figure 10. Quantile normal plots for outcome variable *recprog*.

Histograms and quantile normal plots, along with tests for skewness and kurtosis, resulted in selecting a cubic transformation. The new variable *dv_trecprog* has a more symmetrical distribution. Table 32 displays the results of the new variable.

Table 32

Transformed Dependent Variable dv_trecprog

Variable	N	M	SD	Mdn	Skew
dv_trecprog	333	.447	.227	.512	.287

Regression diagnostics discussed later in this chapter were used to determine if the use of the transformed variable *dv_trecprog* resulted in a better unbiased linear estimate than the original form of the variable.

Scale Development: Independent Variables

The independent variables for this study were derived from the conceptual and theoretical models discussed earlier. This study was designed to investigate and test the relationships between the indicators that theoretically support the adaptive capacity of a community and the outcome variables. Adaptive capacity, as described in the literature review for this study, is composed of those capabilities that experientially and theoretically enhance resilience to disaster. National-level frameworks and doctrine identify those elements as: pre-event planning for response and recovery; development of networks and community engagement; training and exercise; early warning systems; mitigation planning to include vulnerability and risk assessment; knowledge and use of national frameworks (to include NIMS & ICS); and resource mobilization. Table 33 on the following page summarizes the variables included to address the research question.

Table 33

Adaptive Capacity Variables

Variable Name	Variable Label
q8_rva	Written risk & vulnerability assessment
q8_rvas	Written risk & vulnerability assessment specific to the disaster type that impacted the county/parish
q8_mp	Written mitigation plan
q8_mps	Written mitigation plan specific to the disaster type that impacted the county/parish
q8_drsp	Written plan for disaster response
q8_drsps	Written plan for disaster response specific to disaster type
q8_drcp	Written plan for disaster recovery
q8_drcps	Written plan for disaster recovery specific to disaster type
q8_ppnims	Pre-event planning to use NIMS & ICS
q8_pcnetsrs	Pre-event establishment of networks to support response
q8_pcnetsrc	Pre-event establishment of networks to support recovery
q8_ews	Early warning system specific to disaster type
q9_peng	Overall engagement: Community residents
q9_beng	Overall engagement: Businesses
q9_eoeng	Overall engagement: Elected officials
q12_frqos	Frequency of orientation seminars
q12_frqd	Frequency of drills
q12_frqtte	Frequency of tabletop exercises
q12_frqfe	Frequency of functional exercises
q12_frqfse	Frequency of full-scale exercises
q14_unims	Use of NIMS during this disaster
q14_uics	Use of ICS during this disaster

Factor analysis: Independent variables. To begin to address the second research question, the researcher explored the independent variables using factor analysis. As a first step in analysis, an exploratory factor analysis was performed on those variables theoretically associated with pre-event activities. Table 34 illustrates the results of factor analysis.

Table 34

Factor Loadings For Adaptive Capacity Variables (unrotated)

	Factors				
Variables	1	2	3	4	Uniqueness
Risk & Vulnerability Assessment	0.650				0.321
Risk & Vulnerability Assessment (Specific*)	0.715				0.224
Mitigation Plan	0.633				0.214
Mitigation Plan (Specific*)	0.683				0.128
Disaster Response Plan	0.774				0.221
Disaster Response Plan (Specific*)	0.769				0.145
Disaster Recovery Plan	0.689				0.109
Disaster Recovery Plan (Specific*)	0.694				0.107
Pre-planning to Use NIMS & ICS	0.634				0.409
Plans for Response Networks	0.676				0.238
Plans for Recovery Networks	0.705				0.288
Early Warning Systems (Specific)	0.559				0.595
Overall Engagement: Community Residents			0.679		0.199
Overall Engagement: Businesses			0.696		0.176
Overall Engagement: Elected Officials	0.471		0.433		0.546
Frequency of Orientation Seminars		0.467			0.548
Frequency of Drills		0.580			0.506
Frequency of Tabletop Exercises		0.682			0.325
Frequency of Functional Exercises		0.697			0.312
Frequency of Full-scale Exercises		0.589			0.444
Eigenvalues	7.099	2.152	1.547	1.048	
Proportion of the Total Variation	0.548	0.166	0.119	0.081	

Note. n = 324. Retained factors = 11. Only eigenvalues > 1 displayed. *Specific to type of disaster that affected the community.

Results of the factor analysis indicate that approximately 55% of the variance is explained by the presence of 1 factor. In order to provide a visual representation of factor loadings, a scree plot of eigenvalues was obtained. Figure 11 illustrates the findings.

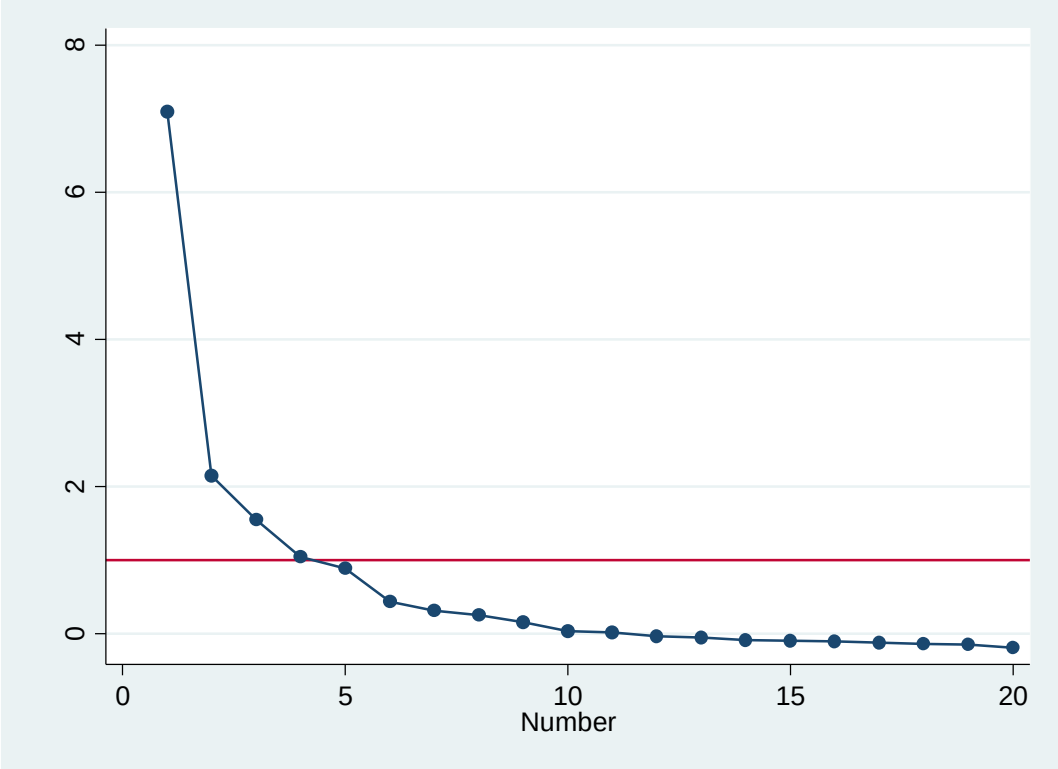

Figure 11. Scree plot following factor analysis of independent variables.

To better understand the relative uniqueness of these factors, the pattern matrix from the factor analysis was evaluated. The results noted in Table 34 provide no evidence that variables should be omitted.

To better understand factor loadings, the researcher conducted orthogonal and oblique rotation. Results of rotation provide additional support relative to factor loadings. Results of orthogonal rotation are displayed in Table 35.

Table 35

Factor Analysis for Adaptive Capacity Variables: Orthogonal Rotation

	Factor			
Variable	1	2	3	Uniqueness
Risk & Vulnerability Assessment	0.699			0.493
Risk & Vulnerability Assessment (Specific*)	0.782			0.371
Mitigation Plan	0.672			0.530
Mitigation Plan (Specific*)	0.757			0.416
Disaster Response Plan	0.754			0.361
Disaster Response Plan (Specific*)	0.793			0.325
Disaster Recovery Plan	0.547			0.463
Disaster Recovery Plan (Specific*)	0.599			0.452
Pre-planning to Use NIMS & ICS	0.568			0.592
Plans for Response Networks	0.573			0.537
Plans for Recovery Networks	0.567			0.499
Early Warning Systems (Specific)	0.558			0.659
Overall Engagement: Community Residents			0.823	0.302
Overall Engagement: Businesses			0.856	0.234
Overall Engagement: Elected Officials			0.599	0.584
Frequency of Orientation Seminars		0.576		0.626
Frequency of Drills		0.672		0.532
Frequency of Tabletop Exercises		0.792		0.347
Frequency of Functional Exercises		0.786		0.362
Frequency of Full-scale Exercises		0.677		0.518
Variance	5.435	2.772	2.591	
Proportion of the Total Variation	0.419	0.214	0.199	
Correlations				
Factor 1	0.829	0.355	0.433	
Factor 2	-0.349	0.932	-0.095	
Factor 3	-0.437	-0.072	0.897	

Note. n = 324. Retained factors = 3. *Specific to type of disaster that affected the county or parish.

Rotation provided confirmation that three unique factors were present. Factor 1 includes those variables theoretically associated with pre-event preparation for response and recovery. Factor 2 includes those variables related to training and exercise based upon the FEMA model presented earlier in the literature review. Factor 3 includes those variables that theoretically reflect community engagement in disaster response and recovery planning.

Cronbach's alpha. To test the internal consistency or reliability of the measurement tool for each factor, Cronbach's Alpha scores were calculated for each. Results of this analysis are reflected in Table 36.

Table 36

Cronbach's Alpha: Adaptive Capacity Variables

Item	Result
Pre-event Planning	
Average interitem covariance	0.7255432
Number of Items in the Scale	12
Scale Reliability Coefficient	0.9130
Community Engagement	
Average interitem covariance	0.7022625
Number of Items in the Scale	3
Scale Reliability Coefficient	0.8569
Training & Exercise	
Average interitem covariance	0.7545479
Number of Items in the Scale	5
Scale Reliability Coefficient	0.8370

Note. Test scale = mean (unstandardized items).

Scale reliability coefficients of .91, .86, and .84 indicate consistency of the subparts for each factor. The researcher was now able to construct the independent variables to test the research questions.

Based upon both a theoretical and a statistical analysis of the constructs within the model, four independent variables were created for this research. All four will be described in additional detail.

Univariate Analysis: Overall Community Pre-Event Planning for Response and Recovery (iv_planning)

This independent variable was created as an additive scale using the scores obtained for the construct subparts reflected by the following variables: q8_rva (risk and vulnerability assessment), q8_rvas (risk and vulnerability assessment specific to disaster), q8_mp (mitigation

plan), q8_mps (mitigation plan specific to disaster), q8_drsp (disaster response plan), q8_drsps (disaster response plan specific to disaster), q8_drcp (disaster recovery plan), q8_drcps (disaster recovery plan specific to disaster), q8_ppnims (pre-planning to use NIMS and ICS), q8_pcnetsrs (pre-planning for response networks), q8_pcnetsrc (pre-planning for recovery networks), q8_ews (early warning systems specific to disaster). Table 37 displays the descriptive statistics for this variable.

Table 37

Descriptive Statistics for iv_planning

Variable	N	M	SD	Mdn	Skew
iv_planning	333	45.189	10.759	47.00	-1.033

The data reveals a negatively skewed distribution. Figure 12 contains a histogram, box plot, symmetry plot, and quantile normal plot for the variable *iv_planning* (pre-event planning for response and recovery).

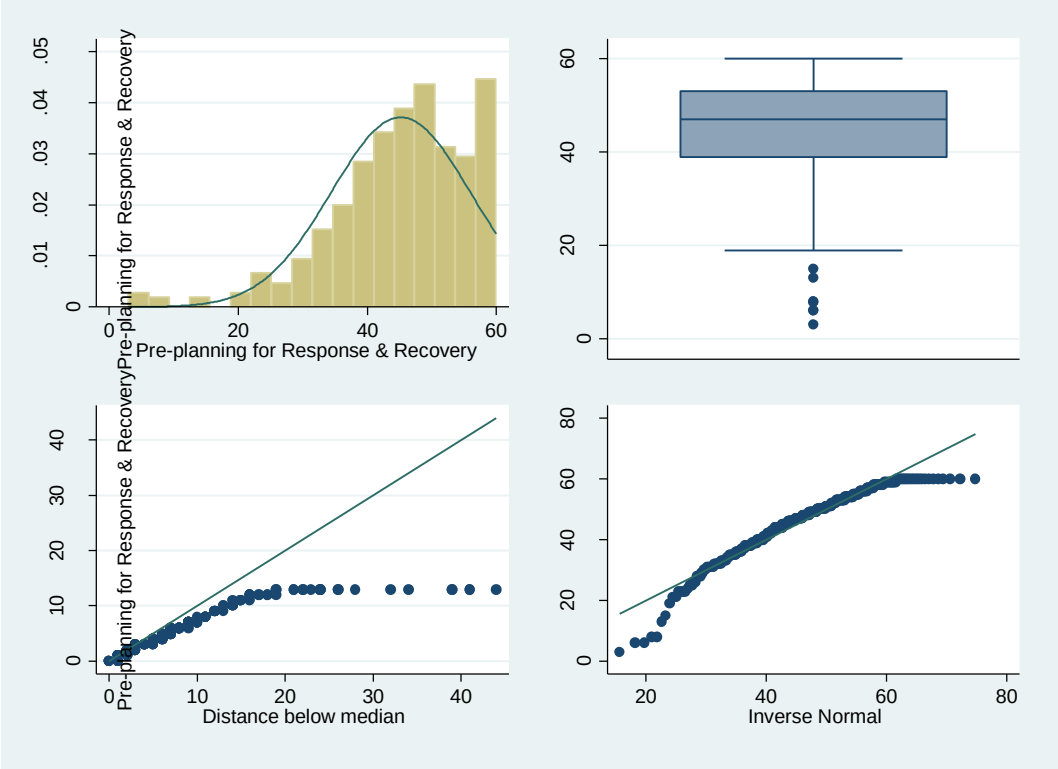

Figure 12. Graphical display of variable *iv_planning*.

Each plot shows the negative skew for the variable. The results of the regression analysis and critique were used to drive the final decisions regarding variable transformation. Given reasonable support for underlying model assumptions, the decision was made to not transform this variable.

Univariate Analysis: Overall Community Engagement (iv_engage)

This independent variable was created as an additive scale using the scores obtained for the construct subparts reflected by the following variables: q9_peng (overall engagement of community residents), q9_beng (overall engagement of local businesses), and q9_eoeng (overall engagement of elected officials). Table 38 shows the descriptive statistics for this variable.

Table 38

Descriptive Statistics for iv_engage

Variable	N	M	SD	Mdn	Skew
iv_engage	333	10.252	2.716	10.00	-0.349

The data reveals a negative skew. Figure 13 contains a histogram, box plot, symmetry plot, and quantile normal plot for the variable *iv_engage* (overall community engagement).

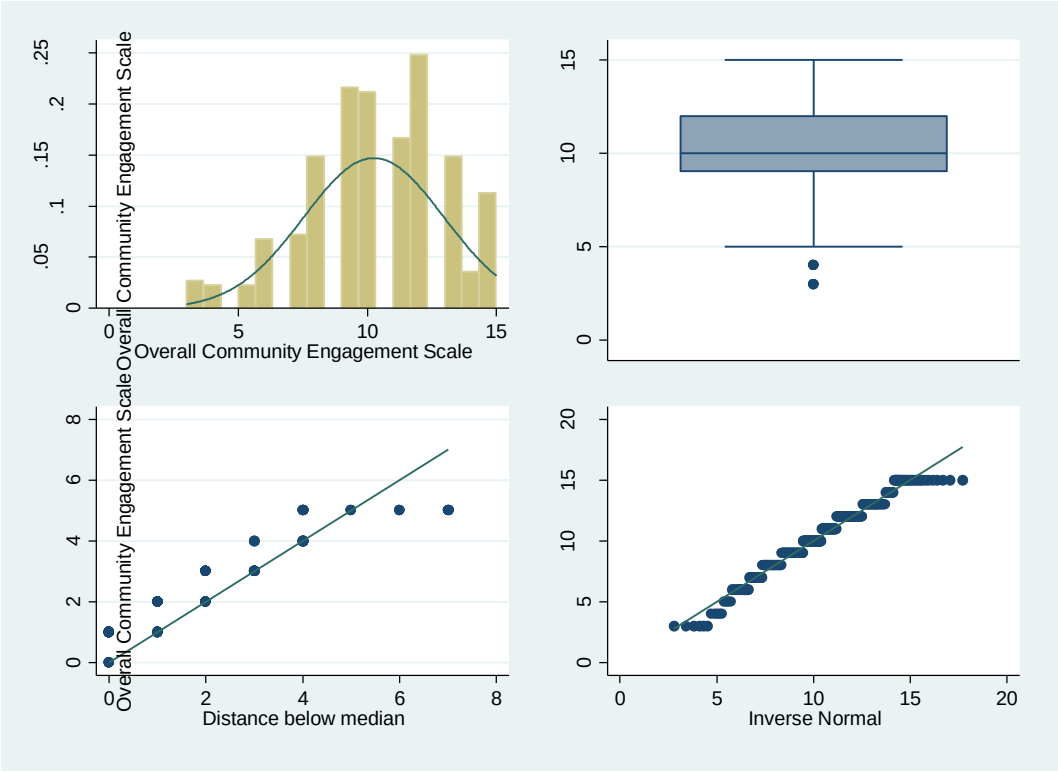

Figure 13. Graphical display of variable *iv_engage*.

As shown, the variable *iv_engage* has a slight negative skew. The researcher used the results of regression analysis and critique to drive the final decisions regarding variable transformation. Given reasonable support for underlying model assumptions, the decision was made to not transform variable *iv_engage* in the final regression model.

Univariate Analysis: Training and Exercises (*iv_training* and *iv_educb*)

Two independent variables were crated for training and exercises. The first independent variable was created as an additive scale using the scores obtained for the training construct subparts reflected by the following variables: q12_frqos (frequency of orientation seminars) q12_frqd (frequency of drill) q12_frqtte (frequency of tabletop exercise) q12_frqfe (frequency of functional exercise) q12_frqfse (frequency of full-scale exercise). Table 39 shows the descriptive statistics for this variable.

Table 39

Descriptive Statistics for iv_training

Variable	N	M	SD	Mdn	Skew
iv_training	333	7.634	4.742	7.00	.646

The data reveals a positive skew. The following figure contains a histogram, box plot, symmetry plot, and quantile normal plot for the variable *iv_training* graphically depicting the skew.

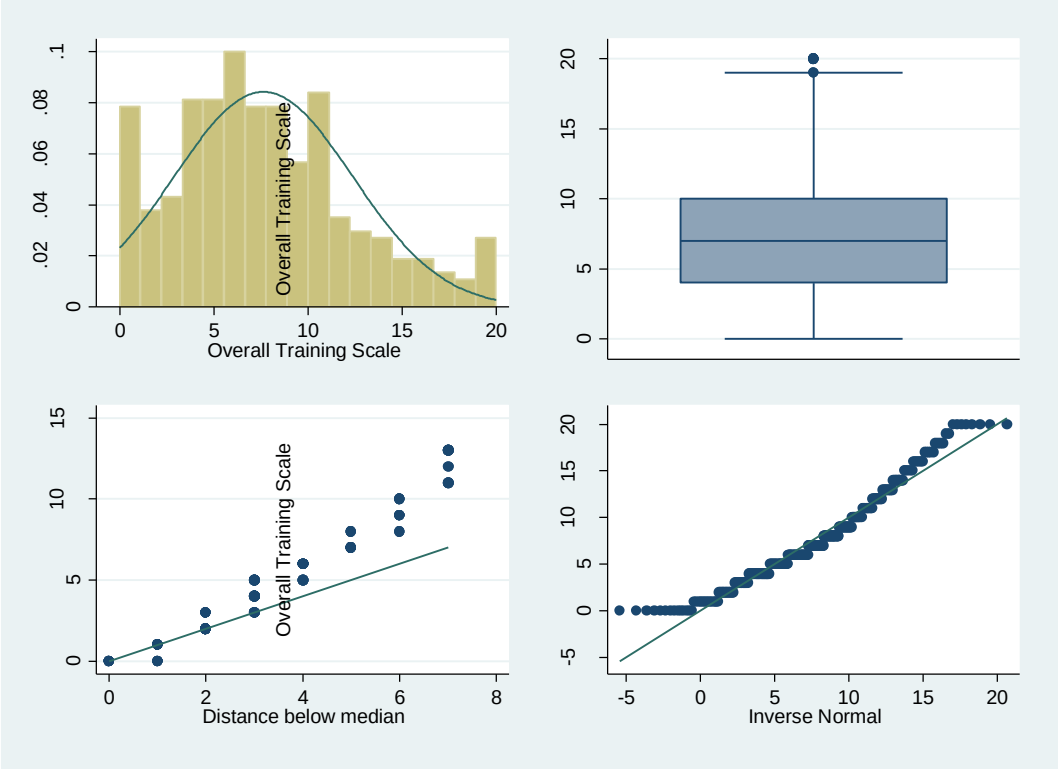

Figure 14. Graphical display of variable *iv_training*.

While a square root of this variable would reduce the positive skew, results of regression analysis and critique indicated model assumptions were met without performing a power transformation on this variable.

The second training variable was created to reflect additional theoretical considerations surrounding the specific concepts involved in designing disaster response training and the expected outcomes of specific training. Using the literature and the training categories established by FEMA (U.S. Department of Homeland Security, 2003) to further explore this variable, Table 40 was created to reflect qualities that further distinguish each of the training categories.

Table 40

Training and Exercise Characteristics

Training Category	Training Elements					Simulates Response Behavior	Fidelity
	Emergency Operations Center Activated	Tests Functions in the Emergency Operations Plan	Simulates Real Events	Simulates High Stress Environment	Resources Moved to Simulated Disaster Site		
Full-Scale Exercise	Yes	Yes	Yes	Yes	Yes	High	High
Functional Exercise	Yes	Yes	Yes	No	No	Medium	Medium
Tabletop Exercise	No	Yes	No	No	No	Low	Low
Drill	No	Yes	No	No	No	Low	Low
Orientation Seminar	No	No	No	No	No	Low	Low

The table shows the FEMA defined training category and their associated training elements that remain part of standard training protocol accepted as the nation's standard for disaster response training (U.S. Department of Homeland Security, 2003). Two additional columns were added to further differentiate training. High, medium, and low designations were provided based upon the degree to which the training type required actual behaviors that mirrored the behavior expected during actual disaster response. Based upon the training items listed, the full-scale exercise was the only category that requires behaviors similar to a real-life situation.

The final column of the table was added based upon training literature in the medical sciences that differentiates the outcomes obtained using high-fidelity environments to simulate actual behaviors. Fidelity is described as the degree to which the skills in the real task are captured in the simulated environment (Marin & Glavid, 2003). In a high-fidelity situation, the environment allows the creation of conflicts and complex problems drawn from those elements (Small, Wuerz, & Simon, 1999). Experientially and theoretically, a high fidelity environment

requires outcomes in both the cognitive and behavioral domains. According to Harrald (2006), critical success factors in disaster response rely on the agility and discipline of the response community. According to Mendoca and Wallace (2004), the ability to take connections among individuals that are implied by disaster plans and then compare them to those that actually occur during the response to an actual or simulated event, is an advantage. Research in medicine (Aggarwal, Black, Hance, Darzi, & Cheshire, 2006), aviation (Byrne & Kirlik, 2005), and psychology (Salas & Cannon-Bowers, 2001) demonstrates outcome differences when behaviors accompany cognitive awareness in environments that are as close to real-life as possible. The literature was used as a basis to differentiate FEMA training types by the degree to which they resulted in behaviors that most mirrored actual disaster response. Table 37 reflects high, moderate, and low fidelity descriptors to categorize each training type. Using this table, the full-scale exercise is believed to be the only high-fidelity training type.

Based upon the literature supporting the notion that a behavioral training model, in a high-fidelity environment, more effectively produces outcomes, a dummy variable for training was created to reflect those counties who had used a full-scale exercise (1) and those that did not (0). Table 41 reflects the percentage of counties and parishes that conducted full-scale exercises and those that did not in the year leading up to the disaster.

Table 41

Frequency of Full-scale Exercises

Full-scale Exercise	Frequency	Percent
Never (0)	116	34.83
One or More Times (1)	217	65.17
Total	333	100

Both variables were tested in the model, with the variable *iv_training* a less defined and more general variable, and variable *iv_educb* specifically designed to demonstrate the impact of behavioral training on the outcome variables. The regression model output with each variable will be discussed later in this chapter.

Univariate Analysis: Use of National Frameworks (ICS & NIMS)

The final independent variable was established based upon the conceptual and theoretical framework that indicates response and recovery is enhanced using the National Incident Management System and the Incident Command System. Both frameworks were previously discussed in Chapter II as best practices in preparedness and response. Before combining into a single variable, correlation analysis was conducted. Table 42 reflects the results of this analysis.

Table 42

Correlation of National Framework Variables

Variable	Use of NIMS (q14_unims)	Use of ICS (q14_uics)

Use of NIMS (q14_unims)	1.000	
Use of ICS (q14_uics)	0.764	1.000

Note. Obs = 320.

The results of the correlation support the assumption that the two variables are so closely related that combining them was a reasonable action by the researcher. To further confirm this, the internal consistency or reliability of the measurement tool using Cronbach's Alpha was conducted on the two variables in question yielding an acceptable alpha coefficient (α=.86), which, provides further support for combining the two variables into a single indicator. As such, variable *iv_natfr* was created to represent the use of national frameworks.

Table 43

Descriptive Statistics for iv_natfr

Variable	N	M	SD	Mdn	Skew
iv_natfr	320	8.216	1.936	8.00	-1.027

The data reveals a negative skew. Figure 15 contains a histogram, box plot, symmetry plot, and quantile normal, each depicting this skew.

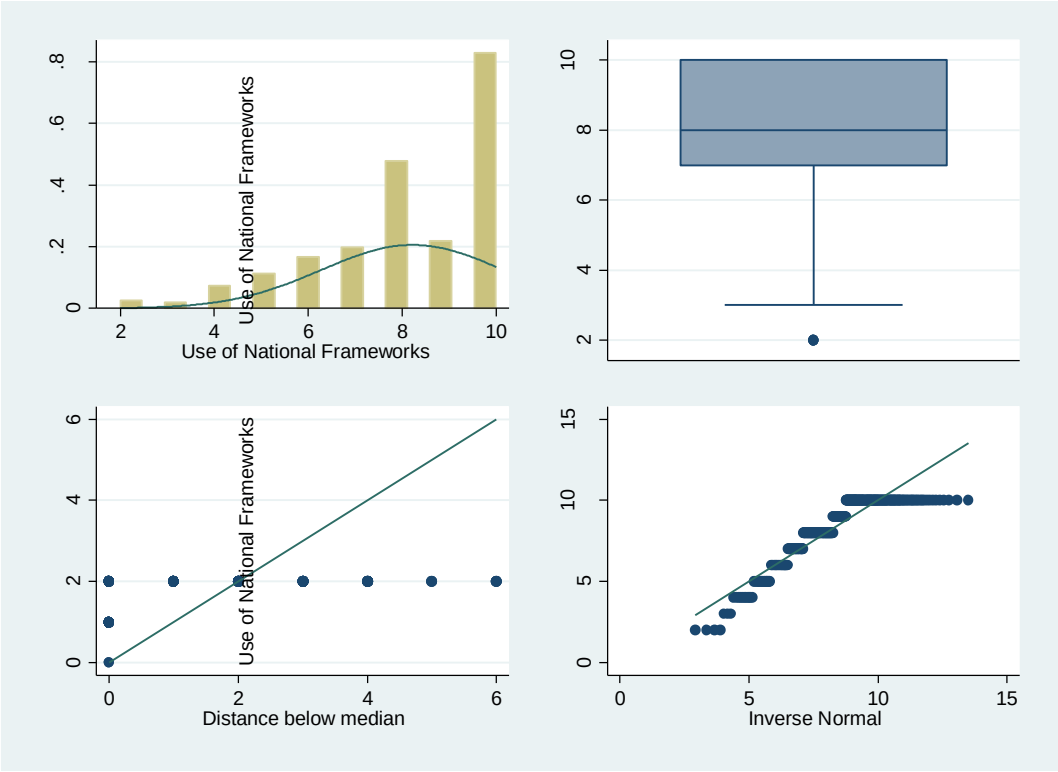

Figure 15. Graphical display of variable *iv_natfr*.

The researcher used the results of regression analysis and critique to drive decisions regarding variable transformation. Given reasonable support for meeting the underlying model assumptions, the decision was made to not transform variable *iv_natfr* in the final regression model.

Control Variables

The control variables for this study were derived from the conceptual and theoretical models discussed in Chapter 2. This study was designed to investigate and test the relationships between the indicators that theoretically support the adaptive capacity of a community and the outcome variables of effective response and recovery. Control variables were included as part of the overall models used to analyze and test relationships between independent and dependent variables. As Babbie (2008) suggests, conclusions of causal relationships between correlated variables can be made only when it is determined that no third variable explains away the observed correlation as spurious. Table 44 contains the control variables selected for this study.

Table 44

Control Variables

Variable Name	Variable Explanation
poppct_rurl	Percentage of the Population Living in Rural Area
pop_den	Population Density (persons per square mile)
pop_child	Percentage of the Population Under 18 Years
pop_senior	Percentage of the Population Over 65 Years
race_wht	Percentage of the Population Race: White
race_blk	Percentage of the Population Race: Black
race_asian	Percentage of the Population Race: Asian
race_aian	Percentage of the Population Race: American Indian / Alaskan Native
race_nhpi	Percentage of the Population Race: Native Hawaiian or Pacific Islander
race_other	Percentage of the Population Race: Two or More Races Declared
race_hisp	Percentage of the Population Race: Hispanic
econ_disadv	Percentage of the Population Below Poverty
dtime	Time From Disaster Declaration Until Survey Completion
past10	Number of Major Disaster Declarations in Last Ten Years
q2_ddrp	Reported Degree of Disruption Caused by This Disaster
q3_impt	Reported Extent of Disaster Impact Within the County
q4_tdrp	Reported Length of Time the County Was Disrupted by Disaster
q6_emten	Tenure in Emergency Management
q7_emexp	Emergency Manager: Prior Experience With Disaster
omb_urbrurl	Urban Rural Designation Using OMB System
nchs_urbrurl	Urban Rural Designation Using NCHS Classification
pop_nonwht	Total Population: Non-white
inc_percap	Per Capita Income
inc_medianh	Median Household Income

The original control variables were selected based upon a review of the literature that pointed to the potential influencers affecting communities in disaster response and recovery based upon their demographic, economic, and sociological experiences. The conceptual framework for this study acknowledges that differences may affect outcomes. To test the relationship of these variables as predictors presented challenges based upon multicollinearity as well as the similarity of the constructs. Using both theory and statistical findings such as correlation matrices, variance inflation factors (VIF values) and tolerance, decisions were made to exclude specific control variables. For example, the literature indicates that there are potential differences in disaster resilience that occur in rural versus urban settings (Cutter, Burton, & Emrich, 2010). As discussed earlier in this chapter, a decision was made to use the NCHS rural classification (*nchs_urbrurl*) as the variable of choice for each county or parish included in this study. As such, the following control variables were dropped in the final model: *poppct_rurl* (percentage of the population living in rural area) and *pop_den* (population density). As noted earlier, disasters disproportionately affect vulnerable populations stemming from social, class, gender, race, or economic circumstances (Bolin, 2007). All race variables were eliminated from the final model, as none were significant. Gender variables were not considered based upon a lack of literature to support inclusion in the model. Vulnerable age groups were included and tested within the model as it seemed to make sense that populations with large percentages of youth or elderly might have significant challenges with response and recovery. However, neither variable proved significant. As such, the final regression model eliminated specific control variables using both theoretical and statistical rationale. Table 45 lists the control variables included in the final model.

Table 45

Final Model Control Variables for Hypothesis One

Variable Name	Variable Explanation
econ_disadv	Percentage of the Population Below Poverty
Dtime	Time From Disaster Declaration Until Survey Completion
past10	Number of Major Disaster Declarations in Last Ten Years
q2_ddrp	Reported Degree of Disruption Caused by This Disaster
q3_impt	Reported Extent of Disaster Impact Within the County
q4_tdrp	Reported Length of Time the County Was Disrupted by Disaster
q6_emten	Tenure in Emergency Management
q7_emexp	Emergency Manager: Prior Experience With Disaster
nchs_urbrurl	Urban Rural Designation Using NCHS Classification

Hypothesis Testing

Hypothesis one: response and recovery performance outcomes. The following hypothesis was generated to address the research question:

H1a: Counties or parishes that have developed adaptive capacity through pre-event planning, community engagement, training, and use of national response frameworks will have improved response and recovery outcomes. The null hypothesis was that there is no relationship between adaptive capacity development and improved response and recovery outcomes.

Multiple regression & multi-level modeling. Multiple regression analysis was used to test the effects of the independent and control variables on the outcome variable. However, in order to examine the potential impact of nesting described earlier in this chapter, multilevel linear modeling employing random intercepts was explored. The counties or parishes within the sample were nested not only within states, but within FEMA regions as well. Evaluation of the random effects at both the state and FEMA region were not substantial as the random effects model was not significantly better than a fixed effects model. While it was originally thought that

practices and other organizational differences might vary across counties, states, and FEMA regions; it seems that FEMA operations remain rather consistent in operation given that no significant variation was gained by adding a random component to the model. It was therefore concluded that an ordinary least squares multiple regression model was the best statistical approach for exploring relationships among the predictor variables used in this study.

Table 46 and 47 illustrate the final multiple regression model output with each training variable introduced separately and follows with a statement that summarizes both regression models.

Table 46

OLS Regression of Response & Recovery Outcome With iv_training

Variable	Coefficient	SE	t	*p*	95% CI
Constant	2.28***	.48	4.73	0.000	[1.33, 3.24]
Pre-planning for Response & Recovery	0.01**	.01	2.78	0.006	[0.00, 0.02]
Community Engagement	0.11***	.02	5.63	0.000	[0.07, 0.15]
National Frameworks	0.19***	.03	7.13	0.000	[0.14, 0.24]
Overall Training (*iv_training*)	0.01	.01	1.28	0.202	[-0.01, 0.03]
Degree of Disruption	0.14*	.07	2.06	0.040	[0.01, 0.28]
% of Impact	0.01	.05	0.28	0.781	[-0.08, 0.10]
Time of Disruption	-0.04	.04	-1.01	0.312	[-0.11, 0.04]
Emergency Manager Tenure	-0.06	.03	-1.70	0.090	[-0.12, 0.01]
Emergency Manager Prior Disaster Experience	-0.10	.17	-0.56	0.575	[-0.44, 0.25]
Past Disaster Experience	-0.01	.02	-0.76	0.447	[-0.05, 0.02]
Urban / Rural	-0.00	.03	-0.08	0.935	[-0.06, 0.06]
Economic Disadvantage	-0.00	.01	-0.12	0.902	[-0.02, 0.02]
Time Since Disaster	0.00	.00	1.48	0.140	[-0.00, 0.00]
R-squared	.42				
Adjusted R-squared	.40				
RMSE	.79				
No. observations	317				

Note. *, **, *** indicates significance at the $p < .05$, $p < .01$, and $p < .001$ level, respectively. CI = confidence interval for B.

Table 47

OLS Regression of Response & Recovery Outcome With iv_educb

Variable	Coefficient	SE	t	*p*	95% CI
Constant	2.36***	.48	4.92	0.000	[1.42, 3.31]
Pre-planning for Response & Recovery	0.01**	.01	2.61	0.009	[0.00, 0.02]
Community Engagement	0.11***	.02	5.68	0.000	[0.07, 0.15]
National Frameworks	0.19***	.03	7.22	0.000	[0.14, 0.24]
Behavioral Training (*iv_educb*)	0.26**	.10	2.65	0.009	[0.07, 0.46]
Degree of Disruption	0.14*	.07	2.01	0.045	[0.00, 0.27]
% of Impact	0.02	.05	0.34	0.732	[-0.07, 0.11]
Time of Disruption	-0.03	.04	-0.84	0.400	[-0.11, 0.04]
Emergency Manager Tenure	-0.06	.03	-1.74	0.083	[-0.12, 0.01]
Emergency Manager Prior Disaster Experience	-0.09	.17	-0.52	0.600	[-0.43, 0.25]
Past Disaster Experience	-0.01	.02	-0.74	0.458	[-0.05, 0.02]
Urban / Rural	0.00	.03	0.05	0.961	[-0.06, 0.06]
Economic Disadvantage	0.00	.01	0.05	0.958	[-0.02, 0.02]
Time Since Disaster	0.00	.00	1.06	0.292	[-0.00, 0.00]
R-squared	.43				
Adjusted R-squared	.41				
RMSE	.79				
No. observations	317				

Note. *, **, *** indicates significance at the $p < .05$, $p < .01$, and $p < .001$ level, respectively. CI = confidence interval for B.

The theoretical and conceptual framework suggests that control variables must be considered for inclusion in the model to ensure against spurious effects. To create a parsimonious model, control variables were introduced and eliminated from the model based upon theoretical and statistical findings. In addition, two training variables were explored as discussed earlier in the chapter. In both regression models, the thirteen included variables together explain about 40% and 41% of the variation in response and recovery outcomes. Very little change in coefficient values are noted, with the exception of the training variables. Somewhat surprising was the finding that overall training was not significant, but training that included a full-scale exercise was significant. As discussed earlier, full-scale exercises require behaviors that simulate an actual disaster response situation, where other training categories do not. This finding will be discussed in more detail in Chapter 5 along with recommendations based upon the finding.

Based upon review of the regression output in both table 46 and 47, the final regression model was accepted as the one including variable *iv_educb*. The regression equation for this model is approximately

$\hat{Y}_i = 2.36 + .01X_{i1} + .11X_{i2} + .19X_{i3} + .26X_{i4} + .02X_{i5} + .14X_{i6} + .02X_{i7} - .03X_{i8} - .06X_{i9} - .09X_{i10} - .01X_{i11} + 0X_{i12} + 0X_{i13}$

Regression criticism. To further assess the OLS model, residuals versus fitted values were examined. Figure 16 shows the graph of these results.

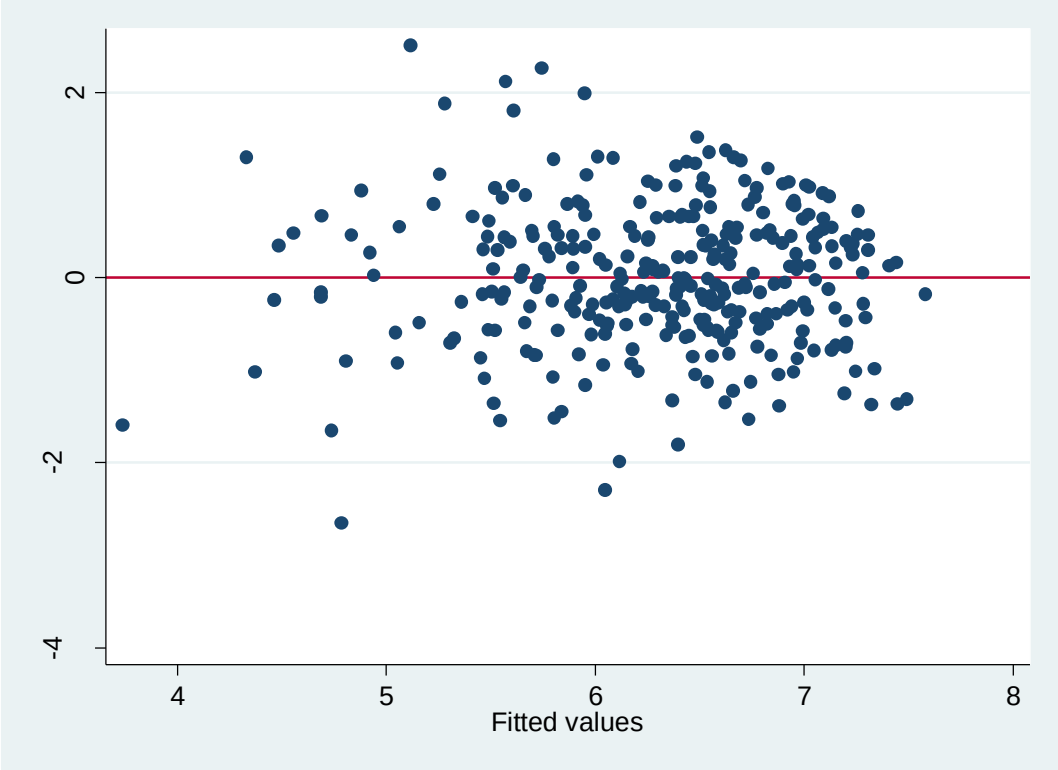

Figure 16. Residuals versus fitted values for OLS regression model.

The plot in Figure 16 shows a slight heteroskedastic pattern and possible outliers. Further analysis of what might be influencing the regression line was conducted using added variable plots (av plots). Figure 17 shows the av plots for each variable in the model.

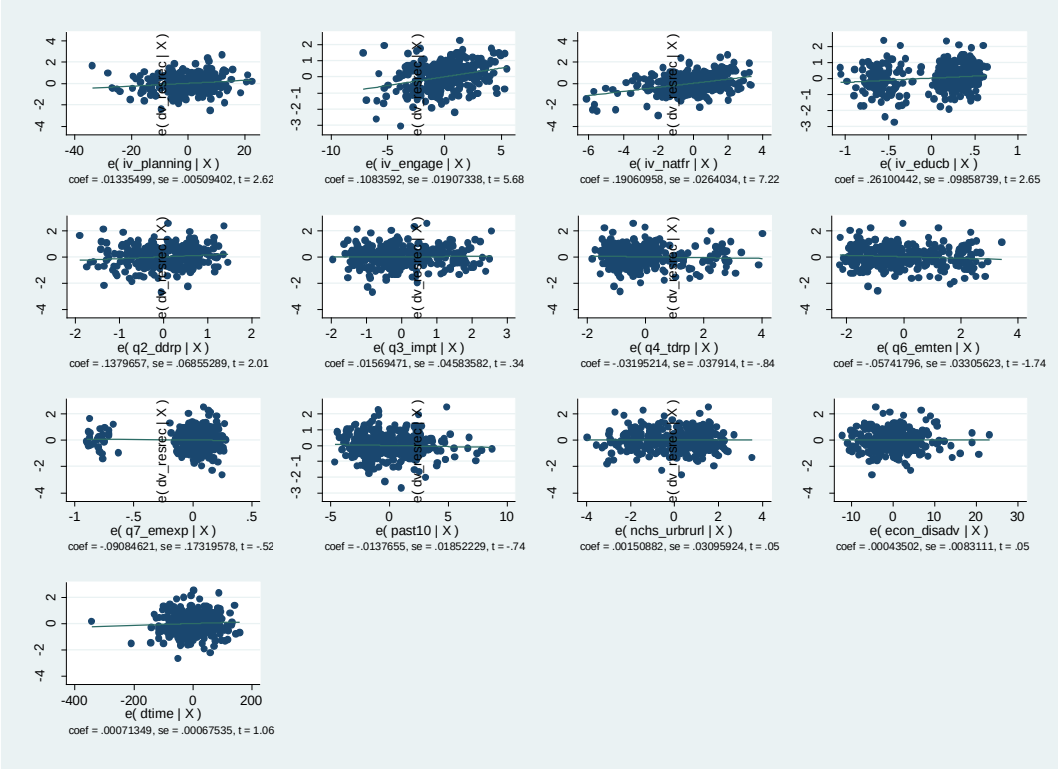

Figure 17. Added variable plots for the OLS regression model.

The added variable plot assisted the researcher in understanding what might be creating leverage within the model. High leverage observations are noted as those points horizontally distant form the rest of the data. It seems that a few possible cases may be exerting leverage. To further analyze influence, a leverage versus squared residual plot was created that marked each case with a researcher derived case number used to assure that counties or parishes included in the sample remained anonymous. Results are shown in Figure 18.

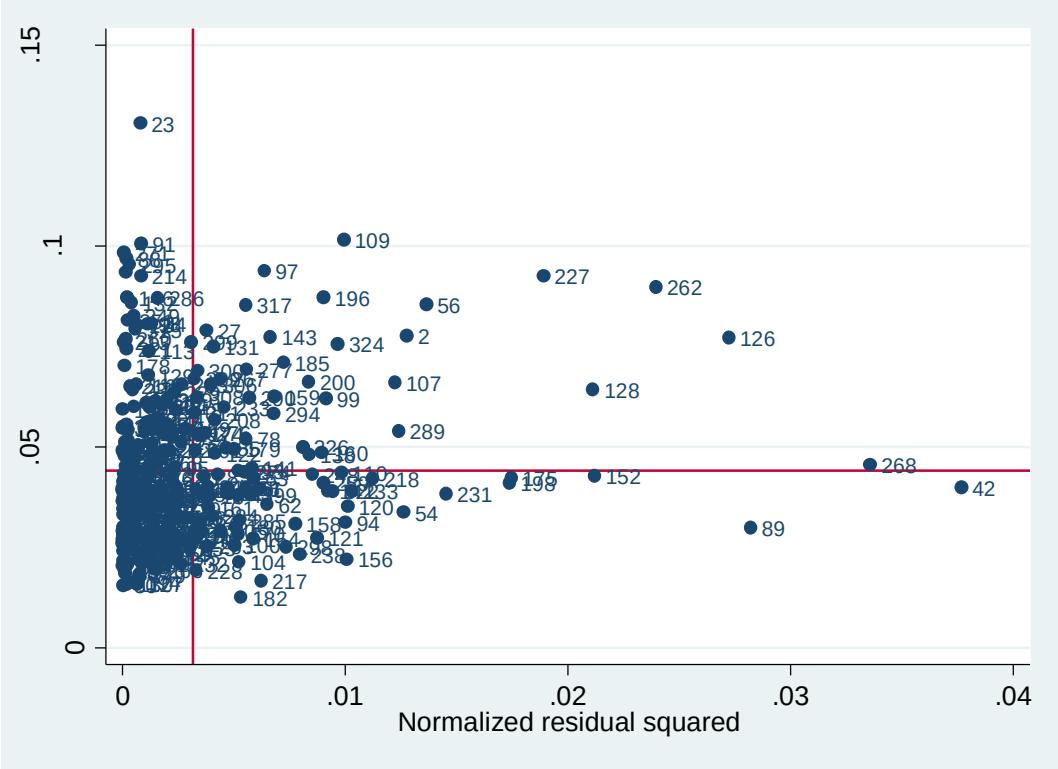

Figure 18. Leverage versus squared residuals plot for OLS regression model.

Figure 18 shows the leverage against the residuals squared. The horizontal line is the mean of the leverage and the vertical line is the mean of the squared residuals. Although there are cases that may have high leverage; and cases with poor fit, it appears that no cases have both a poor fit and leverage indicating minimal influence on the model.

To further evaluate the leverage, a Cook's D was used to evaluate proportionate influence relative to the model. Figure 19 shows the residual versus predicted values proportional to Cook's D.

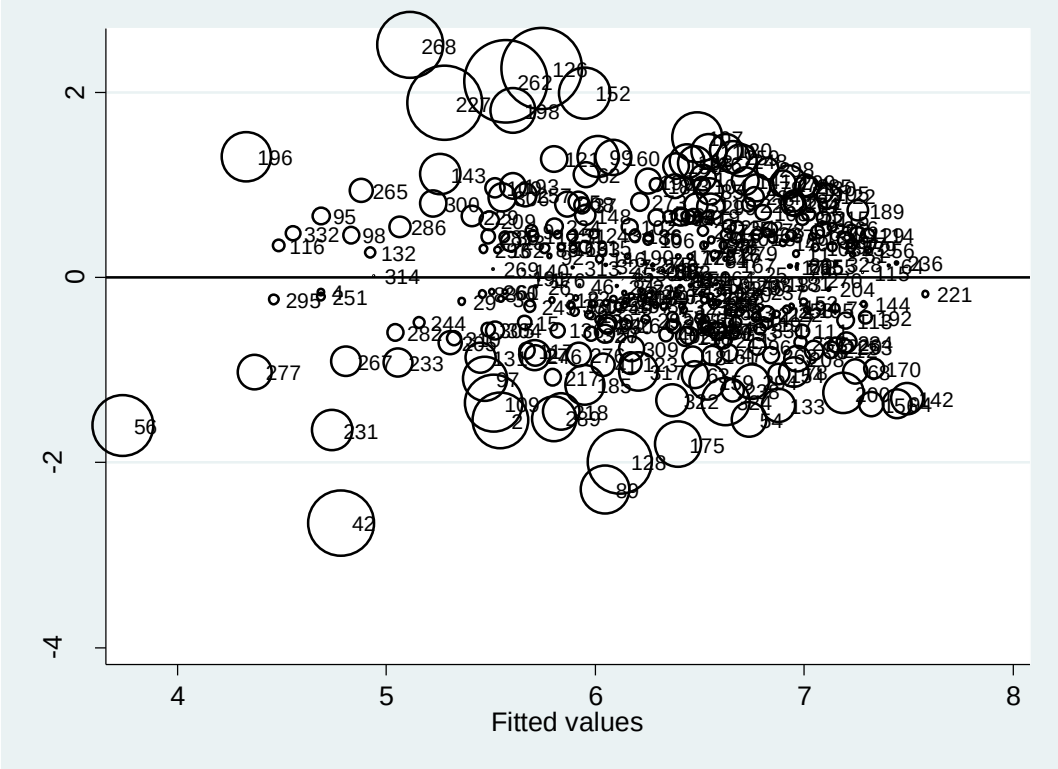

Figure 19. Residual versus predicted values proportional to Cook's D.

Results displayed in Figure 19 show that there are potentially a number of cases that are exerting influence on the regression line. To investigate further DFBETAs were calculated and the four observations having the most negative influence on the variable coefficients and the four having the most positive influence were identified. As one type of influence statistic, DFBETAS indicate by how many standard errors the coefficient on the variable changes if observation *i* were dropped from the regression (Hamilton, 2013, p. 199). Results of those cases having the most influence on the independent variables are displayed in Table 48.

Table 48

Influential Cases on Independent Variables

ID	STATE	FEMA REG	DISASTER	VARIABLE
		Negative Influence		
2	MA	1	HI	iv_engage
85	KY	4	SSTF	iv_educb
99	NC	4	HI	iv_natfr
109	NC	4	HI	iv_engage
126	TN	4	SSTF	iv_engage
128	TN	4	SSTSLWF	iv_planning
128	TN	4	SSTSLWF	iv_natfr
158	IN	5	SSTSLWF	iv_educb
185	OH	5	SSF	iv_planning
196	AR	6	SSTF	iv_planning
198	AR	6	SSTF	iv_natfr
226	TX	6	FIRE	iv_educb
262	MO	7	FLOOD	iv_planning
268	NE	7	FLOOD	iv_engage
268	NE	7	FLOOD	iv_educb
324	AK	10	SS	iv_natfr
		Positive Influence		
2	MA	1	HI	iv_natfr
2	MA	1	HI	iv_educb
42	PA	3	TSL	iv_engage
42	PA	3	TSL	iv_natfr
54	VA	3	HI	iv_educb
56	VA	3	HI	iv_natfr
89	MS	4	SSTSLWF	iv_planning
89	MS	4	SSTSLWF	iv_educb
97	MS	4	FLOOD	iv_engage
99	NC	4	HI	iv_engage
109	NC	4	HI	iv_natfr
128	TN	4	SSTSLWF	iv_engage
200	AR	6	FIRE	iv_planning
218	TX	6	FIRE	iv_planning
227	TX	6	FIRE	iv_educb
268	NE	7	FLOOD	iv_planning

Each influential case was examined individually and no theoretical or statistical basis existed to remove individual cases based upon examination of the data. To further evaluate influential

cases, box plots were examined for each DFBETA variable. Figure 20 shows the distributions of each with outliers identified.

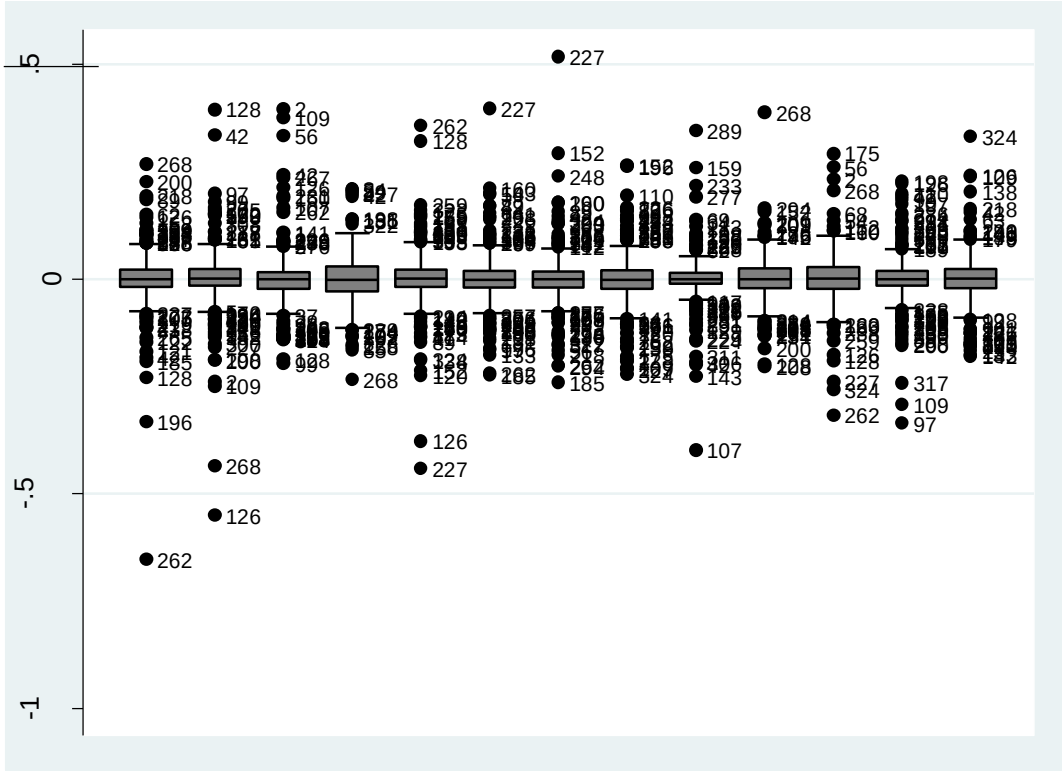

Figure 20. Box plots showing distributions of DFBETA variables with outliers.

Cases 262, 126, and 227 were found to be potentially influential on the model. Case 262 exerts influence on variable *iv_planning* (pre-planning for response and recovery) and Case 126 exerts influence on variable *iv_engage* (overall community engagement). Both variables were significant in the OLS regression model ($p < .01$ and $p < .05$, respectively), so further investigation was warranted. Case 227 exerted influence on the control variable *tdrp*, which was non-significant. To explore the effects of cases 262 and 126, regression was repeated with the cases removed. Table 49 compares the results of each regression against the original OLS regression.

Table 49

Regression Model Comparison With Cases Exerting Leverage Removed

Variable	Original Model	Case 262 removed	Case 126 removed	Cases 262 & 126 removed
Constant	2.36***	2.23***	2.38***	2.25***
Pre-planning for Response & Recovery	.01**	.02**	.01**	.02**
Community Engagement	.11***	.11***	.12***	.12***
National Frameworks	.19***	.19***	.18***	.18***
Behavioral Training	.26**	.27**	.25**	.27**
Degree of Disruption	.14*	.11	.16*	.14*
% of Impact	.02	.03	.01	.02
Time of Disruption	-.03	-.02	-.03	-.02
Emergency Manager Tenure	-.06	-.05	-.06	-.06
Emergency Manager Prior Disaster Experience	-.09	-.11	-.11	-.12
Past Disaster Experience	-.01	-.01	-.01	-.01
Urban / Rural	.00	.01	.01	.02
Economic Disadvantage	.00	.00	-.00	-.00
Time Since Disaster	.00	.00	.00	.00
R-square	.43	.44	.44	.45
Adjusted R-squared	.41	.42	.42	.43
RMSE	.79	.78	.78	.77
No. observations	317	316	316	315

Note. *, **, *** indicates significance at the $p < .05$, $p < .01$, and $p < .001$ level, respectively.

In reviewing the findings listed in Table 49, the removal of influential cases did result in an improved coefficient of determination and some minor changes in coefficient values. However, the survey data from these two particular communities was reviewed in detail and there was no obvious reason to justify the removal of either case from the sample. As such, the researcher

chose a conservative approach to data analysis and accepted the original OLS model as the best model.

As addressed earlier, the residuals versus fitted values plot for the OLS regression model showed signs of heteroskedasticity. Running the same model with a transformed dependent variable to correct for the negative skew produced similar results. Additionally, running a robust regression using Huber weights and biweights confirmed the results from the multiple regression analysis. However, due to the indication of a heteroskedastic pattern in the errors and the outliers observed through the regression diagnostics, robust standard errors were used. Table 50 shows the results of this regression.

Table 50

Regression of Response & Recovery Outcome Variable Using VCE (robust)

Variable	Coefficient	SE	t	*p*	95% CI
Constant	2.36***	.52	4.57	0.000	[1.35, 3.38]
Pre-planning for Response & Recovery	0.01*	.01	2.27	0.024	[0.00, 0.02]
Community Engagement	0.11***	.02	4.52	0.000	[0.06, 0.16]
National Frameworks	0.19***	.03	6.42	0.000	[0.13, 0.25]
Behavioral Training	0.26**	.10	2.62	0.009	[0.07, 0.46]
Degree of Disruption	0.14	.08	1.74	0.083	[-0.02, 0.29]
% of Impact	0.02	.05	0.33	0.741	[-0.08, 0.11]
Time of Disruption	-0.03	.04	-0.78	0.433	[-0.11, 0.05]
Emergency Manager Tenure	-0.06	.04	-1.64	0.102	[-0.13, 0.01]
Emergency Manager Prior Disaster Experience	-0.09	.16	-0.56	0.575	[-0.41, 0.23]
Past Disaster Experience	-0.01	.02	-0.79	0.431	[-0.05, 0.02]
Urban / Rural	0.00	.03	0.05	0.963	[-0.06, 0.06]
Economic Disadvantage	0.00	.01	0.05	0.959	[-0.02, 0.02]
Time Since Disaster	0.00	.00	1.06	0.291	[-0.00, 0.00]
R-squared	.43				
Adjusted R-squared	.41				
RMSE	.79				
No. observations	317				

Note. *, **, *** indicates significance at the $p < .05$, $p < .01$, and $p < .001$ level, respectively. CI = confidence interval for B.

The calculation involved estimating standard errors that did not rely on the assumption of independent, identically distributed errors. This technique is sometimes referred to as the Huber-White sandwich estimator of variance (Hamilton, 2013). Using this regression as the best fitting model, 41% of the variance in response and recovery performance outcome can be explained by the predictor variables contained within the model. As discussed earlier, this reinforces national-level policy and current best practice standards supported in the literature.

Multicollinearity was assessed by evaluating the variance inflation factor within the model. Two variables (q2_ddrp and iv_planning) had VIF values of 1.53 and 1.48 respectively, while the values for other variables ranged from 1.07 to 1.36 producing an overall mean VIF of 1.25. This offered reasonable assurance that multicollinearity was not a factor within the model.

The hypothesis generated for this model was: H1a: Counties or parishes that have developed adaptive capacity through pre-event planning, community engagement, training, and use of national response frameworks will have improved response and recovery outcomes. The regression output for this model shows, while controlling for the effects of all other variables in the model, that for each unit increase in pre-planning for response and recovery, response and recovery performance outcomes increase. This validates the theoretically supported conceptual model indicating that disaster risk and vulnerability assessments, mitigation planning, and written response and recovery plans are predictors of the overall performance of the county or parish during actual disaster. To further illustrate this result, a conditional effects plot was used to show the mean predicted values at specified levels of the independent variable (*iv_planning*).

Figure 21 shows the resulting predicted average marginal effects.

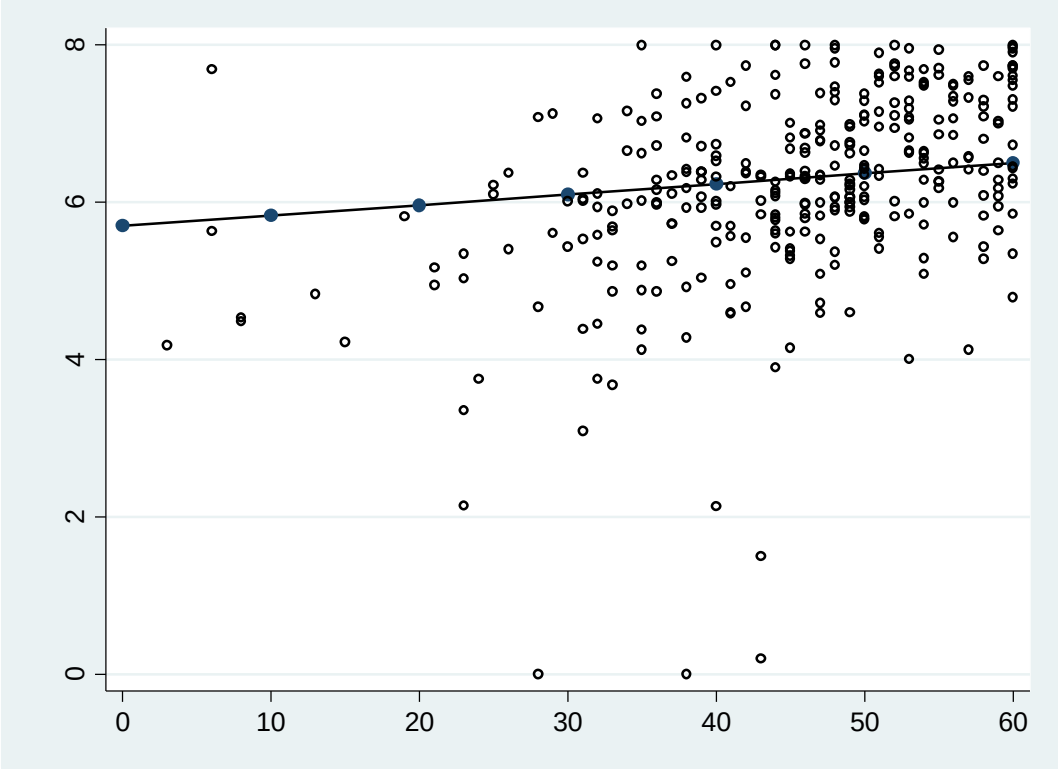

Figure 21. Predictive margins for pre-planning for response and recovery variable.

The regression output also shows, while controlling for the effects of the other variables, for every one-unit increase in overall community engagement, overall response and recovery performance of the county or parish increase. It is noted that this finding is significant at the level $p < .001$. Again, the finding supports the conceptual framework that emphasizes the critical importance of engaging community residents, local businesses, and local government officials in pre-planning for disaster response and recovery. To further illustrate this result, a conditional effects plot was used to show the mean predicted values at specified levels of the independent variable (*iv_engage*). Figure 22 shows the resulting predicted average marginal effects.

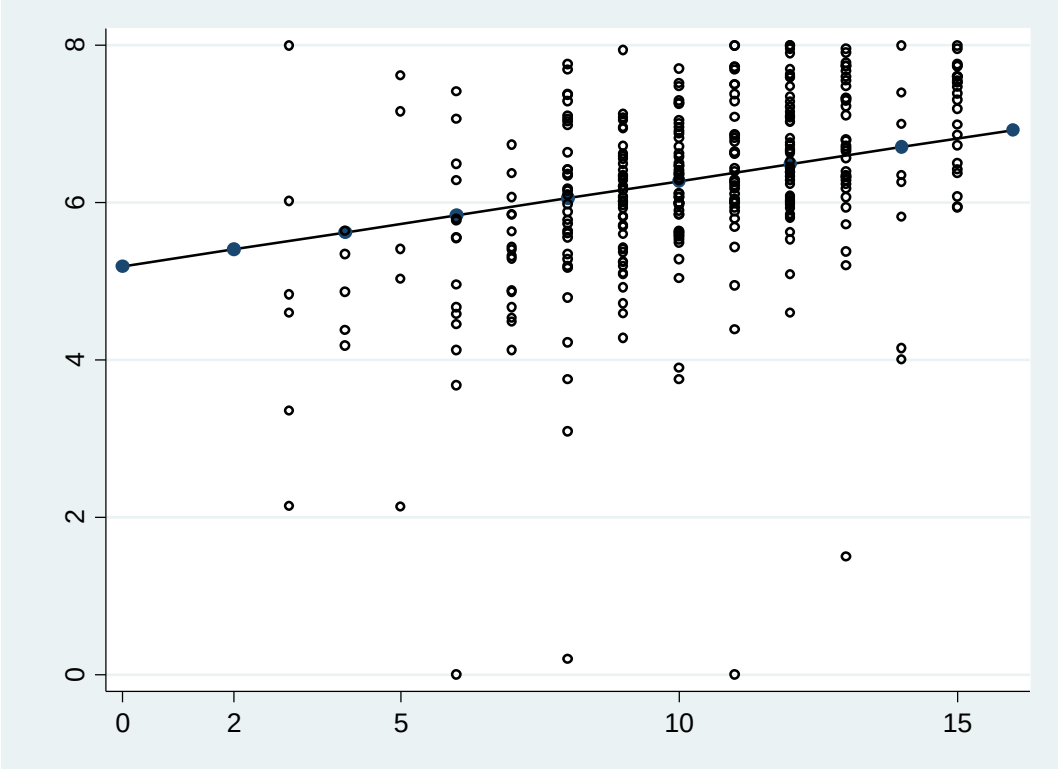

Figure 22. Predictive margins for overall community engagement.

The regression output also shows, while controlling for the effects of the other variables, that for every one unit increase in actual use of national frameworks for response (NIMS and ICS), overall response and recovery performance of the county or parish increased. It is noted that this finding is significant at the 95% CI level ($p < .05$). As was discussed in the literature review, these national frameworks have been long supported as best practice in first responder and disaster preparedness circles. To date, however, no quantitative data has existed to confirm their effectiveness. Providing evidence to support practice is a key finding. To further illustrate this result, a conditional effects plot was used to show the mean predicted values at specified levels of the independent variable (*iv_natfr*). Figure 23 shows the predicted average marginal effects for this independent variable.

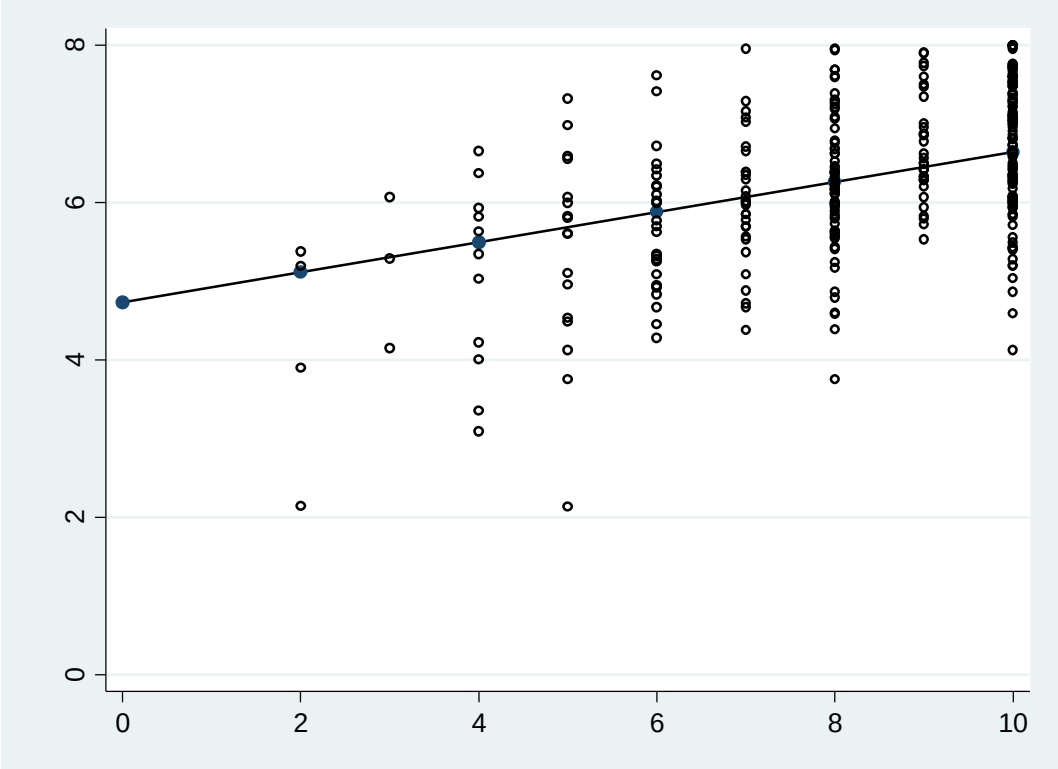

Figure 23. Predictive margins for use of national frameworks.

The regression output also shows, while controlling for the effects of the other variables, that behavioral training (*iv_educb*) increased overall response and recovery performance of the county or parish increased. It is noted that this finding is significant at $p < .001$. The original conceptual framework for this study included exercises and training as part of the model for creating adaptive capacity. However, this study demonstrates that only full-scale exercises create a statistically significant change in the outcome variable. These findings suggest that counties and parishes that conducted at least one full-scale exercise in the year leading up to the disaster produced positive outcomes in overall response and recovery performance. To further illustrate this result, a conditional effects plot was used to show the average marginal effects at each level of the independent variable (*iv_educb*). Figure 24 shows the predicted margins for this independent variable.

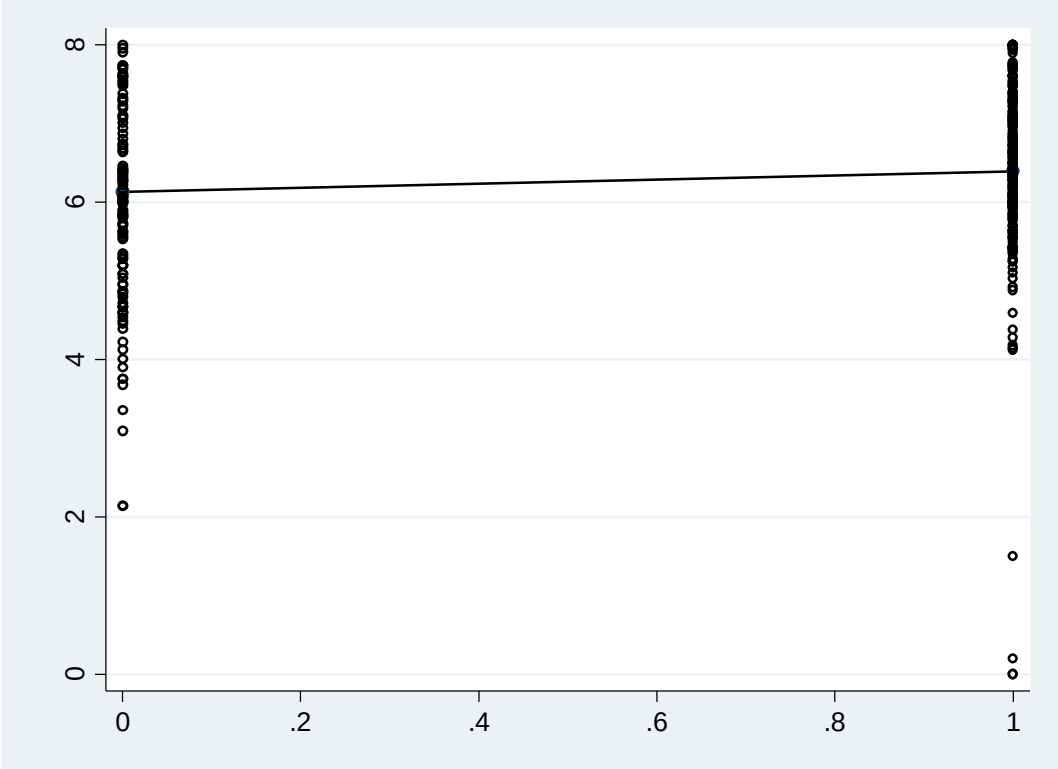

Figure 24. Predictive margins for behavioral education.

No additional control variables were found significant within the model. Overall, the model presented to test hypothesis one had a good fit to the data.

Summary of hypothesis one. In summary, the researcher sought to test the following hypothesis: H1a: Counties or parishes that have developed adaptive capacity through pre-event planning, community engagement, training, and use of national response frameworks will have improved response and recovery outcomes. The null hypothesis states there was no relationship between adaptive capacity development and improved response and recovery outcomes. Given the results of the analysis the null hypothesis is rejected with the final model demonstrating the significance of pre-event planning, overall community engagement, use of national frameworks

for response and recovery, and full-scale exercises (behavioral training) as predictors of response and recovery outcomes.

Hypothesis two: Recovery progression. The second hypothesis in this study was as following: H1b: Adaptive capacity along with response and recovery performance outcomes will predict trajectory of recovery progression. The null hypothesis was that there is not a relationship between adaptive capacity and response and recovery performance on the outcome variable of recovery progression. Hypothesis two was approached using the same general analytical approach taken with hypothesis one, however, a hierarchical or nested regression was employed to specifically understand the effect that response and recovery performance had on resiliency as measured by recovery progression.

Hierarchical regression. Using the same theoretical and conceptual framework used to address hypothesis one, predictor variables were introduced and eliminated from the model based upon theoretical and statistical findings. The conceptual framework for this study indicates that adaptive capacity development will impact overall community resilience to disaster and that resilience is comprised of two separate constructs: (a) overall response and recovery performance; and (b) recovery progression. As the framework suggests, recovery progression over time contains multiple indicators. For the purpose of this study, progression of recovery over time was evaluated in the following areas: (a) return of residents to permanent housing; (b) return of transportation systems; (c) return of displaced businesses; (d) re-building of damaged infrastructure; and (e) return of social structures. Using the analysis of each independent variable discussed earlier in this chapter, along with factor analysis findings and alpha scores, the following independent variables listed in Table 51 were used to test hypothesis two.

Table 51

Independent Variables for Hypothesis Two

Variable Name	Variable Explanation
iv_planning	Pre-event Planning for Response & Recovery
iv_engage	Overall Community Engagement
iv_natfr	Use of National Frameworks
iv_educb	Behavioral Training
dv_resrec	Overall Response & Recovery Performance

Although not part of the original conceptual framework, the inclusion of the outcome variable used in hypothesis one was theoretically and experientially important to include as an independent variable in hypothesis two. Although no quantitative data exists to date, it seems natural to predict that the overall success of the community's response and recovery performance would affect the trajectory of the progression. Thus including this variable as a possible predictor was an important component in creating a representative model.

As discussed earlier in this chapter, a decision was made to use the NCHS rural classification (*nchs_urbrurl*) as the variable of choice for each county or parish included in this study. As such, the following control variables were dropped in the final model: *poppct_rurl* (percentage of the population living in rural area) and *pop_den* (population density). As noted earlier, disasters disproportionately affect vulnerable populations stemming from social, class, gender, race, or economic circumstances (Bolin, 2007). All race variables were eliminated from the final model, as none were significant. Gender variables were not considered based upon a lack of literature to support inclusion in the model. Vulnerable age groups were included and tested within the model as it seemed to make sense that populations with large percentages of youth or elderly might have significant challenges with response and recovery. However, neither variable proved significant. As such, the final regression model eliminated specific control

variables using both theoretical and statistical rationale. Table 52 lists the control variables included in the final model for testing of hypothesis two.

Table 52

Final Model Control Variables for Hypothesis Two

Variable Name	Variable Explanation
econ_disadv	Percentage of the Population Below Poverty
dtime	Time From Disaster Declaration Until Survey Completion
past10	Number of Major Disaster Declarations in Last Ten Years
q2_ddrp	Reported Degree of Disruption Caused by This Disaster
q3_impt	Reported Extent of Disaster Impact Within the County
q4_tdrp	Reported Length of Time the County Was Disrupted by Disaster
q6_emten	Tenure in Emergency Management
q7_emexp	Emergency Manager: Prior Experience With Disaster
nchs_urbrurl	Urban Rural Designation Using NCHS Classification

To begin the analysis, a hierarchical regression was run to assess the significance of dv_resrec to the overall model. It should be noted that the dependent variable was transformed for use in this model per earlier discussions within this chapter, and while it did not completely provide for normal i.i.d. errors, the transformation did improve the residual versus fitted values output. Table 53 shows the findings from this hierarchical regression.

Table 53

Hierarchical Regression for Recovery Progression

Block 1

Variable	Coefficient	SE	t	*p*	95% CI
Constant	0.13	.13	1.03	0.306	[-0.12, 0.39]
Pre-planning for Response & Recovery	0.00*	.00	2.45	0.015	[0.00, 0.01]
Community Engagement	0.00	.01	0.43	0.669	[-0.01, 0.01]
National Frameworks	0.00	.01	0.08	0.939	[-0.01, 0.01]
Behavioral Training	0.0	.03	0.14	0.890	[-0.05, 0.06]
Degree of Disruption	0.02	.02	1.24	0.214	[-0.01, 0.06]
% of Impact	0.00	.01	0.22	0.824	[-0.02, 0.03]
Time of Disruption	-0.04***	.01	-4.13	0.000	[-0.06, -0.02]
Emergency Manager Tenure	0.01	.01	1.18	0.239	[-0.01, 0.03]
Emergency Manager Prior Disaster Experience	-0.05	.05	-1.07	0.285	[-0.14, 0.04]
Past Disaster Experience	-0.01	.01	-1.22	0.225	[-0.02, 0.00]
Urban / Rural	0.00	.01	0.37	0.710	[-0.01, 0.02]
Economic Disadvantage	0.01***	.00	3.22	0.001	[0.00, 0.01]
Time Since Disaster	0.00	.00	0.71	0.477	[-0.00, 0.00]

Block 2 (with variable *dv_resrec*)

Variable	Coefficient	SE	t	*p*	95% CI
Constant	0.04	.13	0.33	0.743	[-0.22, 0.31]
Response & Recovery Outcome (dv_resrec)	0.04*	0.02	2.45	0.015	[0.01, 0.07]
Pre-planning for Response & Recovery	0.00*	.00	2.08	0.038	[0.00, 0.01]
Community Engagement	-0.00	.01	-0.35	0.727	[-0.01, 0.01]
National Frameworks	-0.01	.01	-0.87	0.386	[-0.02, 0.01]
Behavioral Training	-0.01	.03	-0.23	0.818	[-0.06, 0.05]
Degree of Disruption	0.02	.02	0.97	0.335	[-0.02, 0.05]
% of Impact	0.00	.01	0.18	0.860	[-0.02, 0.03]
Time of Disruption	-0.04***	.01	-4.04	0.000	[-0.06, -0.02]
Emergency Manager Tenure	0.01	.01	1.43	0.154	[-0.00, 0.03]
Emergency Manager Prior Disaster Experience	-0.05	.05	-1.01	0.315	[-0.14, 0.04]
Past Disaster Experience	-0.01	.00	-1.12	0.263	[-0.02, 0.00]
Urban / Rural	0.00	.01	0.37	0.713	[-0.01, 0.02]
Economic Disadvantage	0.01***	.00	3.24	0.001	[0.00, 0.01]
Time Since Disaster	0.00	.00	0.57	0.570	[-0.00, 0.00]

Note. *, **, *** indicates significance at the $p < .05$, $p < .01$, and $p < .001$ level, respectively. CI = confidence interval for B. N = 317. R-squared increases from .13 to .15 from Block 1 to Block 2. Adjusted R-squared increases from .10 to .11 from Block 1 to Block 2. RMSE = .21.

When the variable *dv_resrec* is added, block two shows not only increases in the R-squared, but also a significant F-value. Table 54 shows these results.

Table 54

Change in R-squared as a Result of Variable dv_resrec

Block	F	Block df	Residual df	Pr > F	R2	Change in R2
1	3.59	13	303	0.000	0.13	
2	6.00	1	302	0.015	0.15	0.02

These regression results reveal that in block one three significant variables emerge and in block two four significant variables emerge. All theoretically make sense and will be discussed in detail following additional regression criticism.

The model was evaluated for multicollinearity. For the first half of the nested regression, two variables (*q2_ddrp* and *iv_planning*) had VIF values of 1.53 and 1.48 respectively, while the values for other variables ranged from 1.07 to 1.36 producing an overall mean VIF of 1.25. After adding the response and recovery outcome variable (*dv_resrec*) in the hierarchical model to explore recovery progression, the VIF associated with this additional variable was 1.76, while the other VIF values ranged from 1.08 to 1.55 resulting in a mean VIF increase from 1.25 to 1.32. Nonetheless, the addition of this variable did not move other independent variables in or out of significance thereby offering reasonable assurance for including this variable in the model and improving the understanding of recovery progression.

Regression criticism. To further assess the hierarchical regression model, residuals versus fitted values were examined. Figure 25 shows the graph of these results.

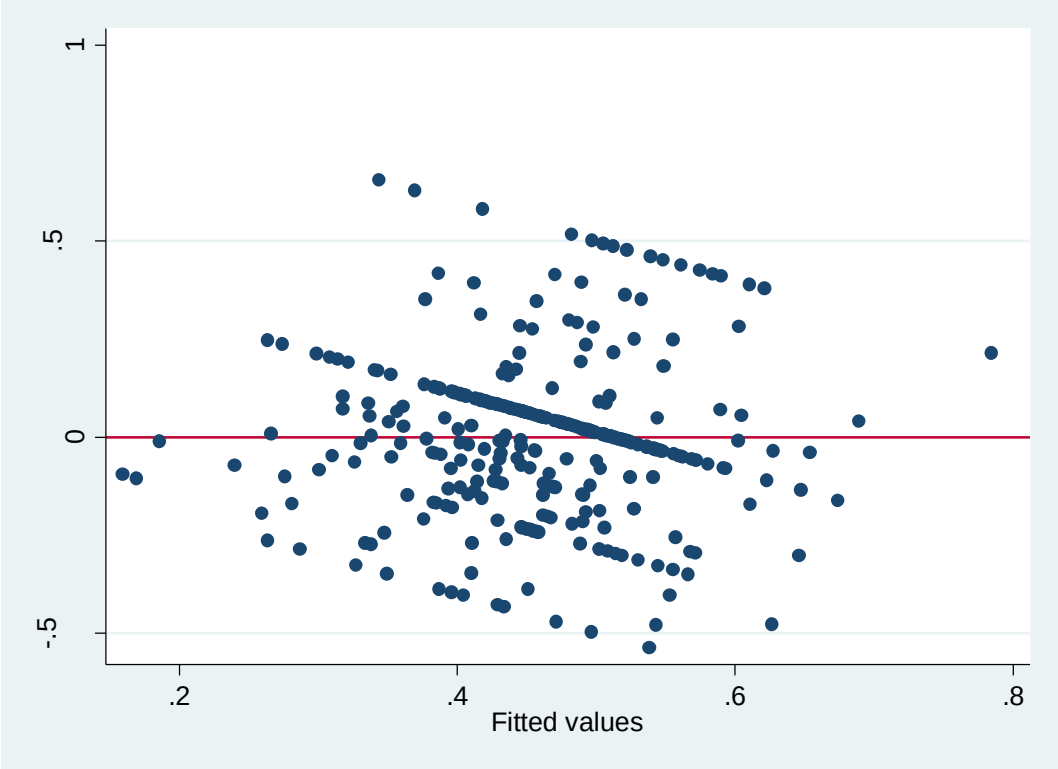

Figure 25. Residual versus fitted values plot.

The plot in Figure 25 shows a heteroskedastic pattern and possible outliers. Further investigation into what might be influencing the regression line was conducted using added-variable plots to help identify observations exerting disproportionate influence within the model. High leverage observations are noted as those points horizontally distant form the rest of the data. It seems that a few possible cases may be exerting leverage. Results are shown in Figure 26.

Figure 26. Added variable plots for recovery progression.

In looking at Figure 26, it seemed that a few possible cases may be exerting leverage. To further analyze influence, a leverage versus squared residual plot was created that marked each case with a researcher derived case number. Results are shown in Figure 27.

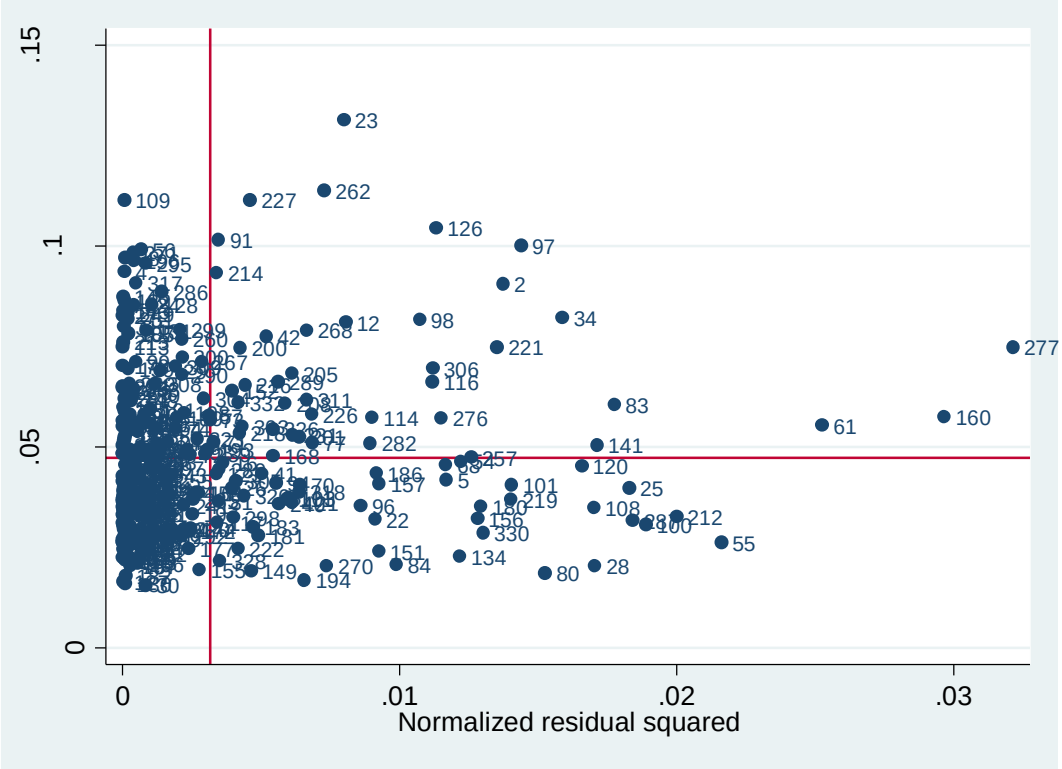

Figure 27. Leverage versus squared residuals plot.

Figure 27 shows the leverage against the residuals squared. The horizontal line is the mean of the leverage and the vertical line is the mean of the squared residuals. Although there are cases that may have high leverage; and cases with poor fit, it appears that no cases have both a poor fit and leverage indicating minimal influence on the model.

To further evaluate the leverage, a Cook's D was used to evaluate proportionate influence relative to the model. Figure 28 shows the graphical results that were analyzed. Results displayed in Figure 28 show that there are potentially a number of cases that are exerting influence on the regression line.

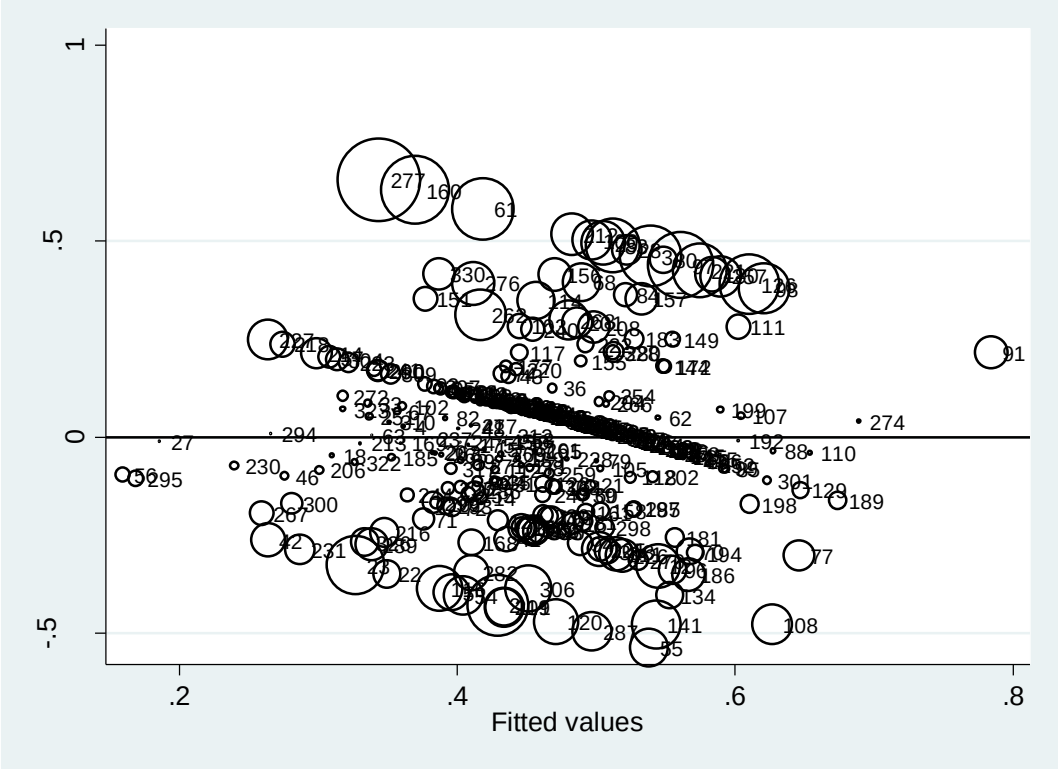

Figure 28. Residual versus predicted values relative to Cook's D.

To investigate further, boxplots of DFBETAs for each progression variable were examined. Figure 29 shows the output that was analyzed.

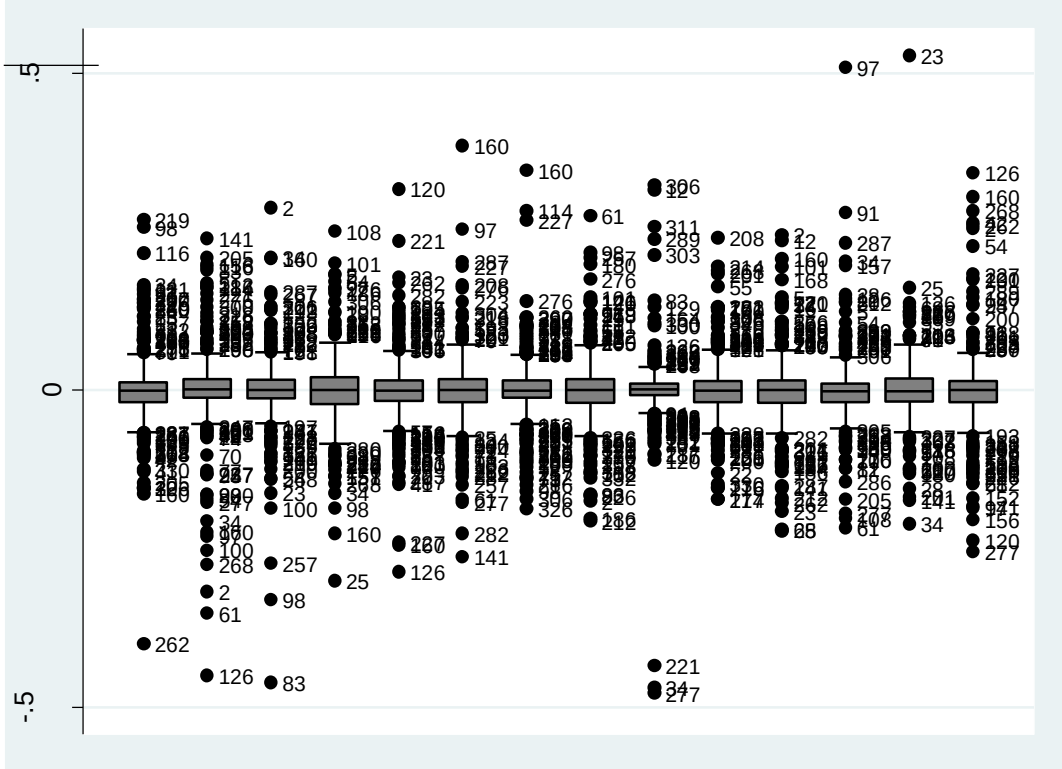

Figure 29. Box plots showing distributions of DFBETA variables.

As seen in the figure, two cases cause particular concern. Case 97 was influencing the variable econ_disadv (% of population below poverty) and Case 23 was influencing the variable *dtime* (time since disaster). Only variable *econ_disadv* was significant. To further investigate, the researcher reviewed the original survey data. Although it was influencing the regression line in a positive manner, no reason to exclude the case could be made. As such a conservative approach was again taken and no cases were eliminated. However, after running a robust regression using Huber weights and biweights pre-event planning for response and recovery dropped out of significance, yet the other results from the multiple regression analysis were confirmed. This suggests that pre-event planning may not play as significant of a role in recovery progression as indicated in this study and further research seems warranted.

Due to the indication of a heteroskedastic pattern in the errors, in addition to the outliers observed in the regression diagnostics, robust standard errors were used. The calculation involved estimating standard errors that did not rely on the assumption of independent, identically distributed errors, which is sometimes referred to as the Huber-White sandwich estimator of variance (Hamilton, 2013). Table 55 shows the results of this regression.

Table 55

Hierarchical Regression for Recovery Progression Using VCE (robust)

Block 1

Variable	Coefficient	SE	t	*p*	95% CI
Constant	0.13	.14	0.93	0.352	[0.15, 0.41]
Pre-planning for Response & Recovery	0.00*	.00	2.38	0.018	[0.00, 0.01]
Community Engagement	0.00	.01	0.36	0.719	[-0.01, 0.01]
National Frameworks	0.00	.01	0.07	0.947	[-0.02, 0.02]
Behavioral Training	0.00	.03	0.14	0.892	[-0.05, 0.06]
Degree of Disruption	0.02	.02	1.23	0.219	[-0.01, 0.06]
% of Impact	0.00	.01	0.22	0.825	[-0.02, 0.03]
Time of Disruption	-0.04***	.01	-4.13	0.000	[-0.06, -0.02]
Emergency Manager Tenure	0.01	.01	1.18	0.240	[-0.01, 0.03]
Emergency Manager Prior Disaster Experience	-0.05	.05	-1.03	0.306	[-0.15, 0.05]
Past Disaster Experience	-0.01	.00	-1.36	0.174	[-0.01, 0.00]
Urban / Rural	0.00	.01	0.38	0.706	[-0.01, 0.02]
Economic Disadvantage	0.01***	.00	3.23	0.001	[0.00, 0.01]
Time Since Disaster	0.00	.00	0.77	0.443	[-0.00, 0.00]

Block 2 (with variable *dv_resrec*)

Variable	Coefficient	SE	t	*p*	95% CI
Constant	0.04	.15	0.29	0.773	[-0.26, 0.34]
Response & Recovery Outcome (*dv_resrec*)	0.04*	.02	2.13	0.034	[0.00, 0.07]
Pre-planning for Response & Recovery	0.003*	.00	2.07	0.039	[0.00, 0.01]
Community Engagement	-0.00	.01	-0.29	0.772	[-0.01, 0.01]
National Frameworks	-0.01	.01	-0.84	0.400	[-0.02, 0.01]
Behavioral Training	-0.01	.03	-0.23	0.820	[-0.06, 0.05]
Degree of Disruption	0.02	.02	0.97	0.333	[-0.02, 0.05]
% of Impact	0.00	.01	0.18	0.860	[-0.02, 0.03]
Time of Disruption	-0.04***	.01	-4.31	0.000	[-0.06, -0.02]
Emergency Manager Tenure	0.01	.01	1.44	0.152	[-0.00, 0.03]
Emergency Manager Prior Disaster Experience	-0.05	.05	-0.94	0.350	[-0.15, 0.05]
Past Disaster Experience	-0.01	.00	-1.25	0.213	[-0.01, 0.00]
Urban / Rural	0.00	.01	0.37	0.708	[-0.01, 0.02]
Economic Disadvantage	0.01**	.00	3.19	0.002	[0.00, 0.01]
Time Since Disaster	0.00	.00	0.60	0.546	[-0.00, 0.00]

Note. *, **, *** indicates significance at the $p < .05$, $p < .01$, and $p < .001$, respectively. CI = confidence interval for B. N = 317. R-squared increases from .13 to .15 from Block 1 to Block 2. Block 2 adjusted R-squared = .11. RMSE = .21.

Model 2 continues to be the better fit as demonstrated by the data output from the hierarchical regression using the sandwich estimator. Table 56 details the changes associated with R-square along with the significance of the F-value.

Table 56

Change in R-squared as a Result of Adding Variable dv_resrec

Block	F	Block Df	Residual Df	Pr > F	R2	Change in R2
1	3.50	13	303	0.000	0.13	
2	4.53	1	302	0.034	0.15	0.02

Using this regression as the best fitting model, 11% of the variance in recovery performance progression can be explained by the predictor variables contained within the model. Although these findings are positive and highlight the importance of overall response and recovery performance in laying the groundwork for recovery progression, more research is needed to better understand what else might impact recovery progression.

The hypothesis generated for this model was: H1b: Adaptive capacity along with response and recovery performance outcomes will predict trajectory of recovery progression. The null hypothesis was that there is not a relationship between adaptive capacity and response and recovery performance on the outcome variable of recovery progression. The regression output for this model shows, while controlling for the effects of all other variables in the model, that for each unit increase in pre-event planning for response and recovery, cubed response and recovery performance outcomes increase by 0.003. It is noted that this finding is significant at $p < .05$. Although this is a very small change in the value of the coefficient, it makes sense theoretically that if a community engages in pre-event planning for both response and recovery, the ability to mobilize resources (both economic and human) should be improved, thereby allowing for a recovery progression to occur in a positive trajectory. To further illustrate the

regression results, a conditional effects plot was used to show the mean predicted values at specified levels of the independent variable (*iv_planning*) in the original units of the dependent variable (i.e., cubed root of the predicted means). Figure 30 shows the resulting predicted average marginal effects.

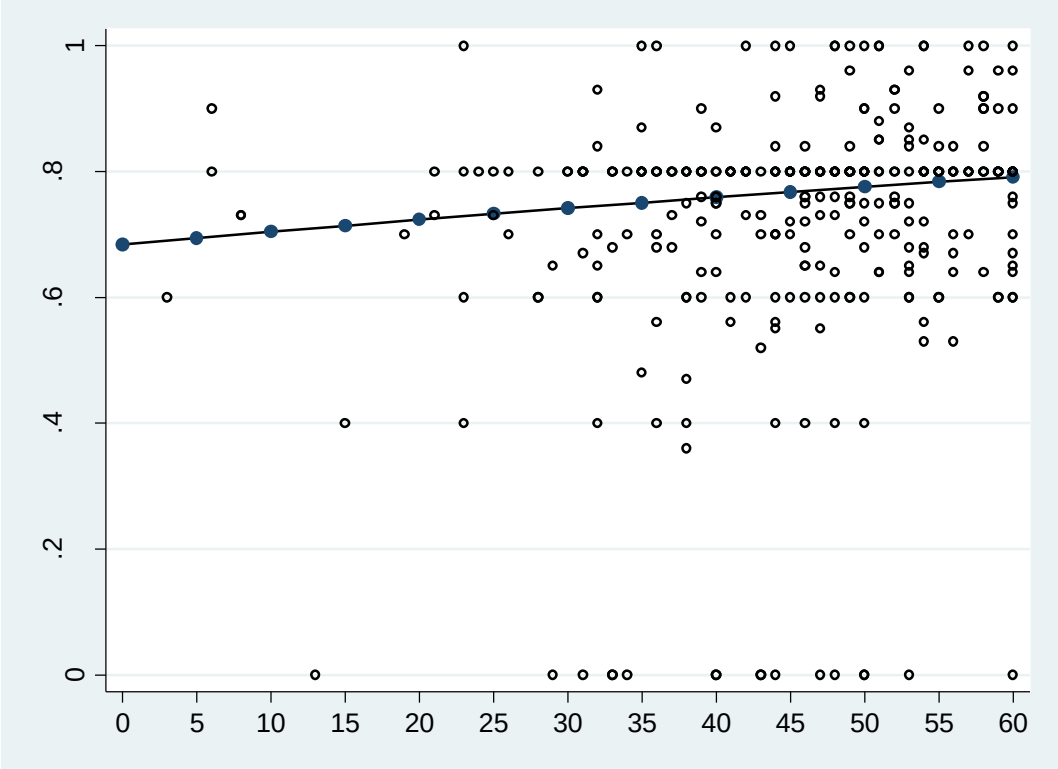

Figure 30. Predictive margins for pre-planning for response and recovery.

The regression output also shows, while controlling for the effects of the other variables, that when the total time of disruption increases, recovery progression decreases. This again makes theoretical sense. As the time of disruption increases, resources are consumed. Additionally, as disruption time is prolonged, so is the ability to maintain baseline economic, social, and business functions within a community. As disruption is prolonged, focus on basic needs often takes precedence over re-building. It is noted that this finding is significant at $p < .001$. To further illustrate the regression results, a conditional effects plot was used to show the

mean predicted values at specified levels of the independent variable (q4_*tdrp*) in the original units of the dependent variable (i.e., cubed root of the predicted means). Figure 31 shows the resulting predicted average marginal effects.

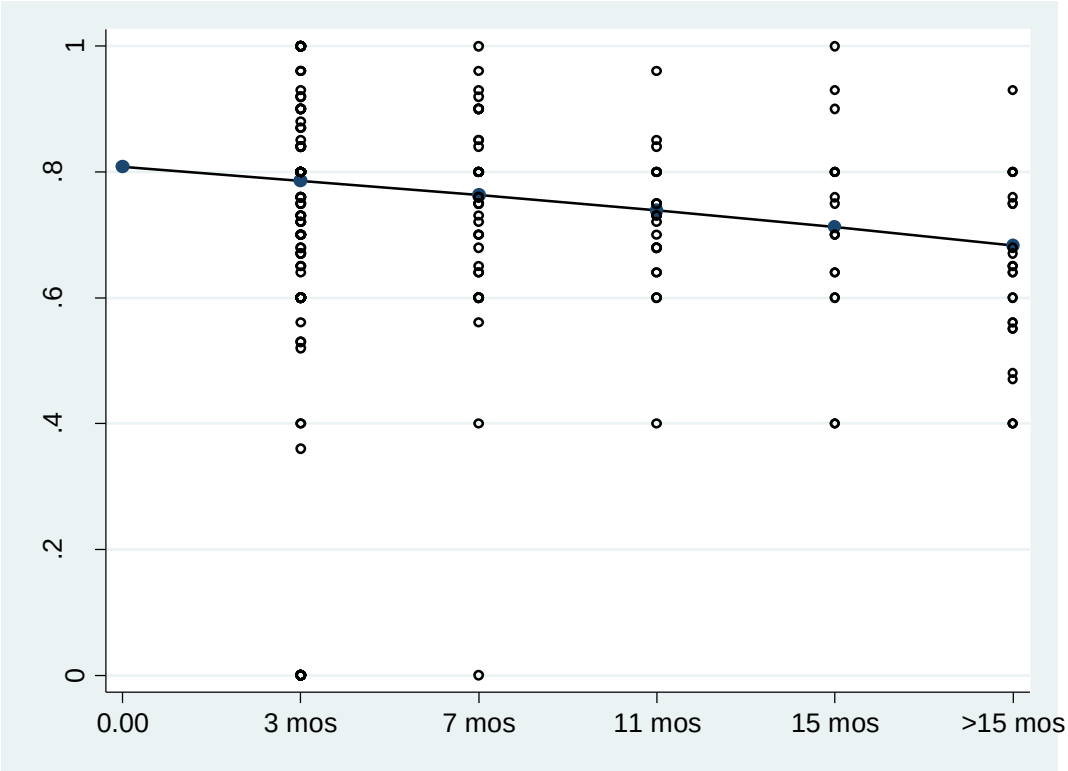

Figure 31. Predictive margins for total length of disruption.

The regression output also shows, while controlling for the effects of the other variables, that for every one-unit increase in % of population below the level of poverty, recovery progression increases by .01. It is noted to be significant at $p < 0.05$. At first glance, this seems somewhat contradictory. Why would a county or parish that is economically more challenged have a better recovery progression? More research is certainly needed in order to answer this question. However, some initial thoughts relate to what the community had as a baseline condition relative to infrastructure, businesses, social structures, and transportation. If the baseline condition was limited, it would not take much in terms of recovery to get back to

baseline, or even move above baseline once the flow of federal funds is released for re-building. Similarly, it would likely take a longer period of time to recover for an economically advantaged community to recover when businesses and key social capital are displaced. Chamlee-Wright and Storr (2011) assert that social capital was key in post-Katrina impacted communities as community members returned and relied upon their own efforts and informal support from friends and family to begin the re-building process. This reliance on self and established networks may indeed result in a slower recovery progression. Nonetheless, more research seems needed to better understand and interpret this finding. To further illustrate the regression results, a conditional effects plot was used to show the mean predicted values at specified levels of the independent variable (*econ_disadv*) in the original units (i.e., cubed root of the predicted means). Figure 32 shows this graph.

Figure 32. Predictive margins for % population below poverty.

No additional control variables were found significant within the model. Overall, the model presented to test hypothesis two was representative and had a good fit to the data. However, the final model explains only approximately 15% of the variation in recovery progression. More research is needed to better understand what additional variables affect recovery progression in disaster- impacted communities.

The final variable demonstrating significance is *dv_resrec*. As discussed earlier, it was conceptually congruent that those communities that had a positive outcome with response and recovery performance would naturally have a positive trajectory in disaster recovery. Findings show that when controlling for the effects of other variables, that for every one unit increase in response and recovery performance, cubed disaster recovery progression increases. To see these results visually a conditional effects plot was used to show the mean predicted values at specified

levels of the independent variable (*dv_resrec*) in the original units (i.e., cubed root of the predicted means). Figure 33 shows the results.

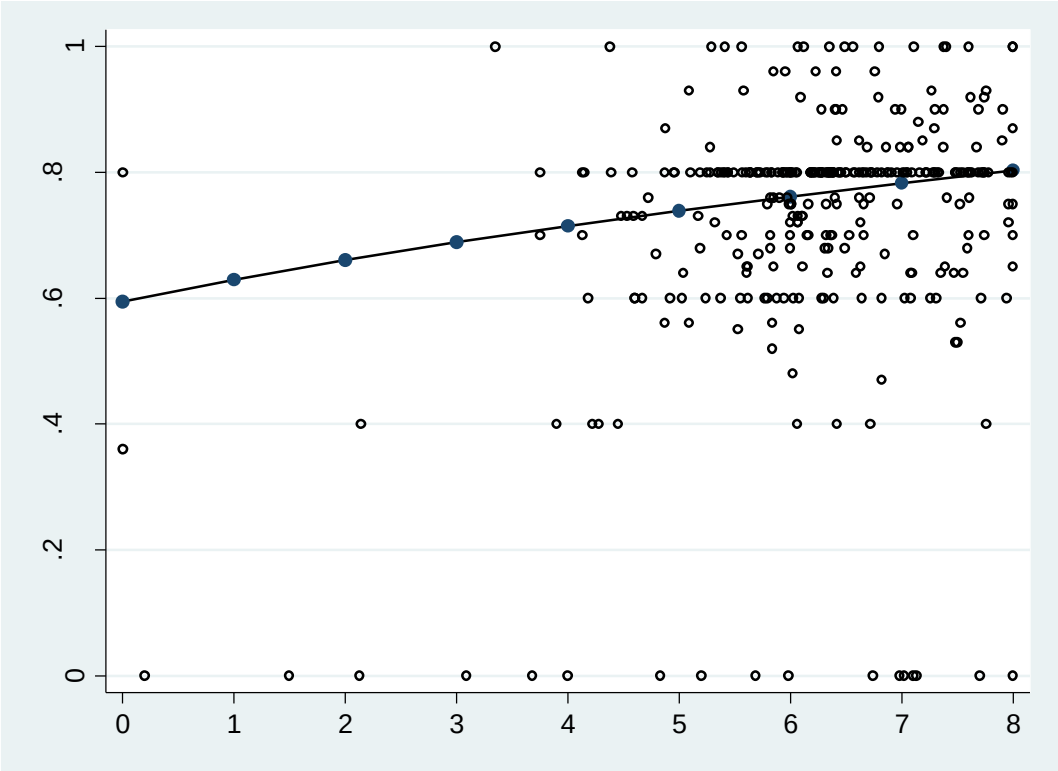

Figure 33. Predictive margins for response and recovery performance outcomes.

Summary of hypothesis two. In summary, the researcher sought to test the following hypothesis: H1b: Adaptive capacity along with response and recovery performance outcomes will predict trajectory of recovery progression. The null hypothesis suggested no relationship exists between adaptive capacity and response and recovery performance on the outcome variable of recovery progression. Given the results of the statistical analysis, the null hypothesis is rejected with the final model demonstrating the significance of pre-event planning and response and recovery performance outcomes on recovery progression. Additionally, the greater the time a community was impacted by disaster, the slower the progression. This makes sense theoretically based upon the expected impact on community resources when time of disruption

increases. In addition, findings suggest that as the percentage of the population below poverty increases, the greater the trajectory of progression. This appears to be theoretically confusing, but indicates that more data are needed to better understand the factors impacting this finding. Overall findings suggest that disaster recovery progression is impacted by pre-planning efforts aimed at response and recovery, yet the robust regression results suggested that this effect may be less pronounced and suggests further research is warranted. Nonetheless, communities that have a good response and recovery performance are significantly more likely to have a positive trajectory of recovery over time than those communities who had a poorer response. Given that pre-event planning plays a significant role in response and recovery performance, it seems reasonable that the positive effect uncovered in this study may hold, although somewhat less pronounced than indicted in this model.

Chapter Summary

The purpose of this study was to determine if a relationship exists between community adaptive capacity development and disaster response and recovery outcomes. Specifically, the first objective involved identifying the adaptive capacity that exists within local communities at the time of major disaster. The second objective involved measuring the impact of adaptive capacity on disaster response and recovery performance and recovery over time, i.e. progression. The analysis within this chapter was done in support of the following research questions:

- Do communities that experienced major disaster declaration in 2011 evidence adaptive capacity?
- In local communities who have experienced major disaster, did adaptive capacity development produce improved response and recovery outcomes?

Statistical analysis was used to test the hypotheses generated for this study using Stata. Quantitative analysis revealed that the presence of adaptive capacity in the form of pre-planning for response and recovery; overall community engagement in preparedness activities; use of national response frameworks (NIMS & ICS); and behavioral training (full-scale exercises) positively predict the response and recovery performance outcomes within a county or parish. In addition, successful response and recovery performance is predictive of the recovery progression over time, but is affected by the total time of disruption as well as the percentage of the population below the poverty line.

CHAPTER V

DISCUSSION & RECOMMENDATIONS

Introduction

This chapter provides a brief overview of the study, including a statement of the problem and the methods involved. The majority of the chapter is devoted to a summary and discussion of the research questions and hypotheses that were tested, along with a discussion of the results. The theoretical and conceptual frameworks are re-visited in light of the findings and recommendations for future scholarly activities and future research are presented.

Summary of the Study and Methodology

Disasters of all kinds continue to affect the United States and other nations. In 2012 alone the Atlantic region of the United States witnessed 19 named storms, of which 10 became hurricanes. Records reveal that this activity was well above the 30-year average for named storms and hurricanes (National Weather Service, 2012). The United States has also been home to unprecedented attacks and use of weapons designed to induce mass destruction, such as the incidents in Sandy Creek Elementary School and at the 2013 Boston Marathon. Anecdotal evidence suggests that our response and recovery from these disasters has shown improvement over well-publicized failures such as those that occurred in Hurricane Katrina. However, the evidence to date is limited by the inability to quantify response and recovery outcomes.

Despite our long history with disaster response and recovery, the evidence-base from which our policies and practice evolves has been largely based upon the stories told by those who have experienced disaster (the lived experience), and the reliance on national-level policy and doctrine espousing changes in order to improve outcomes. It has been argued that national preparedness requires the building of disaster resilient communities by supporting and strengthening the institutions, assets, and networks that are already at work within the

community (Federal Emergency Management Agency, 2011a). This argument was strengthened in the United States by the release of Presidential Policy Directive PPD/8 that called for the building of core capabilities to confront disaster and to measure and track progress related to these capabilities (U.S. Department of Homeland Security, 2011a).

The idea of building community resilience to improve outcomes related to disaster response and recovery is a common theme in disaster literature (Boin, 2010; McEntire et al., 2002; Paton & Johnson, 2006; Rose, 2004). This literature asserts that resilience begins with pre-disaster preparedness and planning, and ends with the ability of a community to responds to and recover from disaster. Pre-disaster preparedness, mitigation, and recovery capacity-building results in a resilient community with an improved ability to withstand, respond to and recover from disasters (U.S. Department of Homeland Security, 2011a). Concerns from the research community focus on disagreements as to the definition of resilience, whether resilience is an outcome or a process, what type of resilience is being addressed, and which policy realm it should target (Cutter, et al., 2010). In consideration of this, a conceptual framework of community reliance was established for this study.

From this researcher's perspective, resilience of a community is measured by the effective response and recovery of a community to an actual disaster. The pathway to resilience requires what Norris et al. (2008) refer to as networked adaptive capacities. In simple terms, those capabilities that allow a community to move from disruption to equilibrium. The literature, as well as the National frameworks used in the United States for disaster response and recovery, provided the researcher with the adaptive capacity variables to test a conceptual framework for community resilience to disaster. This research was seeking to validate the elements of adaptive capacity that existed in communities impacted by actual disaster. The research was set within a

sociological and human ecology framework to explain and predict the possible human interactions surrounding adaptive capacity development within a community.

Previous studies of disaster response and recovery have typically used a retrospective case-study approach to examine the challenges and gaps based upon the lived experience of those in disaster. Although a powerful approach, no large-scale quantitative study had to date been conducted to validate the concepts that comprise national response and recovery frameworks. As such, the purpose of this study was to determine if a relationship exists between the development of disaster readiness capabilities and disaster response and recovery outcomes. The research questions for this study were the following:

- Do communities that experienced major disaster declaration in 2011 evidence adaptive capacity?
- In local communities who have experienced major disaster, did adaptive capacity development produce improved response and recovery outcomes?

To address these questions, the researcher identified the adaptive capacity within local communities at the time of major disaster and then measured the impact of that capacity on disaster response and recovery while controlling for other variables that theory suggests might impact disaster response and recovery. A quantitative approach using cross-sectional survey methodology and existing community data available in the U.S. Census Report for 2010 was selected as an appropriate design to explore the research questions.

Discussion of Major Findings

The first research question was addressed using a descriptive approach. Theoretically, adaptive capacity is represented as community disaster readiness capabilities. These capabilities are all components of well-documented practices for disaster response and recovery. Although

the national frameworks for preparedness and response were released in 2008, focus on overall planning for response and recovery has been ongoing since the 1970's when major losses of life and property occurred in the aftermath of the California wildfires (Federal Emergency Management Agency, 2004). Additionally, federal emphasis on the National Incident Management System began in 2004 with ties to federal funding in place since 2006 (Federal Emergency Management Agency, 2004). In reviewing the findings from this study, it appeared that in 2011, the majority of U.S. counties and parishes had responded with considerable effort to incorporate elements of adaptive capacity at the local-level, i.e. county or parish. This is an important finding as the literature cites continued concerns in this area. Coordination of effort during Hurricane Katrina in 2005 was a severe challenge as regional planning and rehearsals had not been carried out, resulting in chaotic efforts in local coordination (Kahn & Barondess, 2008, p.917). Additionally, the U.S. House of Representatives issued a report on February 16, 2006, citing examples of disaster preparation failures at multiple levels including a poorly prepared local response effort that led to lawlessness, chaos, communication failures and inadequate alternatives to meet disaster response needs.

Critics have argued that disaster research has focused primarily on the consequences of disaster rather than on evidence surrounding actual response practice (Britton, 2007). Findings from this study provide quantitative data of national-level response and recovery practice in communities affected by major disaster. Figure 34 shows graphically the descriptive data reflecting the percentage of counties or parishes that have either highly or completed developed capability.

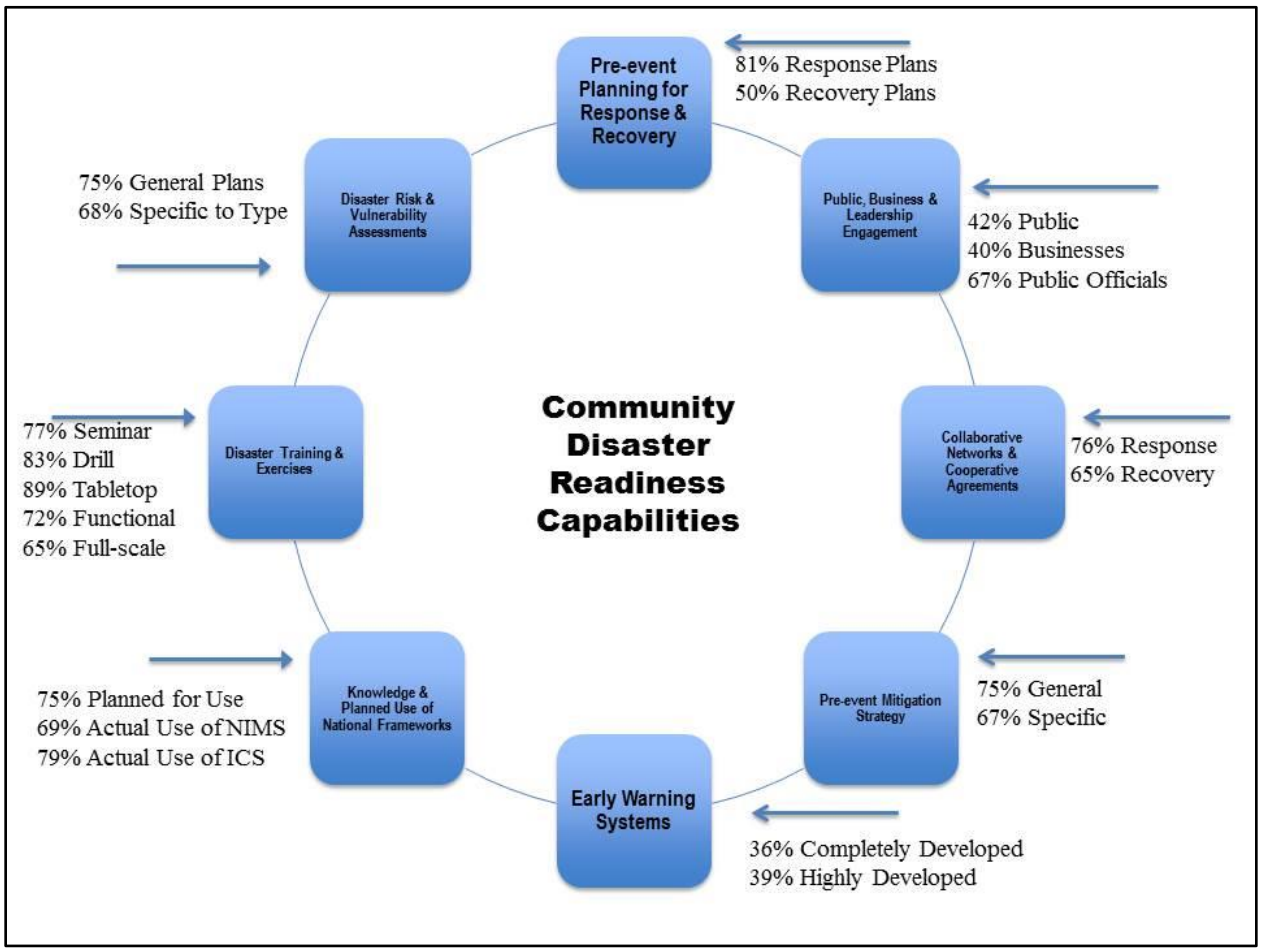

Figure 34. Response and recovery adaptive capacity frequencies.

Some inferences can be drawn from the descriptive data. It appears that there was trending toward capability development in United States counties or parishes in 2011. However, no benchmark data exists from past research in order to make comparison regarding when, why, or how this capability was developed and what the progression of the development has been. Findings do suggest that pre-event preparedness for response and recovery is occurring in the majority of U.S. communities. This would address concerns cited in the literature that suggest preparedness is perhaps too costly for some communities. Wineman, Braun, Barbera, and Loeb (2007) found that insufficient financial and staff resources are obstacles in community

preparedness and response planning. It is noted from the data that recovery planning and capability development seemingly lags behind response capability development. This is understandable if we look at national-level policy and doctrine. Until the release of the National Disaster Recovery Framework in 2012, recovery concepts had remained largely in the background. Data on recovery from disaster-affected communities was obtained from anecdotal reporting and individual case-study analysis. It would be interesting to see how these findings compare in future research once the National Disaster Recovery Framework has been operationalized at the local-level.

The finding that approximately 75% of the counties or parishes surveyed had a completely or highly developed early warning system specific to the type of disaster that affected the community is promising, but is viewed with caution. Hamilton (2000) argues that providing effective warnings regarding disaster is complex and requires alignment on the technical end as well as the political decision-making end. Additionally, capabilities for warning vary greatly by disaster type (Hamilton, 2000). In view of these arguments, the finding is favorable, but warrants future investigation and inquiry.

Without further hypothesis testing, not much exists within the data in terms of understanding how a change in capability development explains or predicts response and recovery outcomes nationally. What is important, however, is the establishment of baseline indicators for future research designed to determine if changes over time occur in variables associated with adaptive capacity. Some in the literature have suggested that the criteria for assuring the quality of resilience variables are widespread, yet to date no single set of established indicators for quantifying disaster resilience has emerged (Cutter, et al., 2010). This study

provides data supporting the existence of specific capabilities based on national policy that arguably support resilience at the level of the county or parish.

The descriptive data presented here were obtained using a very purposeful simplified conceptual framework to gather basic data regarding those indicators most cited in the literature as critical elements informing response and recovery outcomes. Using a random sample of 2011 disaster impacted communities, findings support that these adaptive capacities are present in counties and parishes across the nation. Theoretically, the structural-functionalist framework proposed earlier on in this study offers some explanation for the findings. As Parsons (1961) suggests, systems undergo structural change when failing to come to terms with changing environments. The well-publicized failures in disaster response have perhaps created impetus for change at the local level. It is likely that counties or parishes have recognized the disparities that existed in New Orleans and other disaster impacted communities and accept that new structures could have prevented poor outcomes. It was evident that there was outrage nation-wide at the disparity between the value of protecting the public and those most vulnerable, and documentation of unpreparedness such as occurred in Hurricane Katrina.

According to Powers (2004), structural-functionalism explains the alignment of behaviors and new structures consistent with core values. Findings from this study offer a positive perspective relative to disaster preparedness and response core values at the local-level. Not surprisingly, findings appear consistent with a rational choice theoretical framework. It is logical to assume that leaders will establish the processes and protections to ensure the ability of a community to adequately respond and recover from disaster. As argued by Fuchs (2001), reengineering a culture by adhering to scientific principles is rational. The adaptive capacity variables in this study were logically based upon theoretical principles, common doctrine and

public policy. The data invite additional inquiry related to the continued gaps that may exist when capability is not present. Perhaps additional quantitative data supporting the effectiveness of this capability with regard to outcomes will enhance increased development and adoption of capability at the local-level.

In summary, the descriptive data infers that adaptive capacity is present in the majority of counties or parishes across the nation, although not universally. This raises additional questions as to the driving and inhibiting forces at play within communities. At the conclusion of this chapter additional research is proposed in light of these findings.

The second research question asks if improved response and recovery outcomes are predicted by adaptive capacity development. Two hypotheses were formulated to address this research question. The first hypothesis argued that counties or parishes that developed adaptive capacity through pre-event planning, community engagement, training, and the use of national response frameworks will have improved response and recovery outcomes. Findings from this research support a relationship between the existence of adaptive capacity and improved outcomes in response and recovery (R^2=.43, F(13, 303)=13.34; p=.000). Pre-event planning, community engagement, behavioral training, and the use of national response frameworks predicted response and recovery outcomes while controlling for other variables. The data suggest that despite differences in disaster type and scope, characteristics of the emergency manager (such as tenure or prior experience), past disaster experience of the community, rural/urban divides, economic disadvantage, or time since disaster; the presence of these capabilities in counties and parishes improves response and recovery outcomes. Additionally, these findings provide an additional benefit in terms of what other disaster researchers have suggested as an "adaptive capacity assessment"(Longstaff, Armstrong, Perrin, Parker, and Hidek, 2010, p.14).

Although Longstaff et al. (2010) argue that "no one definition of resilience will fully satisfy participants in this diverse field of research and practice, no one tool will be equally satisfying or sufficient"(p.17), this study provides a necessary first step in actualizing adaptive capacity assessment and tying it to outcomes. Using the conceptual framework proposed in this research, an overall assessment of adaptive capacity was created for each county or parish included and then tested against resiliency. Prior to this study, quantitative data demonstrating the relationship between response and recovery outcomes and the use of recommended doctrine and protocol was limited. Findings from this research provide further support to continue advancing activities at the local-level focused on pre-event planning, community engagement, training, and the use of national response frameworks.

As argued by Donner (2008), policy makers and professionals in the field must carefully and continually consider forces shaping organizational decision-making processes in emergency and disaster response. By providing quantitative data regarding the effectiveness of response and recovery interventions, decision-making by local leadership can be supported. This study demonstrates a relationship exists between adaptive capacity and response and recovery outcomes. However, the adoption of these capacities is not universal as shown by the descriptive data presented. Additional research is suggested to explore decision-making at the local level in communities that have not developed adaptive capacity. Understanding the driving and restraining forces influencing these decisions would inform the field.

Variables originally thought to explain findings were not significant in this study. Economic and demographic variables, such as rural or urban location, along with race and age characteristics, were not statistically significant. This was somewhat surprising to the researcher as the literature suggests that disasters disproportionately affect vulnerable populations stemming

from social, class, gender, race, or economic circumstance that creates vulnerability (Bolin, 2007). As was compellingly argued by Norris el al. (2008), poor communities are at greater risk for death and damage as a result of disaster, and then are often less successful in mobilizing support following disaster. Results of this study, however, do not confirm these arguments. However, case study accounts following Hurricane Katrina demonstrated associations between age, race, and economic disadvantage. As such, additional research is suggested to further explore community vulnerabilities and the impact they have on disaster response and recovery.

Findings indicate that pre-event planning predicts increased response and recovery outcome. This provides support for the national-level emphasis that has been placed on mitigation strategies, risk assessment, and written plans for response and recovery. This finding is theoretically supported by literature indicating that pre-event planning reduces some of the stress that a community may experience, by eliminating the surprise or unexpectedness of the event (Comfort, 1999; Longstaff, 2005; Paton & Johnson, 2006).

Overall community engagement, to include the public, local businesses, and elected officials was also significant. This reinforces the need for local consensus-building efforts and the building of a common agenda at the local-level (Paton & Johnson, 2006). It also further validates the inclusion of "community capital" variables suggested by Cutter, Burton, and Emrich (2010) in their research identifying disaster resilience indicators. Continued emphasis at the local-level on communication strategies to involve the public is critical to ongoing preparedness efforts.

Theoretically the National Incident Management System (NIMS) and the Incident Command System (ICS) are deemed best practices in the United States for disaster preparedness and response (U.S. Department of Homeland Security, 2008a). NIMS standardizes incident

management and ICS provides guidance for planning the organizational structure used in response. Despite continued emphasis on these systems as best practice, limited empirical data regarding their outcomes has existed. Findings from this research indicate that use of these national frameworks does result in improved response and recovery outcomes ($p = .000$). This knowledge may support community efforts to maintain NIMS and ICS capability at the local-level. As the theoretical framework of structural-functionalism suggests, communities may benefit from knowledge that empirical data exists to support use of these frameworks. This knowledge may allow for wider adoption of these structures as core values within the community, as opposed to structures being imposed through a bureaucratic process.

According to national-level doctrine local leaders and emergency mangers have a defined role in preparing communities for disaster (U.S. Department of Homeland Security, 2008a). As such, it is not surprising that education and training have been cornerstones in this country's preparedness efforts. Training and exercise of response and recovery plans are cited as key activities in providing communities with the knowledge, skills, and abilities needed when disaster strikes (U.S. Department of Homeland Security, 2012b). FEMA's Comprehensive Exercise Program (Federal Emergency Management Agency, 1995) continues to set the standard for local communities relative to disaster preparedness. This comprehensive exercise program was described earlier in Chapter Two. It was anticipated that overall training at the local-level would have a strong relationship with response and recovery outcomes. However, somewhat surprising, the frequency of overall training (i.e., cumulative number of orientation seminars, drills, tabletop exercises, functional exercises, and full-scale exercises) was not significant. When tested individually within the model, only full-scale exercises demonstrated significance in relation to response and recovery outcomes. Based on the researcher's experience at the local-

level, the results support the notion that full-scale exercises are not consistently used as a matter of practicality and out of concern for cost. In this study alone, only 34% of the counties or parishes impacted by major disaster had a full-scale exercise in the year leading up to the disaster. Overall, the most frequently used training activity was the tabletop exercise. Findings from this study suggest that this training method does not adequately prepare counties or parishes for maximizing response and recovery outcomes.

Theoretically, the significance of full-scale exercises makes sense. As discussed earlier in Chapter 4, the full-scale exercise is distinct from the other training methods in that it combines cognitive and behavioral training in an environment designed to simulate a real disaster scenario. In reviewing educational psychology literature and training literature, some thoughts are offered relative to the ability of this type of training to increase positive outcomes in response and recovery. Researchers have argued that increasing difficulties within a practice scenario serves to enhance the ability of the learner to transfer knowledge (Schmidt & Bjork, 1992). Schmidt & Bjork (1992) make a strong argument for the use of variation in order of events, in the nature and scheduling of feedback, and in the versions of the tasks to be completed. A full-scale exercise often contains these elements based upon the nature of the event, the degree of uncertainly introduced, as well as by the number and type of agencies involved in the activity. Kirkpatrick's (2006) evaluation typology for training provides some baseline for understanding the elements of a full-scale exercise that separate it from the others. This model encourages evaluation activities to assess reaction (expectations and perceptions), knowledge (measured changes in what is known before and after the education), transfer (application of knowledge), and impact (outcomes in relation to expectation). The full-scale exercise is the only training methodology that offers participates the opportunity to achieve in all four realms.

Team leadership and team learning concepts offer a potential explanation as to the significance of full-scale exercises relative to effective and efficient response and recovery. According to Zaccaro, Rittman and Marks (2002), team coordination functions are critical for success. They argue:

> To be effective, these team coordination functions need to become fairly automatic behavior patterns displayed by team members, individually and collectively, as teams confront tasks. Likewise, if teams need to operate in highly dynamic and complex conditions, then the application of these functions needs to be adaptive. In essence, teams need to balance two countervailing necessities in such environments: the need to standardize how team members contribute to and combine their resources and the requirement that they remain flexible as task conditions become more dynamic (p. 475).

Disasters, by their design, require coordination and collaboration of multiple organizations as well as reliance on both individuals and groups. According to Harrold (2006), response organizations must have agility and discipline couched within a system that allows improvisation. Kendra and Wachtendorf (2003) describe improvisation as the combination of planning with the ability to meet unexpected situations. It makes sense from this perspective to view the full-scale exercise as the only opportunity to creatively introduce a scenario in which improvisation becomes necessary. Thus, in keeping with Harrold's (2006) assertion, agility and discipline of the team is reinforced and supported. According to Salas and Cannon-Bowers (2001), there is empirical evidence to support that team training works when it is theoretically driven, focused on required competencies, and designed to provide trainees with realistic opportunities to practice and receive feedback.

The concept of discovery may also inform the argument that only full-scale exercises can fully engage the learner and result in the transfer of training. Baldwin and Ford (1988) describe the transfer of training as the extent to which knowledge, skills, and attitudes acquired in training are applied, generalized, and maintained over time. In a study of the effects of introducing error in learning, Anderson (1980) noted that a moderate amount of behavioral learning, via trial and error engagement, in addition to cognitive learning facilitates transfer and retention. Behaviorally engaging individuals in full-scale exercises facilitates discovery as individuals and groups must engage in problem solving and trial and error behavior inherent in a simulated disaster scenario. As discussed in Chapter Four, the use of a high fidelity (or high reality) environment supports the creation of conflicts that allow emergence of new problems that must be solved using critical-thinking as well as collaboration. Theoretically, when participants engage behaviorally and in a high fidelity environment, learning occurs through discovery and therefore the knowledge transfers to new/similar scenarios. This seems to explain the significance of full-scale exercises as opposed to alternative training strategies.

Overall, the significant findings relative to pre-event planning, overall community engagement, use of national frameworks, and the importance of full-scale exercises validate the continued use of national frameworks and doctrine. Although the findings are not surprising from a logical perspective (as they have always appeared logical and congruent), there has not been quantitative data to support the use of these capabilities to effect response and recovery outcomes.

The second hypothesis generated for this study explored if adaptive capacity, along with response and recovery performance outcomes, predict the trajectory of recovery progression. The null hypothesis stated there was no relationship between these variables. The findings suggest

that approximately 13% (R^2=.13, F(13, 303)=3.5, p=.000) of the variation in recovery progression was explained by the first block using a hierarchical regression model and 15% (R^2=.15, F(14, 302), p=.000) after adding the response and recovery outcome variable (ΔR^2=.02, F(1, 302)=4.53, p=.034), which showed that response and recovery outcomes provided a significant improvement to the model and that recovery progression was partially a function of initial response and recovery outcomes. A total of four variables were noted to be significant in the final model, pre-event planning (p = 0.039), total time of disruption (p = 0.000), overall response and recovery outcome (p = 0.034), and percentage of the population falling below poverty (p = 0.002). Each of these findings will be discussed in more detail.

Community recovery after disaster is a complex phenomenon. According to Chang (2010), recovery has been cited by Berke & Beatley (1997), Haas, Kates, & Bowden (1977), Mileti (1999), Olshansky (2005), and Rubin, Saperstein, & Barbee (1985) as the least understood phase of the disaster cycle. The literature suggests however, that recovery is multi-faceted. According to the National Disaster Recovery Framework or NDRF, recovery begins with pre-disaster preparedness and includes a wide range of planning activities (U.S. Department of Homeland Security, 2011c). Although this framework is now publically available as a resource to communities, it was not available to communities prior to the 2011 major disaster that impacted their county or parish. Empirical findings, however, validate the critical importance of pre-event planning and its relationship with the progression of recovery as measured by return of residents to permanent housing, return of transportation systems, return of displaced businesses, re-building of infrastructure, and return of social systems. As discussed in Chapter Four, two cases were investigated that seemed to positively leverage this variable, however, there was no compelling evidence to simply drop these cases. In response, a robust regression was run to

control for the effects of these outliers. Data obtained from the robust regression indicated that pre-event planning was not a significant predictor of recovery progression thereby indicating caution when interpreting the initial results. As it seems theoretically congruent that progression would be enhanced through anticipatory planning relative to recovery, more research is needed in this area.

Study findings related to the significance of the overall response and recovery performance of the community ($p = 0.034$) on recovery progression also validates the close alignment of community behaviors needed to enhance resilience to disaster. Response and recovery performance lays the foundation for recovery progression. Further evidence of this is found in the close alignment of the National Disaster Recovery Framework and the National Response Framework (discussed earlier in Chapter Two). Overall performance related to response and recovery communication, collaboration, resource mobilization, and disaster management impact the progression of recovery. According to the National Disaster Recovery Framework or NDRF, "each community defines successful recovery outcomes differently based upon its circumstances, challenges, recovery vision and priorities" (U.S. Department of Homeland Security, 2011c, p. 13). This research supported this position through the creation of indices by which to allow measurement specific to the community's experience relative to recovery. Demonstrating a positive relationship between overall response and recovery performance and the progression of recovery provides encouragement to communities who question the importance of investing time and effort into these national-level frameworks supporting disaster recovery.

Although the model for progression of recovery explains only about 15% of the variability in the dependent variable, it does offer some support relative to the national-level

doctrine that was released to guide communities in the recovery process. However, more research is required in this area to better understand disaster recovery progression. In a study of recovery in New Orleans follow Hurricane Katrina, researchers found clear disparities related to social vulnerability (Finch et al., 2010). Lagging recovery was found to relate to the synergistic effects of storm impacts combined with pre-existing levels of social vulnerability (Finch et al., 2010). In the present study, the only demographic variable that was significant (and somewhat surprising) was the positive relationship between economic disadvantage and positive progression of recovery. Specifically, findings suggest that as the percentage of people who fall below the poverty line increases, recovery progression increases. While initially this result seems contrary to logic, Finch et al. (2010) discovered that neighborhoods in the mid-range of social vulnerability lagged more than those in either the high or low categories of social vulnerability. They suggest that this may be attributed to the availability of resources, both private and government, to help groups in these categories. It is possible that this phenomenon is also at play within this study. It also seems logical to conclude that the baseline conditions relative to infrastructure, businesses, social structures, and transportation play a role here. Just how much did the community move from baseline due to the disaster? If the community was doing extremely well from an economic standpoint prior to this disaster, and a significant shift from baseline occurred, might it not seem plausible that they would take a longer period of time to recover? More research would be suggested to explore the concept in more depth.

The final variable that was significant related to progression of recovery was total time of disruption. The data indicate that as the time of disruption increases, the progression of recovery decreases. These findings are theoretically congruent. As argued by Fisher (2008), the greater the scope and scale of disruption, the more likely the time for recovery will be extended and the

more likely the community and social structures will be affected. It is impossible to draw any additional conclusions based upon this data. However, future qualitative research is suggested to explore additional indicators relative to time. Based upon the work of Finch et al. (2010), other measures of social vulnerability might be explored in relation to the data.

Limitations of the Study

Since this is an early attempt to quantitatively measure the impact of adaptive capacity on response and recovery outcomes in a national-level study of communities impacted by major disaster declaration, it is not without shortcomings. Reliance on the local emergency manager as the sole informant for county or parish data is clearly a limitation as other individuals within a community could also inform the research questions and offer valuable perspective. If the study were repeated and funding resources were available, additional informants from the local level should be included and data collection may further benefit by including qualitative as well as quantitative data.

A second limitation stems from relying primarily on national data sources such as the U.S. Census and the FEMA databases for disaster declarations. These data sources may not provide a full measure of demographic and disaster specific data used to explore response and recovery outcomes. Again, qualitative data may provide advantageous in forming a better understanding, clarification and differentiation among types of disasters.

Despite limitations, the multivariate analysis of data provides good empirical evidence for rejecting the null hypotheses with stronger evidence relative to explained variability with respect to the first regression model (Hypothesis 1a) and somewhat less for the second (Hypothesis 1b). Findings suggest pre-event planning for response and recovery, use of national frameworks, community engagement, and behavioral training predicts outcomes in overall

response and recovery. Additionally, recovery progression relates to the overall response and recovery performance of the county or parish, percentage of the population below poverty, and total time of community disruption.

Recommendations

Resilience to disaster remains a very complex phenomenon difficult to conceptualize and operationalize. The findings from this study may begin to better inform this field of interest and provide a basis from which to expand the research and thinking. Replication of this study in a population of 2012 or 2013 disaster-impacted communities would provide comparative data for further analysis and for moving closer to a more comprehensive understanding. Based upon the current findings, the researcher recommends a revision to the conceptual framework originally proposed. Figure 35 illustrates the suggested changes to the framework.

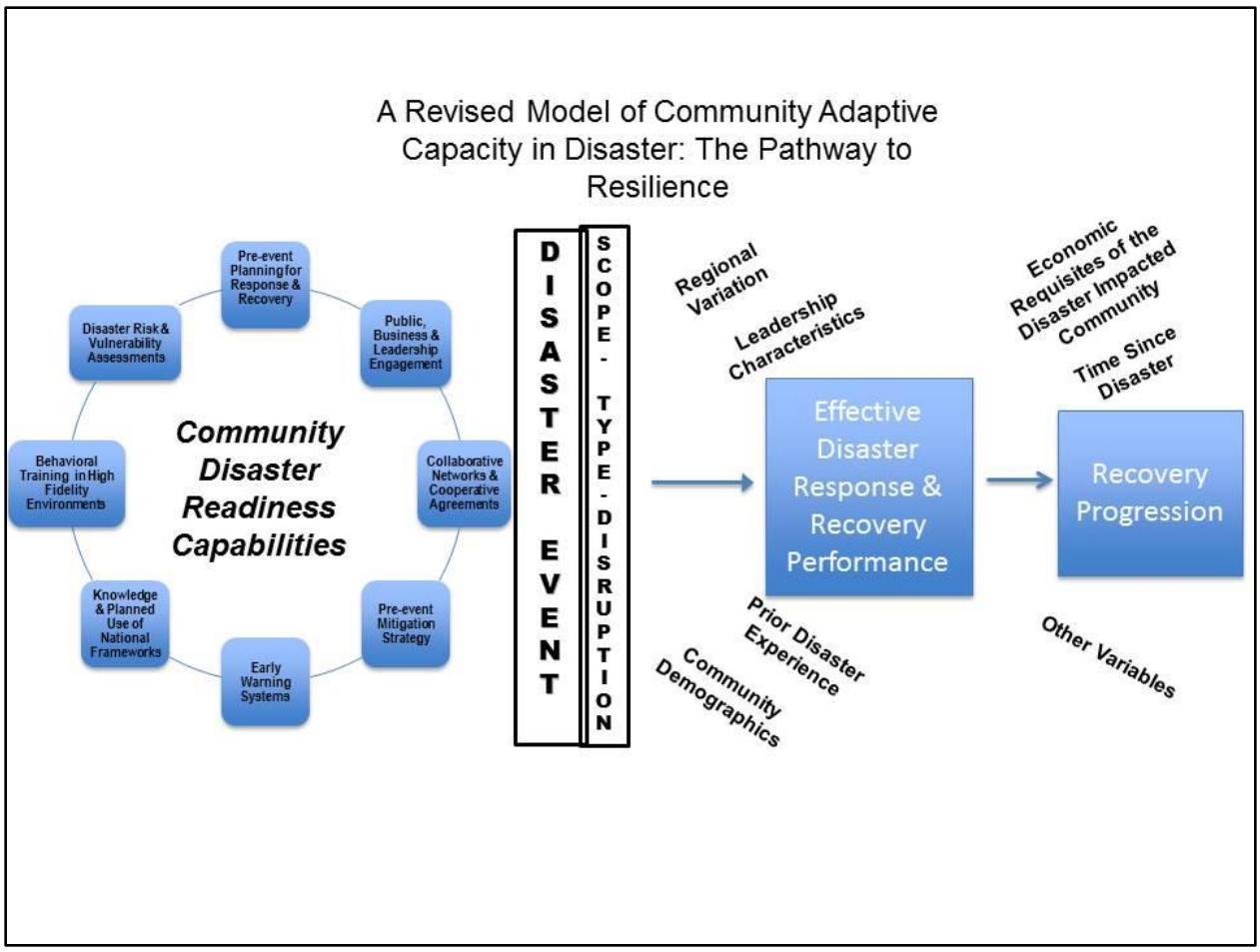

Figure 35. Revisions to the conceptual framework based upon study findings.

Developing the theoretical foundation and nuances for this conceptual model will require more research. Replication of the current study, combined with qualitative case study research, would further inform and provide an extended basis for theory development.

Additionally, other published studies offer differing perspectives of resilience variables. Cutter et al., (2010) used a slightly different methodology to measure baseline characteristics of resilience in communities. Their method allowed for the identification of 36 variables for analysis that reflected the underlying subcomponents of their conceptual model for resilience. They obtained measures for each of their five subcomponents of resilience to include social resilience, economic resilience, institutional resilience, infrastructure resilience, and community

capital (Cutter, et al., 2010, p. 7). From this they created a resilience score for each community within their study, thereby allowing a rank ordering of communities from low resilience to high resilience. If the study presented in this dissertation were repeated, it would seem relevant to incorporate some additional variables as defined by Cutter et al. (2010) to ascertain their presence and use in disaster impacted communities. While the model for predicting response and recovery was relatively strong, these variables might prove particularly beneficial for better conceptualizing and strengthening the weaker model addressing recovery progression. While included in this dependent variable, it may prove beneficial to explore the significance of the Cutter et al. (2010) disaster resilience scores for the five subcomponents as mediator variables in developing a stronger measure of response progression.

Additional geographical and built environment variables emerge when theoretically exploring the concepts of vulnerability and resilience. Hurricane Katrina posed challenges for leadership relative to highway and transportation systems, levee construction, and evacuation challenges related to the Lake Ponchartrain Causeway. Exploring in more depth issues surrounding county or parish exit, or egress infrastructure, would provide valuable insight into challenges faced in Hurricane Katrina. Other geographical locations within the United States will certainly have challenges relative to geography. When evacuation is not an option, what alternative actions are available? What role does leadership play in such a situation? These are interesting questions that can be addressed in future research. Additionally, geographical variables impact the ability of a community to manage supply chains post-disaster. Exploration of this from a systems engineering perspective may prove valuable and inform the field.

The way we train for disaster response should continually involve re-evaluation. The findings from this study suggest that only full-scale exercises were significant in improving

response and recovery outcomes. More collaborative research from an interdisciplinary perspective seems warranted. Concepts and ideas stemming from the literature found in organizational psychology, medicine and nursing, systems engineering, aviation, educational psychology, and others would assist with further exploration and generate more empirical evidence to support training solutions geared toward effective response and recovery outcomes. Although full-scale exercises was the only training variable exhibiting statistical significance in this study, such training is costly and possibly unrealistic for most communities. So it is suggested that further research is needed into ways that training can elicit behavioral outcomes in a high fidelity environment that predominantly benefits from experiential learning. With the technological advances being made in computer science and systems engineering, this area remains open for investigation into how we can best prepare local communities for response and recovery.

In terms of recovery progression, this study explored responses relative to the recovery progression in the following areas: return of residents to permanent housing, return of transportation systems, return of displaced businesses, re-building of damaged infrastructure, and return of social structures. Two aspects suggest questions areas of interest for further study. First, what is going on in communities to indicate recovery is slower than expected or not progressing at all? Second, what is going on in communities to indicate recovery reaches a restoration level equal or better than pre-disaster levels? The answers to both questions would provide interesting data relative to the disaster recovery process and provide an avenue for better tapping into recovery progression as a phenomenon. A multiple case-study approach and the use of both quantitative and qualitative data would possibly help to shed some light on these two questions.

Finally, further research and validation of national-level policy and doctrine continues as a need. It seems critically important that data drive decisions as they relate to activities suggested, mandated, and often funded at the local-level. Resource constraint at the local-level is a problem that will likely continue. Decision-making abilities of local leaders and emergency managers can be better supported with data that demonstrates outcomes achieved through the investment of resources.

Concluding Remarks

Disasters continue to affect this nation and others. Since initiating this research, a number of high profile disasters have occurred in the United States, including Hurricane Sandy, the massacre of children and adults at the Sandy Hook elementary school, the Oklahoma tornados, and the predictions of a devastating 2013 hurricane season. These events continue to underscore the critical nature of preparedness, response, and recovery. According to FEMA, national preparedness requires the building of disaster resilient communities by supporting and strengthening the institutions, assets, and networks that are already within the community (Federal Emergency Management Agency, 2011a). To do this requires empirical data to drive evidence-based interventions designed to support community resilience to disaster.

The literature, along with national-level doctrine and policy suggest the importance of specific capability development to improve disaster response and recovery. The idea of building community resilience to improve outcomes related to disaster response and recovery is a common theme in disaster literature (Boin, 2010; McEntire et al.,, 2002; Paton & Johnson, 2006; Rose, 2004;). This literature asserts that resilience begins with pre-disaster preparedness and planning, and ends with the ability of a community to respond to, and recover from, disaster. Pre-disaster preparedness, mitigation and recovery capacity building results in a resilient community

with an improved ability to withstand, respond to and recover from disasters (U.S. Department of Homeland Security, 2011a). Findings from this study validate the critical importance of pre-event planning, community engagement, use of national frameworks (NIMS & ICS), and behavioral training (in a high-fidelity environment) to effect response and recovery outcomes. Establishment of empirical data provides communities with reinforcement to continue "resilience-building" activities at the local-level. More research, however, is needed however to continue to inform policy makers, professionals, and responders in the field.

The conceptual model (with recommended revisions) of community adaptive capacity presented for this study has value. However, much remains unknown. As was evident in this study, the area of recovery progression is not well understood. The independent variables selected for this study were based upon the literature within the field suggesting their importance in disaster recovery. While these variables explained 43% of the response and recovery outcome, they were only able to explain approximately 15% of the variation in response progression. Although this research takes a strong step forward, more research remains in need.

Despite the vulnerability to disaster, US counties and parishes, with state and federal assistance, have made advancements in building core capabilities to confront disaster and to measure and track progress. Data from this study underscores suggestions from FEMA that a "whole of community" effort is necessary. Communities become more resilient, as evidenced by effective response and recovery, when adaptive capacity exists at the local-level.

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Appendix A

Survey Instrument

2011 Disaster Response and Recovery Survey

***1. Please indicate the following:**

County/Parish Name

State:

***2. Using your best judgment, how much disruption did this disaster cause within your county or parish?**

- High degree of disruption
- Moderate degree of disruption
- Low degree of disruption
- No disruption
- Not sure

***3. Using your best judgment, what percentage of the county or parish was impacted by this disaster?**

- 0 - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

***4. Using your best judgment, how long was the county or parish disrupted by this disaster?**

- 0 -3 months
- 4 - 7 months
- 8 - 11 months
- 12 - 15 months
- Greater than 15 months

***5. Were you in an emergency manager/ coordinator role within this county or parish at the time of the 2011 Major Disaster?**

- Yes
- No

If no, (please specify what role you were in at the time)

2011 Disaster Response and Recovery Survey

***6. How long have you personally been in an emergency manager / coordinator role?**

- 0 - 5 years
- 6 - 10 years
- 11 - 15 years
- 16 - 20 years
- over 20 years

***7. Prior to this disaster, were you personally involved in any other major disaster in an emergency management or first responder capacity?**

- Yes
- No

2011 Disaster Response and Recovery Survey

***8. Based upon your knowledge and experience, what best describes the extent of your county or parish's pre-event planning for disaster in the following areas. On each line indicate 5 for an extremely well developed and complete plan and indicate 1 for a minimally developed and incomplete plan. Indicate "Did not have" for each element not present at all.**

	5	4	3	2	1	Did Not Have
A written disaster risk / vulnerability assessment?	○	○	○	○	○	○
A disaster risk / vulnerability assessment specific to the type of disaster that affected your community?	○	○	○	○	○	○
A written disaster mitigation plan or strategy?	○	○	○	○	○	○
A disaster mitigation plan or strategy specific to the type of disaster that affected your community?	○	○	○	○	○	○
A written plan for disaster response?	○	○	○	○	○	○
A written plan for disaster response specific to the type of disaster that affected your community?	○	○	○	○	○	○
A written plan for disaster recovery?	○	○	○	○	○	○
A written plan for disaster recovery specific to the type of disaster that affected your community?	○	○	○	○	○	○
Pre-event planning to use NIMS and ICS?	○	○	○	○	○	○
Pre-event establishment of collaborative nt nworks ad cooperative agreements to support disaster response?	○	○	○	○	○	○
Pre-event establishment of collaborative nt nworks ad cooperative agreements to support disaster recovery?	○	○	○	○	○	○
An early warning system specific to the type of disaster that affected your community?	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***9. How would you describe the overall engagement of the following in disaster planning efforts prior to the 2011 Major Disaster that affected your county or parish where 5 equals highly engaged and 1 equals highly disengaged?**

	5	4	3	2	1
Community residents	○	○	○	○	○
Local business community	○	○	○	○	○
Elected officials	○	○	○	○	○

***10. Based upon your knowledge and experience, what best describes the extent of your county or parish's pre-event planning for response and recovery in the following areas, with 5 indicating extremely well developed and complete plan and 1 indicating minimally developed and incomplete plan. If your countyor parish had no plan, please indicate Did Not Have.**

	5	4	3	2	1	Did Not Have
A written plan for supporting vulnerable populations during disaster response and recovery?	○	○	○	○	○	○
A written plan for supporting temporary housing or sheltering during disaster response and recovery?	○	○	○	○	○	○
A written plan for supporting household pets during disaster response and recovery?	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***11. Based upon your experience with this disaster, how important are the following in preparing the first responder community for disaster response, with 5 being extremely important and 1 being extremely un-important?**

	5	4	3	2	1
Orientation Seminar: An overview to familiarize participants to roles, plans, procedures, equipment	○	○	○	○	○
Drill: A coordinated, supervised activity, normally used to test a specific operation or function	○	○	○	○	○
Tabletop Exercise: A facilitated analysis of an emergency in an informal stress-free environment	○	○	○	○	○
Functional Exercise: A fully simulated interactive exercise that tests the capacity to respond to an event	○	○	○	○	○
Full-scale Exercise: Evaluates operational capabilities by simulating actual response conditions	○	○	○	○	○

***12. In the year leading up to the 2011 Major Disaster, how often were pre-planned disaster response simulation exercises conducted?**

	Four or more times	Three times	Two times	One time	Never
Orientation Seminar	○	○	○	○	○
Drill	○	○	○	○	○
Tabletop Exercise	○	○	○	○	○
Functional Exercise	○	○	○	○	○
Full-Scale Exercise	○	○	○	○	○

***13. Based upon your knowledge and experience, how effective were the following pre-event disaster response exercises in preparing the first responder community for actual disaster response with 5 being extremely effective and 1 being extremely ineffective?**

	5	4	3	2	1	Not Conducted
Orientation seminar	○	○	○	○	○	○
Drill	○	○	○	○	○	○
Tabletop Exercise	○	○	○	○	○	○
Functional Exercise	○	○	○	○	○	○
Full-Scale Exercise	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***14. To what extent do you agree or disagree with the following statements, with 5 indicating strongly agree and 1 indicating strongly disagree?**

	5	4	3	2	1	Not applicable
First responders used the National Incident Management System (NIMS) during this disaster	○	○	○	○	○	○
NIMS was effective in achieving positive outcomes for our community during response	○	○	○	○	○	○
Based upon this experience, our community would be likely to use NIMS again	○	○	○	○	○	○
First responders used the Incident Command System (ICS) during this disaster	○	○	○	○	○	○
ICS was effective in achieving positive outcomes for our community during response	○	○	○	○	○	○
Based upon this experience, our community would be likely to use ICS again	○	○	○	○	○	○

***15. Following the 2011 major disaster, how satisfied were you with the ability of the following to manage disaster response with 5 equaling extremely satisfied and 1 equaling extremely unsatisfied?**

	5	4	3	2	1	Not Applicable
Local First Responders (Fire, Police, Rescue)	○	○	○	○	○	○
Local Emergency Management Officials	○	○	○	○	○	○
Local Public Works Department	○	○	○	○	○	○
Local businesses	○	○	○	○	○	○
Local Health and Human Services Organizations	○	○	○	○	○	○
Local Media (Radio, Television)	○	○	○	○	○	○
Local Government Officials	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***16. During the 2011 disaster, how effective was the collaboration of the following organizations in supporting disaster response activities in your county or parish with 5 equaling extremely effective and 1 being extremely ineffective? If they were not involved in response, please indicate "Not Involved".**

	5	4	3	2	1	Not Involved
Federal agencies	○	○	○	○	○	○
State agencies	○	○	○	○	○	○
Local agencies	○	○	○	○	○	○
Local businesses	○	○	○	○	○	○
Private philanthropic or charity organizations	○	○	○	○	○	○
Local hospitals and social service organizations	○	○	○	○	○	○
Individual Community Residents	○	○	○	○	○	○
Local government officials	○	○	○	○	○	○
State government officials	○	○	○	○	○	○
Federal government officials	○	○	○	○	○	○
Military	○	○	○	○	○	○

***17. Following the 2011 major disaster, how satisfied are you with the adequacy of resources available for disaster response with 5 equaling extremely satisfied and 1 equaling extremely unsatisfied?**

	5	4	3	2	1	Not Applicable
Local Resources for Disaster Response	○	○	○	○	○	○
State Resources for Disaster Response	○	○	○	○	○	○
Federal Resources for Disaster Response	○	○	○	○	○	○
Resources aai lab l e t o support vulnerable populations (elderly, hospitalized, disabled, youth, others)?	○	○	○	○	○	○
Resources to support temporary housing or sheltering?	○	○	○	○	○	○
Resources to support household pets during disaster?	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***18. Following the 2011 major disaster, how satisfied are you with the communication of the following individuals or agencies during disaster response with 5 equaling extremely satisfied and 1 equaling extremely dissatisfied?**

	5	4	3	2	1	Not Applicable
Incident Commander	○	○	○	○	○	○
Emergency Operations Center	○	○	○	○	○	○
Local Emergency Management Authority	○	○	○	○	○	○
State Emergency Management Agency	○	○	○	○	○	○
Federal Emergency Management Agency	○	○	○	○	○	○
Government Officials	○	○	○	○	○	○
Media	○	○	○	○	○	○
First Responder Groups	○	○	○	○	○	○
Hospitals & Social Service Agencies	○	○	○	○	○	○

***19. Following the 2011 major disaster, how satisfied were you with the ability of the following to manage disaster recovery with 5 equaling extremely satisfied and 1 equaling extremely unsatisfied?**

	5	4	3	2	1	Not Applicable
Local First Responders (Fire, Police, Rescue)	○	○	○	○	○	○
Local Emergency Management Officials	○	○	○	○	○	○
Local Public Works Department	○	○	○	○	○	○
Local Businesses	○	○	○	○	○	○
Local Health and Human Services Organizations	○	○	○	○	○	○
Local Media (Radio, Television)	○	○	○	○	○	○
Local Government Officials	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***20. During the 2011 disaster, how effective was the collaboration of the following organizations in supporting disaster recovery activities in your county or parish with 5 equaling extremely effective and 1 being extremely ineffective? If they were not involved in response, please indicate "Not Involved".**

	5	4	3	2	1	Not Involved
Federal agencies	○	○	○	○	○	○
State agencies	○	○	○	○	○	○
Local agencies	○	○	○	○	○	○
Local businesses	○	○	○	○	○	○
Private philanthropic or charity organizations	○	○	○	○	○	○
Local hospitals and social service organizations	○	○	○	○	○	○
Individual Community Residents	○	○	○	○	○	○
Local government officials	○	○	○	○	○	○
State government officials	○	○	○	○	○	○
Federal government officials	○	○	○	○	○	○
Military	○	○	○	○	○	○

***21. Following the 2011 major disaster, how satisfied are you with the communication of the following individuals or agencies during disaster recovery with 5 equaling extremely satisfied and 1 equaling extremely dissatisfied?**

	5	4	3	2	1	Not Applicable
Incident Commander	○	○	○	○	○	○
Emergency Operations Center	○	○	○	○	○	○
Local Emergency Management Authority	○	○	○	○	○	○
State Emergency Management Agency	○	○	○	○	○	○
Federal Emergency Management Agency	○	○	○	○	○	○
Government Officials	○	○	○	○	○	○
Media	○	○	○	○	○	○
First Responder Groups	○	○	○	○	○	○
Hospitals & Social Service Agencies	○	○	○	○	○	○

2011 Disaster Response and Recovery Survey

***22. Based upon your knowledge and experience, which best describes the community's post-disaster progress in the following areas?**

	Restored to better than pre-disaster levels	Completely restored to pre-disaster levels	Progressing in a positive manner, but not complete	Progressing slower than expected	Not progressing at all	Not applicable
Return of Residents to Permanent Housing	○	○	○	○	○	○
Return of Transportation Systems	○	○	○	○	○	○
Returnio Dspl aced Businesses	○	○	○	○	○	○
Re-building of Damaged Infrastructure	○	○	○	○	○	○
Return of Social Structures (theatre, art, entertainment, etc.)	○	○	○	○	○	○

***23. Following the 2011 major disaster, how satisfied are you with the adequacy of resources available for disaster recovery with 5 equaling extremely satisfied and 1 equaling extremely unsatisfied?**

	5	4	3	2	1	Not Applicable
Local Resources for Disaster Recovery	○	○	○	○	○	○
State Resources for Disaster Recovery	○	○	○	○	○	○
Federal Resources for Disaster Recovery	○	○	○	○	○	○

***24. Overall, on a scale of 1 to 10, with 1 indicating poor and 10 indicating excellent, how would you rate the effectiveness of response and recovery in this particular disaster?**

	1	2	3	4	5	6	7	8	9	10
Overall Response	○	○	○	○	○	○	○	○	○	○
Overall Recovery	○	○	○	○	○	○	○	○	○	○

Appendix B

Informed Consent Tool

2011 Disaster Response and Recovery Survey

Dear Emergency Management Director,

You are invited to participate in a research study entitled: "Identifying Adaptive Capacity And Its Impact On Response And Recovery In Communities Affected By Major Disaster In 2011." This study is being conducted toward fulfillment of a dissertation by Becky Zukowski and will be completed in conjunction with Indiana University of Pennsylvania under the direction of John A. Anderson, Ph.D. as the dissertation committee chair.

The purpose of this study is to determine if a relationship exists between the development of adaptive capacity and disaster response and recovery outcomes. The objective is to identify what variables are most important in building the capacity required to effectively and efficiently prepare, respond, and recover from disaster.

If you agree to participate, the survey will take approximately 20 minutes of your time. Risks that you may experience from participating include the possibility of experiencing discomfort in recalling experiences related to this disaster within your community. There are no costs for participating. There are no benefits to you other than to further research on this topic.

Your information collected during this study is completely confidential and your name will never be used in any reporting of results or in any discussion of data collected. Your response will be considered only in combination with those from other participants. The project personnel listed as investigators are the only individuals who will have access to the survey questions and responses and will collect the responses immediately upon receipt so that no one can identify you relative to your individual responses. All survey data will remain the property of the project investigators and will be maintained in a secure location under their control at all times. The information obtained in this study may be published in scientific journals or presented at scientific meetings, but your identity will be kept strictly confidential.

Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later by withdrawing at any time by contacting any of the numbers provided below. You will not be penalized in any way for withdrawing or not answering the survey.

If you have questions about the study or study procedures, you are free to contact the project personnel at the addresses and phone numbers shown below. If you have questions about your rights as a study participants or complaints about your treatment as a research subject, you can contact the following persons listed below or the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects at (724) 357-7730.

Becky Zukowski, MSN, RN
Ph.D. Candidate
Department of Sociology
Administration & Leadership Studies
1455 Ray Road
Penn Run, PA 15765
724-464-3018
email: rzukowski@mtaloy.edu

John A. Anderson, Ph.D.
Professor and ALS Doctoral Coordinator
Department of Sociology
Dixon University Center, South Hall, Rm. 105
2986 North Second Street
Harrisburg, PA 17110
717.720.4064

To voluntarily agree to take part in this study, you must be 18 years of age or older. By completing the survey, you are giving your consent to voluntarily participate in this research project.

Your time is appreciated and we look forward to receiving your completed survey.

2011 Disaster Response and Recovery Survey

This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects.

Sincerely,

Becky Zukowski, MSN, RN

Appendix C

IRB and RTAF Approvals

Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

November 12, 2012

Rebecca Zukowski
1455 Ray Road
Penn Run, PA 15765

Dear Ms. Zukowski:

Your proposed research project, "Identifying Adaptive Capacity and Its Impact on Response and Recovery in Communities Affected by Major Disaster in 2011," (Log No. 12-227) has been reviewed by the IRB and is approved as an expedited review for the period of November 11, 2012 to November 11, 2013.

It is also important for you to note that IUP adheres strictly to Federal Policy that requires you to notify the IRB promptly regarding:

1. any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented),
2. any events that affect the safety or well-being of subjects, and
3. any modifications of your study or other responses that are necessitated by any events reported in (2).

Should you need to continue your research beyond November 11, 2013 you will need to file additional information for continuing review. Please contact the IRB office at (724) 357-7730 or come to Room 113, Stright Hall for further information.

Although your human subjects review process is complete, the School of Graduate Studies and Research requires submission and approval of a Research Topic Approval Form (RTAF) before you can begin your research. If you have not yet submitted your RTAF, the form can be found at http://www.iup.edu/page.aspx?id=91683 .

This letter indicates the IRB's approval of your protocol. IRB approval does not supersede or obviate compliance with any other University policies, including, but not limited to, policies regarding program enrollment, topic approval, and conduct of university-affiliated activities.

I wish you success as you pursue this important endeavor.

Sincerely,

John A. Mills, Ph.D., ABPP
Chairperson, Institutional Review Board for the Protection of Human Subjects
Professor of Psychology

JAM:jeb

xc: Dr. John Anderson, Dissertation Advisor
Ms. Brenda Boal, Secretary

Indiana University of Pennsylvania
www.iup.edu

Office of the Assistant Dean for Research
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
www.iup.edu/research

November 26, 2012

Ms. Rebecca Zukowski
1455 Ray Road
Penn Run, PA 15765

Dear Ms. Zukowski:

Now that your research project has been approved by the Institutional Review Board for the Protection of Human Subjects, I have reviewed your Research Topic Approval Form and approved it.

Your RTAF indicates your anticipated graduation date as August 2013. You must apply for graduation by August 1, 2013. This means that your dissertation must be submitted to the School of Graduate Studies and Research by July 15, 2013 if you desire to graduate by your anticipated date. For deadlines for subsequent graduation dates, please access http://www.iup.edu/page.aspx?id=16683.

The Thesis/Dissertation Manual, additional resources, and information to help you start writing can be found at http://www.iup.edu/graduatestudies/thesis/default.aspx.

Also, The Applied Research Lab provides free assistance with statistical analysis and research design--both quantitative and qualitative--to all IUP students. The ARL can also provide assistance in the use of the features in Word and Acrobat you'll need to correctly format your dissertation. For more information, please visit their website: http://www.iup.edu/arl/default.aspx.

You are now eligible to receive a FREE copy of Adobe Professional! This software will help you to create an electronic thesis or dissertation. It can be picked up at the IT Support Center, G35 Delaney Hall. If you live off campus, you can send an email from your IUP email account to it-support-center@iup.edu. Please indicate you are a graduate student requesting Adobe Professional and include your Banner ID, mailing address, and which version - Windows or Mac.

Finally, if you change your topic, the scope or methodology of your project, or your committee, a new Research Topic Approval Form must be completed.

I wish you well and hope you find this experience to be rewarding.

Sincerely,

Hilliary E. Creely, J.D., Ph.D.
Assistant Dean for Research

xc: Dr. Yaw Asamoah, Dean
Dr. John Anderson, Graduate Coordinator
Ms. Julie Bassaro, Secretary

HEC/js

Appendix D

Dissertation Timeline

Dissertation Activity Gantt Chart														
Specified Actions		Sub-Actions	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	
1	IRB Approval													
2	Collect Data	Pilot Survey												
		Email Surveys												
		Create Code Book												
		Track Responses												
		Data Entry												
		2nd Mailing												
3	Analyze Data	Review Data												
		Develop Models												
		Outline Results												
4	Results Chapter													
5	Discussion Chapter													
6	Defense													
7	Requested Changes & Final Submission													
8	Graduate													

Figure D2. Researcher Timeline

Appendix E

Final Budget

Budget

Postage (2 mailings per community)	$537.00
Survey Monkey Professional Software	$300.00
STATA upgrade for data analysis (STATA 12)	$295.00
Telephone expenses	0.00
Printing	$117.00
Envelopes & Paper	$100.00
Total	$1,349.00

Figure E1. Final budget for this research.