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Pathways to Communicate Recovery and Resiliency

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PATHWAYS TO COMMUNITY RECOVERY AND RESILIENCY

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ABSTRACT

Over the past quarter century, the number of disasters has increased annually. It can take communities years, if not decades, to recover from such disasters. Resilience allows a community to withstand disaster impacts and recover more rapidly. Therefore, improving community resilience should be a major goal of development. However, although building resilience is a frequently stated recovery goal, there has been little research to uncover what is required to build a community back better. We begin this paper with a discussion of definitions of recovery and existing indicators for measuring recovery. Following, we discuss the metrics of community resilience to disasters. We then outline planned research into the pathways to recovery following two disasters: Hurricane Katrina and the 2004 Indian Ocean tsunami. The key research objectives are to (1) examine why communities facing the same disaster recover differentially and (2) determine pathways to successful disaster recovery by analyzing the combinatorial causal conditions of pre-disaster community factors, disaster response engineering and planning efforts. We propose to address these questions using a cross-comparative case study using Ragin's multi-value Qualitative Comparative Analysis (mvQCA), with causal factors and outcome indicators identified through a combined content analysis and Delphi panel approach. This research is expected to result in several major contributions to the field of disaster recovery. First, this research will determine where community planners should focus their efforts based upon the pathways to recovery of a community after a disaster. A second contribution will be the development of a disaster recovery framework populated with data from this study. This research will help to transform the way we analyze and compare data across multiple cases within disaster recovery research.

KEYWORDS: Disaster recovery, cross-case comparison, resilience, vulnerability

INTRODUCTION

Despite efforts to improve community resilience to disasters, over the past 25 years the number and economic impact of disasters has increased annually. Recovery from these disasters takes years, if not decades. Disaster losses and the required recovery efforts may delay social investments aiming to reduce poverty, increase access to education, health services and safe housing. They may also have negative long-term consequences on the environment and on economic investments (UNDP 2004).

Although the immediate phase of disaster response is well-studied, strategies for long-term recovery have not been studied extensively (Rubin 2009). Historically, the idea of recovery has implied a return to the pre-disaster state (Haas 1977). Traditional examples include repairing housing and rebuilding basic infrastructure. However, rebuilding to reduce future vulnerability to disasters is increasingly becoming a key recovery goal. Disaster recovery is a highly uncertain,

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dynamic and non-linear process. Defining the endpoint of recovery is difficult, if not impossible, as all communities will recover at different rates and to different final states (Rubin et al 1985). Some groups in a community impacted by a disaster will not regain their pre-disaster standard of living. Alternatively, some subsets of society may be able to improve their pre-disaster conditions during the post-disaster recovery process (Smith and Wenger 2006). Although there are admittedly multiple pathways to recovery, these pathways are not well understood.

This paper will outline planned research to address the question of why communities facing the same disaster recover differentially. The key research questions are: (1) why do communities facing the same disaster recover differently? and (2) what combinations of pre-disaster community factors, disaster response engineering and planning efforts create pathways to successful recovery? We will use Ragin's multi-value Qualitative Comparative Method (mvQCA) to perform cross-comparative case studies of communities in Mississippi and Louisiana recovering from Hurricane Katrina and communities in India recovering from the 2004 Indian Ocean Tsunami. The important factors in community capacity will be determined through a two-step process. We will begin with a content analysis of articles relating to disaster recovery from three top journals. This content analysis will be used to identify indicators of recovery, resilience, and vulnerability. One Delphi panel will then review the set of recovery indicators while a second Delphi panel will review the indicators of resilience and vulnerability. In this paper we present a brief background summary of the existing research relating to disaster recovery, community resilience and vulnerability. We then present the proposed research methodology and the expected contributions that will result from this research.

BACKGROUND

Disasters and recovery have been studied from a variety of perspectives including sociology, policy implementation, decision-making, engineering, geography and urban planning. Disaster recovery theory is still in the early stages of development, and a comprehensive theory of sustainable recovery has yet to be formed (Smith and Wenger 2006). Here we introduce some of the issues involved in defining recovery. Following that we discuss the concepts of vulnerability and resilience which impact a community's recovery process.

Defining Recovery

Disaster recovery has been studied from a variety of perspectives including: roles of power and decision making, urban planning, sociology of disasters, and policy implementation. Early literature in this field defined recovery as a predictable part of the post-disaster process, with the goal of returning to normalcy (Haas et al 1977, Britton 1999). However, this is an oversimplification, as recovery does not always follow a clearly defined path, nor is the process uniform across all sectors of society. Smith and Wenger (2006) suggest that disaster recovery can be defined as "the differential process of restoring, rebuilding, and reshaping the physical, social, economic, and natural environment though pre-event planning and post-event actions." Because disasters are a result of interactions between the physical, built and human environments, it is important that recovery efforts incorporate all of these systems. In addition, many researchers now claim that a successful recovery should not return the community to its pre-disaster condition, but rather should result in an increase in disaster resilience (Mileti 1999). A simple return to pre-disaster conditions can propagate the conditions of vulnerability that led to the disaster (Smith and Wenger 2006, Mileti 1999, Berke 1993). It is important to note that

sustainable recovery may take years, and therefore measurements of recovery and post-disaster capacity must be taken well after a disaster has occurred.

Given the general framework that recovery is a non-linear and dynamic process with the ultimate goal of increasing community resilience, the question shifts to an appropriate definition of recovery with metrics and indicators. Organizations such as the Brookings Institute provide metrics such as economic growth, household income levels, educational attainment, equity, community engagement (Liu 2010). Chang (2010) proposes a framework for measuring recovery based on statistical indicators, including population levels, housing damage index, and number of businesses. Because of the diversity of definitions and indicators, we will first perform an in-depth content analysis on definitions and indicators from existing literature, analyzing three disaster focused journals from social science, practitioner-oriented and engineering journals. After reporting the results of the content analysis, we will establish a final set of indicators using a Delphi panel of experts, described in a subsequent section

Community Vulnerability, Capacity & Resilience

In recent years, studies of community vulnerability and resilience have been emphasized by agencies working in disaster mitigation. A range of definitions exists for these two concepts, reflecting contributions from a variety of disciplines. The concepts of vulnerability, resilience and community capacity are highly intertwined. However, it is important to note the differences between them. Researchers in disaster recovery often base their work, either explicitly or implicitly, on vulnerability theory, which states that risk and access to recovery programs is not equal among all social groups (Wisner 2001). Previous studies have confirmed that communities have differing levels of vulnerability and resilience to disaster, and several authors have developed indicators for resilience and vulnerability.

Blaikie et al., (1994: p. 9) defines *vulnerability* as "the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impacts of a natural hazard." This definition is primarily concerned with *social vulnerability*, which is caused by a combination of social conditions and unsustainable development. Cutter et al (2003) uses a hazards-of-place model of social vulnerability to develop a Social Vulnerability Index (SoVI). This index is based on data relating to both social and place inequalities and is used to model and compare social vulnerability across the United States. Tierney (2006) discusses the causal links between social inequalities (particularly social class, ethnicity and gender). From the natural hazards perspective, vulnerability is based on the concept of humans being put at risk due to their environment or physical location (Burton 1993). For this research, we will use the concept that vulnerability is a combined function of the physical environment, the built environment and social conditions. A community's vulnerability is due to its exposure to risks from natural hazards and to a lack of capability to cope with the impacts of disasters and recover quickly.

Community resilience and capacity act to counter vulnerability. In this study we define r*esilience* as the ability to withstand disaster impacts as well as to cope with those impacts and recover quickly. It can be thought of as a function of *inherent resilience*, the ability to withstand impacts without extensive losses, and *adaptive resilience*, the ability to adapt and access resources to cope with a disaster and recover (Paton and Johnston, 2006). The concept of *capacity* is directly related to a community's level of resilience. In fact, many authors use these terms interchangeably (Burton 1993); however, while resilience is nearly always used in relation to disaster recovery, capacity is also used by development researchers to describe a community's

ability to deliver services to members. Cutter et al (2010) claim that every community has a set of capacities that dictate how they will specifically respond to and recover from a disaster event.

Figure 1 shows how a disaster may impact a community's level of capacity and resilience. The level of capacity in the community will decrease as a result of the disaster event. This decrease may be the result of damage to critical infrastructure, loss of life, damage to institutions or other causes. The level of the drop in capacity will be dependent on the event itself as well as on both the pre-disaster capacity and vulnerability levels and the disaster event. Following the disaster, community capacity will begin to increase as a result of response and recovery activities. The slope of the recovery line will be different for each community, context, scale, and event. A successful recovery will result in a capacity level that is higher than the pre-disaster level and a more resilient community. Vulnerability and resilience both play a role in how a disaster will impact a community and how that community will recover. Indicators of both vulnerability and resilience must be accounted for in determining how pre-disaster conditions impact recovery.

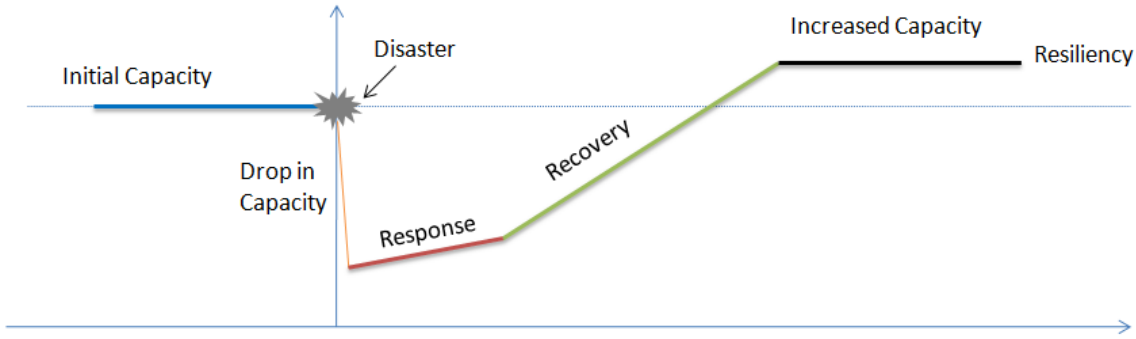

Figure 1: Recovery can result in increased community resiliency
(Adapted from Dr. Mary Ellen Hynes, DHS (2001); Blair Ross, ORNL; CARRI 2008)

While in the past engineers have studied the resilience of critical infrastructure and buildings in isolation (Bruneau 2003), Cutter (2010) uses a systems theory approach wherein capacity is measured through a set of composite indicators, with the significant areas of capacity defined as: social, economic, institutional, infrastructure and community. Norris et al. (2008) propose a similar framework wherein community resilience is a process linking the adaptive capacities (social capital, economic development, information and communication and community competence) to adaptation after adverse events. While these and other studies have focused on developing frameworks to measure resilience, studies linking resilience measures to the post-disaster recovery are lacking (Norris 2008). In addition to the academic indicators of resilience and vulnerability, many disaster relief organizations have developed tools and methodologies for measuring community capacity. For example the Inter-Agency Standing Committee (IASC), which is composed of representatives of all fourteen leading UN and non-UN humanitarian agencies, has developed the In-Country Team Self-Assessment Tool for Natural Disaster Response Preparedness (IASC 2005). This tool is a checklist of resources, vulnerabilities and capacities related to disaster response and recovery. Despite the focus on measuring vulnerability and resilience among academics and practitioners, a thorough assessment of how these resilience frameworks lead to recovery is still lacking. Such an assessment is critical for validating the indicators of resilience.

RESEARCH OBJECTIVES

Disaster recovery poses methodological problems for researchers, because it is a complex and dynamic process without a clear endpoint. Researchers have yet to agree upon a measure of successful recovery and its time and physical scale variability. The first phase of this research will develop a set of indicators of recovery through a content analysis of journal articles and a Delphi panel. We will then measure recovery of the case study communities according to these indicators. In recent years, there have been large numbers of singular case studies of disasters. Many of these studies have pointed to specific pre-disaster factors relating to aspects of community vulnerability or resilience (Airress 2008, Chamlee-Wright 2009a, 2009b, Cutter 2003, 2010). These case studies have led researchers to identify single variables of importance; however, in reality, a combination of factors is often at work to enable a community to recover successfully. Unfortunately a dearth of cross-case comparisons exists, leading numerous scholars to call for cross-case comparisons of community recovery (Olshansky 2005, Chang 2010). These wider cross-case comparisons of community recovery are necessary in order to discover these pathways and begin to develop a more comprehensive theory of recovery.

Therefore, the research objectives are to: (1) examine why communities facing the same disaster recover differentially and (2) determine pathways to successful disaster recovery by analyzing the combinatorial causal conditions of pre-disaster community factors, disaster response engineering and planning efforts.

RESEARCH METHOD

To define disaster recovery, determine pathways to disaster recovery, and understand why differential recovery occurs, we will employ a mixed-method approach starting with content analysis and Delphi panels and culminating in a cross-case comparative study of communities recovering from a disaster. In performing such a comparison, it is critical to study a large enough set to see variations while still maintaining insight into the specifics of each case. Attempting to study different pathways to recovery implies that a purely statistical analysis cannot be used. It is important to maintain sensitivity to interactions between causal variables. As a result, a middle ground between case-studies and statistical analysis is provided by a family of research methods known as qualitative comparative analysis (QCA), which has aspects of both quantitative and qualitative research methods.

Research Setting

Cross-comparative case studies will be used of communities in Mississippi and Louisiana recovering from Hurricane Katrina and communities in India recovering from the 2004 Indian Ocean Tsunami.

Hurricane Katrina

Hurricane Katrina made landfall as a Category 3 storm in southeast Louisiana on August 29, 2005, causing severe destruction along the gulf coast. Much of the destruction was due to the storm surge (Knabb 2006). In the city of New Orleans, the storm resulted in more than 50 different levee breaches. Eventually 80% of the city and large tracts of neighboring parishes

became flooded. Floodwaters were over 10 feet high in some locations and the floodwaters lingered for weeks (Anderson 2007). Most of the major roads traveling into and out of the city were damaged. In addition, the Mississippi coast was severely damaged by high winds, rain, and storm surge. Along portions of the coast, the storm surges traveled as much as six miles inland. Early estimates calculated that 90% of the structures within half a mile of the coast were completely destroyed by Katrina. Hurricane Katrina was the most expensive disaster in U.S. history, resulting in $81billion (FY 2005) in property damages (Blake 2007).

More than five years after Hurricane Katrina, there have been numerous studies of how the city and surrounding communities have recovered. Many of these have focused on issues of how race and economic class led to differences in how the disaster impacted communities, as well as the immediate response and long-term recovery (Colten 2006, Elliot 2006, Lipsitz, 2006). Although it is clear that material resources are important in recovery, some researchers have focused solely on low and moderate-income neighborhoods to determine factors important for recovery when financial resources are absent. In studies of the Lower Ninth Ward and the New Orleans East Vietnamese community, Chamlee-Wright (2009a, 2009b) found that attachment to place was a key factor in recovery as measured by population return. However, the data also suggest that attachment to place alone was not enough to generate population return and other factors were necessary. Airriess' (2008) case study of the Vietnamese American community in New Orleans showed that successful recovery occurred as a result of the community's social network strength, the coordinating role of the church and the external financial support of the recovery efforts. Such case studies of recovery point to the variety of pathways to recovery. However, a broader cross-case comparison is necessary in order to generalize these pathways into a recovery framework.

Indian Ocean Tsunami

An earthquake measuring 9.0 on the Richter scale occurred off the northern coast of Sumatra, Indonesia on Sunday, 26 December 2004. This earthquake and resulting tsunami affected many countries in Southeast Asia and beyond, including Indonesia, Sri Lanka, India, Thailand, the Maldives, Somalia, Myanmar, Malaysia, Seychelles and others. The tsunami was noticed as far away as South Africa, some 8,500 km away from the epicenter of the earthquake, where a 1.5 m wave surged on shore about 16 hours after the earthquake. For this research, we will focus on impacted communities in India. The tsunami waves hit the southern and eastern coastal areas of India and penetrated inland up to 3 km, causing extensive damage on the Andaman & Nicobar Islands, and in the coastal districts of Andhra Pradesh, Kerala, Tamil Nadu and union territory of Pondicherry (ADB). The total number of deaths confirmed in India was 12,405, with the majority of these in Tamil Nadu. The total number displaced was 730,000 (Arya 2006).

Many of the studies of the tsunami impacts in India have focused on the effectives of the immediate response and early recovery efforts. Prater et al (2006) performed a case study of pre-tsunami capacity, emergency response and short-term recovery in Tamil Nadu, India. They found that despite the lack of adequate disaster response plans, the local and state governments demonstrated a great deal of capacity in the immediate response and early recovery phase. Aldrich (2011) studied the role of social capital in the recovery of several villages in Tamil Nadu. Through this comparative case study, Aldrich noted that villages with similar levels of damage have recovered differently and have received different resources throughout the recovery process, largely as a result of community social network strength. However, in many villages, widows, migrants and Dalits (members of low castes) were left out of the recovery process.

Villages with high levels of social capital had higher levels of aid received and better recovery; however, they had more instances of discrimination. A broader cross-case comparison is needed to determine what factors, besides social capital, were important in community recovery after the tsunami.

Qualitative Comparative Analysis

QCA provides a middle ground between purely statistical large-N studies, which may lose the ability to examine detailed causal links, and case study analysis, which allows for limited generalizations of findings. QCA is a relatively new approach, first developed by sociologist Charles Ragin in 1987, but its principles have since been applied extensively, primarily in the fields of sociology and political science, but also in management and economics. QCA has recently been employed in studies of engineering and engineering management (Gross 2010, Gross and Garvin 2011, Chan 2010). To our knowledge, QCA has not yet been applied to disaster recovery but it is a particularly attractive method due to its ability to answer some of the causal questions that single case studies cannot answer.

A key feature of QCA techniques is that they allow for "multiple conjectural causation" across cases, a conception wherein:

- A combination of conditions generate an outcome
- Several different combinations may produce the same outcome
- A condition may be sufficient but not necessary to produce an outcome

This sensitivity to interactions between variables is retained by the use of Boolean algebra (Ragin 1987, Rihoux 2009). The insight into how combinations of causal variables create different pathways leading to similar outcomes is a significant benefit to using Ragin's method versus statistical methods.

There are three main variants of Ragin's method: crisp-set (csQCA), fuzzy-set (fsQCA) and multi-value (mvQCA). Crisp set is useful when all causal and outcome variables can be defined into binary categories as either 0 (absent) or 1 (present). In cases where there are more gradients in the variables, either fsCQA, where each variable can be assigned a value from a continuous range, or mvQCA, where there are several discreet options for each variable assignment should be used (Gross 2010, Rihoux 2009). For this study, we will employ mvQCA. We selected mvQCA because it allows multiple values for each input. We expect there will be a wide range of data values collected; therefore dichotomizing all data into 0 and 1 values would be highly restrictive and would lose details of the rich cases. Conversely, using fsQCA creates a very large logic space requiring a large number of cases to fill it sufficiently. mvQCA provides an optimal point between the size of the logic space and the refinement in the input variables.

In summary, QCA involves identifying a specific outcome of interest (in this case community recovery) along with conditions, which are predicted to affect that outcome. The set of conditions studied will be selected through a content analysis of journal articles on disaster recovery and a sequence of Delphi panels. The conditions and outcomes for multiple cases are quantified through the data collection process, tabulated, and patterns in the resulting data array are identified to highlight combinations of conditions that support a given outcome. Disaster recovery research requires a thorough understanding of the variables within each case. As a result, there are many instances of single case studies of community recovery. However, broad cross-case comparisons are lacking. We believe that Ragin's QCA will help balance the

demands for in-depth case knowledge while providing the ability to compare variables to the outcome of disaster recovery across a broader spectrum of cases.

Content Analysis: Variable Selection

Due to the diversity of definitions and indicators of recovery, vulnerability and resilience, we will begin this research with an in-depth content analysis of the existing disaster literature. We will analyze articles from 2000 to the present from three top disaster focused journals from social sciences, engineering and practitioner-oriented fields. Articles will be selected by keyword search. For example, a search in the *Natural Hazards Review* for articles published since 2000 with "disaster recovery" or "resilience" or "vulnerability" in the title, abstract or keywords returned 62 articles. We will analyze the content of these articles and will use emergent coding to code categories of indicators used to measure recovery, resilience and vulnerability. Table 1 shows an initial set of indicators for resilience derived from the content analysis. The final indicators of resilience and recovery will be measured for each community and will be used as the outcome of interest in the QCA process.

Table 1: Initial Set of Pre-Disaster Causal Conditions

Category	Indicators
Pre-Disaster	
Social	Age, education, gender, minority groups, social network strength
Economic	Employment, home ownership, income equity, single sector dependence
Institutional	Emergency preparedness, previous disaster experience, presence of building codes, land use laws
Infrastructure	Housing types and construction methods, level of building codes, maintenance, built environment density
Disaster Impact	
Disaster Impact	Number people injured, proportion structures damaged, proportion of community displaced, total$ losses
Recovery Strategy	
Recovery Strategy	Level of funding, NGO presence, citizen participation, goals

Delphi Method

The Delphi method will be used to narrow down recovery definitions and factors to a reasonable set for investigation during this study period. One Delphi panel will review the set of recovery indicators while a second panel reviews the indicators of resilience and vulnerability. Advisory panels of experts in disaster research will be assembled and surveyed regarding their perceptions of important factors in disaster recovery. Experts will be drawn from academia and government disaster response agencies based on pre-determined criteria for expert status. For example, experts from academia will have written at least three journal articles or book chapters on the recovery process. Members of government agencies will have assisted with recovery efforts following at least three disasters.

After each round of survey responses, the facilitator will assemble the feedback and provide an anonymous summary, including justifications for variable selection (Hallowell 2010). Once experts have reviewed the summary of responses, another round of surveys will be completed. Ideally, convergence on a set of variables will be achieved after three rounds of

surveys. This process is outlined in Figure 2. Validation will be achieved by showing each panel the results from the other panel and asking if there are any significant disagreements.

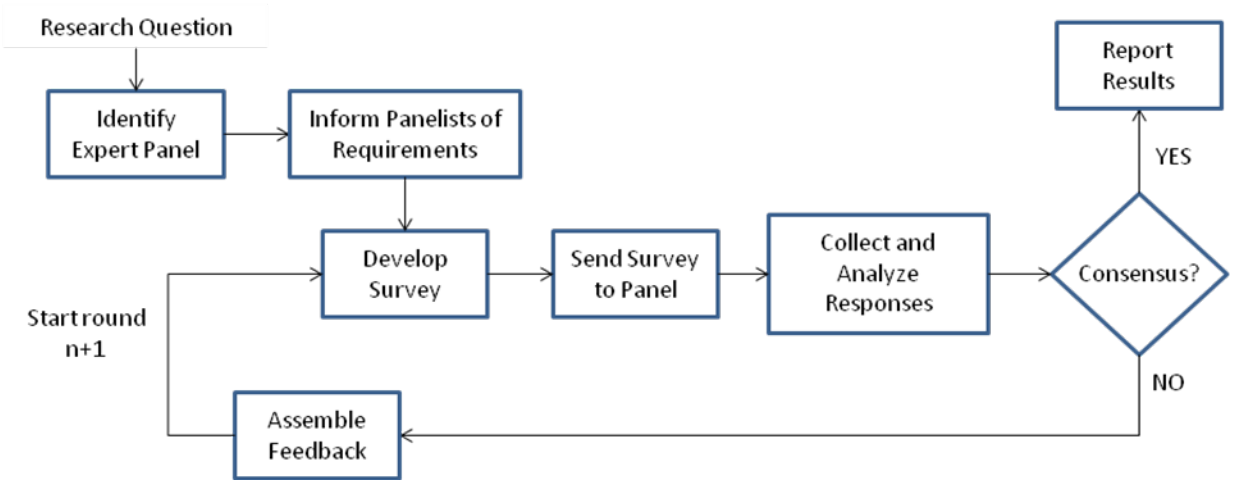

Figure 2: Overview of the proposed Delphi method

Data Collection

Hurricane Katrina Pilot Study

A pilot test of the QCA method will be performed using a smaller set of communities from the gulf coast region. Data for this pilot will be available from:

- U.S. census data (2000 and 2010)
- Greater New Orleans Community Data Center (www.gnocdc.org)
- Results of prior case studies
- Semi-structured interviews with selected key informants

Indian Ocean Tsunami

We will initially select fifteen communities from the tsunami-impacted area along the Indian coast. This is based upon a recommendation of 10 to 40 cases for an intermediate-N analysis with between four and seven conditions (Rihoux 2009). It is important to fully populate the QCA logic space by selecting case communities that demonstrate wide variety in the variables of interest, including both pre-disaster conditions and recovery outcomes. Therefore the selected communities will have different levels of pre-disaster vulnerability, different strategies for recovery and varying levels of success in their overall recovery as of the study date.

In each of the communities, data will be collected using interviews, surveys, first-hand observations and collection of existing documentation, including documentation from previous case studies. Multiple respondents with different roles in the community will be interviewed in order to gain different perspectives on the recovery. In addition, government officials and representatives of non-governmental organizations (NGOs) will be interviewed in order to ascertain their roles. Data collection and community identification will be an iterative process as additional communities may be recognized as important during field visits. Throughout the data collection period, interviews will be transcribed and imported into QSR NVivo. This software will enable the results to be coded, analyzed and contrasted to determine the ultimate measure given to a causal condition or recovery outcome for a community.

Analysis

Once we generate the truth table summarizing causal variables and outcomes, it will be checked for contradictory configurations. These are configurations where two cases have different outcomes although they have the same values for all causal variables. Any contradictory configurations must be resolved before analysis can proceed. Methods for resolving contradictory configurations include: (i) adding or replacing a condition in the model, (ii) reexamining the threshold levels used to dichotomize the variables, or (iii) reexamining the cases involved in a more traditional qualitative way to determine what may cause the difference.

Using the final truth table, free of contradictory configurations, Boolean minimization will be performed. Software such as Tosmana will be used to find the most logically succinct combinations of conditions necessary and sufficient to produce that outcome. The software will also be used to examine the logical remainders (non-observed cases) in order to generalize further.

EXPECTED CONTRIBUTIONS

This research is expected to result in several contributions to the field of disaster recovery. First, the content analysis and Delphi method will help to build consensus among researchers as to the important causal factors in recovery and the appropriate indicators of successful recovery. In addition, the use of mvQCA in performing a cross-case comparison will help to build a comprehensive theory of disaster recovery. This research will help to transform the way we analyze and compare data across multiple cases within disaster recovery research.

Identification of important variables to study in cross-case comparison

We will perform a content analysis on the top disaster-related journals in engineering and the social sciences and survey experts from academia and agencies using the Delphi method to determine the pre-disaster community variables believed to be most influential for post-disaster community recovery. This iterative method attempts to reach consensus amongst experts (or determine reasoning for the lack of consensus). This consensus will help to combine results from singular case studies, condense the broad results of indicators, and help provide a common grounding for scholars in diverse disciplines to pave a path forward within disaster recovery work.

Consensus building on recovery definition

Currently, there are a wide variety of definitions for recovery, and researchers use a number of different indicators to measure recovery. The content analysis and Delphi panels described above will also provide a common understanding of what it means for communities to recover. A common grounding will again provide a starting point for various researchers to collect and combine research data across cases.

Cross-Case Comparison of Recovery

The majority of studies within the disaster recovery literature analyze single case studies. This research answers calls within the literature for cross-case comparisons (Olshansky 2005), which allows for generalization of the results and can provide increased validity to the recommendations resulting from the case study. In addition, this research utilizes Qualitative Comparative Analysis, specifically mvQCA. To our knowledge, this would be one of the first

studies to utilize mvQCA within the research community focusing on disaster recovery. The use of this method may prove to be extremely beneficial and fruitful to the community and has the potential to transform disaster recovery studies by allowing a combination of breadth and depth in cross-case comparative studies.

Disaster Recovery Theory Building

This research aims to build a comprehensive theory of pathways to recovery following a disaster. It will link pre-disaster measures of resilience to the post-disaster recovery process and, through cross-case comparisons, generate data and results that will enable the researchers to develop theory of sustainable community recovery following a disaster. Smith and Wenger (2006) state that such a theory would be important to both researchers and practitioners. This will not only contribute to our theoretical understanding of community resilience and recovery, but will also validate recommendations for communities preparing for a future disaster event by showing various pathways to recovery.

LIMITATIONS OF THE RESEARCH

The use of Ragin's Qualitative Comparative Method limits the number of causal factors which can be investigated. If too many causal factors are included in the analysis, it is likely that a unique explanatory equation will be generated for each case and the results will not be generalizable. Because the number of causal factors is so limited, it is important that the correct factors are selected for analysis. We will seek to ensure this through the content analysis and Delphi panel; however it is still possible that some factors will by necessity be left out. In addition, because we are focusing on the effect of pre-disaster community conditions, it is necessary to establish a community resilience baseline from several years ago. Interviews will therefore be retrospective, limiting the validity of the data collected.

Another limitation of this research is based upon the two disasters selected for analysis. Both Hurricane Katrina and the 2004 Indian Ocean Tsunami were relatively rapid onset disasters with enormous impacts. Research results may be different for slow onset disasters such as floods, droughts, or famines. The magnitude of these disasters resulted in an outpouring of external support (both financial and technical) from government and NGOs. It also led to a significant amount of attention on the recovery process and political involvement in the post-disaster decision making. A smaller disaster would not be subject to these factors; therefore the results of this study may be less applicable to such a situation.

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