A COMMUNITY-BASED PARTICIPATORY RESEARCH APPROACH TO ASSIST VULNERABLE COMMUNITIES IN DEVELOPING A DISASTER PREPAREDNESS PLAN TO LESSEN THE IMPACT OF NATURAL DISASTERS

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAIʻI AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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By

Christopher A. Crabtree

Dissertation Committee:
Al Katz, Chairperson
Kathryn Braun
Tetine Sentell
Angela Sy
Kris Qureshi
ABSTRACT

Background: In 2010, more than 200,000,000 people were negatively affected by natural disasters (CRED, 2009). That number is increasing as population densities continue to grow in coastal and other vulnerable areas (Hays et al., 2001). The top-down approach typically employs external evaluation and assessment teams and applies a universal preparedness plan and externally produced, high-value technology, which fails to take into consideration the specific needs, resources, and capacities of vulnerable communities (Wisner, 2004; Mercer, 2008; Burton, 1993). This dissertation study will examine the utilization of Community-based Participatory Research (CBPR) in interventions aimed at helping communities plan for and minimize the impact of natural disasters on their communities.

Method: This dissertation study employed three different methods. A systematic literature review was conducted employing the PRISMA protocol. PhotoVoice, a qualitative research method, was utilized with a community in Hawaii to complete the vulnerability, capability, and gap analysis and to develop disaster reduction strategies. A one-group, pre-post-survey design was used to assess changes in participants self-rated perceptions following the development and implementation of the community disaster training and exercise program.

Results: The literature review identified 14 CBPR interventional studies related to natural disasters that operationalized all nine CBPR principles to a degree. The principle of sustainability was least operationalized. Through PhotoVoice, the community identified 42 vulnerabilities and 50 capabilities, sorted into 17 themes. Thirteen gaps were then identified, which yielded 16 feasible strategies to reduce the community’s vulnerabilities. The community helped develop and lead a training and exercise related to tsunami preparedness, as well as evaluation tools. A bootstrap pair sample analysis on the pre and post-survey demonstrated significant increases in the mean in all skill areas (p<.05). The majority of participants agreed that CBPR principles were reflected in the training and exercise program. In addition, the community was successful in developing a contextually appropriate tsunami evacuation plan.
Conclusion: Applying CBPR principles to disaster preparedness research was effective at increasing community capacity, system development, and commitment to sustainability.
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CHAPTER 1
INTRODUCTION

Problem Statement

Natural disasters are extreme geological, meteorological, or hydrological events such as earthquakes, hurricanes, floods, tsunamis, etc. that surpass the capacities and capabilities of the impacted communities to effectively cope or manage (Lindell & Prater, 2003). Each year, natural disasters result in significant loss of life, the destruction of homes and public infrastructure, and economic hardship (World Bank, 2006). Disasters strike both rich and poor indiscriminately (Khan, Hamayatullah & Abuturab, 2008). But vulnerable populations, such as the physically challenged, elderly, non-native speaking, children, chronically ill, mentally ill, the impoverished and geographically or culturally isolated, often suffer worse effects from disasters than others (Paton & Johnston, 2001). For example, a remote fishing village in Hadenya, Japan was completely isolated following the tsunami of 2011 and had to survive on their own for twelve days before emergency assistance arrived (Fackler, 2011).

According to the international disaster database EM-DAT, in 2010, more than 200,000,000 people were negatively affected by natural disasters (CRED, 2009). For example, in July 2010, Pakistan sustained some of the worst flooding in its history resulting in 2000 dead and 20 million negatively impacted (CRED, 2012). The growing population densities in coastal and other vulnerable areas, deforestation, and the degradation of natural buffers for housing and commercial development have contributed significantly to the increased level of both risk and vulnerability within communities around the world (Hays et al., 2001). As a result, many communities and nations have sought and tried a variety of approaches that assist with the development of mitigation, preparedness, response, and recovery strategies to reduce the impact of a natural disaster.

Disaster Management Strategies

The common top-down approach to disaster management and mitigation typically involves the development of a series of strategies and interventions by an “outsider,” and then directing these strategies on the impacted community (Mercer, 2008). Community members are becoming increasingly frustrated and disenfranchised because they are being excluded from the decision-making process and involvement in disaster mitigation
and management planning (Rubin, 1991). The top-down approach does not often take into consideration the specific needs, resources, and capacities of the vulnerable communities that are often the most heavily impacted because it does not include representatives from those vulnerable populations in the planning process (Wisner, 2004; Burton, 1993).

Fortunately, disaster management approaches have been slowly evolving, from the more common top-down approach that focuses on “command and control” and unidirectional decision making to a more community-based participatory research approach (Pearce, 2002). Community-based participatory research (CBPR) facilitates communities through the process of discovering solutions for themselves (Ivanitz, 1999). It is a collaboration or partnership that facilitates these fundamental principles of participatory research. These include: 1) building on strengths and resources; 2) power sharing 3) co-learning; 4) capacity building; 5) system development; 6) disseminating finding and knowledge to all; and 7) a commitment to sustainability (Minkler & Wallerstein, 2008).

**CBPR and Disaster Management Strategies**

A community-based participatory approach engages the community through the utilization of a variety of techniques, such as story-telling, picture taking or drawing, timelining, mapping, brainstorming, prioritizing, ranking and so forth, to assist communities in developing a better understanding of their vulnerabilities, risks, and resiliencies (Mercer, 2008). In addition, a community-based approach is necessarily customized to the locale, which increases the chance of developing a socially, geographically, economically and culturally acceptable mitigation and preparedness program for the community (Kumar 2002). This approach empowers community members who understand their situation the best to identify their own problems, needs and priorities (Abarquez & Murshed, 2004; Vrolijks, 1998).

The implementation of community-based participatory research in the field of disaster-reduction or management is still fairly new. It was not until about five to seven year ago that the United Nation (UN) and other organizations started to endorse this research approach. Although the utilization of this approach is slowly increasing, the number of articles reporting on its use is still fairly limited. Currently no research studies
have been published in Hawaii and only two in the rest of the United States that utilize a true CBPR approach to disaster preparedness.

This dissertation study will examine the utilization of CBPR in interventions aimed at helping communities plan for and minimize the impact of natural disasters on their communities. Effective interventions found in the literature review that utilized a true CBPR approach in natural disaster preparedness guided the development and adaptation of an intervention that was used in Hawaii. One such successful intervention, “An Integrated Community-Based Disaster Program in Taiwan,” utilized a CBPR approach consisting of the following components: vulnerability assessment, training and a disaster exercise. It was similar to the Federal Emergency Management Agency’s “Preparedness Cycle” best practice model (FEMA, 2010). Utilization of a process that encompasses the components of the FEMA preparedness cycle satisfies both federal compliance standards and potential federal funding criteria, which can lead to sustainability funding. In addition, the flexibility of the process accommodates a number of applications, methods and tools.

Framework

Conceptual Framework

The model in Figure 1 provides a visual representation of the conceptual framework that was utilized in this dissertation study. The CBPR core principles were applied in a process of developing a contextually appropriate disaster specific preparedness plan utilizing an adapted FEMA preparedness cycle as a guide or framework. The Disaster Preparedness Cycle consists of the following four components: assess, analyze/develop, train, and exercise and evaluate. Each component assists in the development and improvement of overall preparedness.

Steps in Disaster Preparedness Cycle

The assessment is the first component and the foundation upon which all of the other components rely or depend on the most. It consists of identifying a specific hazard, assessing the vulnerabilities associated with the hazard and identifying the current capabilities used to address those vulnerabilities both within and outside of the community.
Analyzing and Developing is the next component in the process (FEMA, 2010). After the initial assessment is conducted, capabilities are analyzed and categorized according to vulnerability and specialization such as communications, medical care, animal care, etc. Areas in need of improvement and gaps in capabilities are identified and potential solutions or strategies are developed.

Training is the third component in the process (FEMA, 2010). It builds on the previous two components by utilizing the assessments and gap analysis conducted and the strategies or solutions developed to identify training needs. Training is then conducted relative to those needs.

Exercising and Evaluation are the final components (FEMA, 2010). Exercising is the process of testing a procedure, process, plan or components of the plan through a simulated event relative to the hazard. It provides an opportunity to identifying strengths or best practices, shortfalls and gaps in the plan, procedures and process. Evaluation is essential in capturing those lessons learned. Group after-action reports are typically facilitated to capture those lessons. Participants are asked what worked, what did not work, and what needs improvement. Those lessons learned are then incorporated back into the preparedness plan to improve it.

**Influencing Factors for this Project.**

Influencing factors such as culture, historic context of collaboration, and the researcher’s capacity and readiness to conduct CBPR may determine the extent that CBPR core principles are able to be implemented and the extent that the disaster preparedness cycle is implemented. Community-based participatory research is highly contextual because of the uniqueness of each community. Identifying contextual factors within a community recognizes influences that may facilitate or impede the implementation of a health promotion initiative or project, and the extent CBPR principles are able to be implemented.

**Culture and History.** The community chosen for this study is an isolated peninsula community at sea level surrounded by ocean on three sides. The community has two main employers. It is home to about 100 residents. Access to and from the community is extremely limited. In addition, the historical significance of the
community has made it a target for a variety of research over the years. As a consequence, the community is extremely guarded with regard to all research projects.

**Figure 1.1 Conceptual Model of Proposed Study**

**Perceived Severity of the Issue.** The community’s geographical isolation, limited access, limited resources, location in a low lying area near the ocean make it extremely vulnerable to the impact of natural disasters. This community was chosen as the site for this participatory study based on the following criteria: geographically isolated, limited resources, limited access, good internal organization, open-mindedness toward outsiders, and willingness to develop emergency preparedness.

**Historic Context of Collaboration and Community and Researcher’s Readiness for Research Engagement.** The researcher has had an established relationship with the
study community for the past 4 years. In 2008, as the training officer for a local disaster response team, I accompanied a small number of instructors to this community to conduct a community requested Community Emergency Response Team (CERT) training course for about 30 - 40 residents. The training lasted one week and was concluded with a tsunami evacuation exercise that utilized the skills developed in CERT training. The training and exercise was very well received. In 2009, this researcher and a small contingent returned to this community by invitation to provide medical support during a community festival. Lastly, in 2010, this researcher and a small contingency from the local disaster response team went to this community to upgrade and augment their communication devices. The researcher’s good relationship with the community and agency leaders within this community was utilized throughout the studies to help facilitate the process and engage the community.

Cultural sensitivity and awareness are paramount to the effectiveness of this community-based participatory research study. Every effort was made to create a comfortable environment for expression and participation. The process for conflict resolution was defined and agreed upon by the community prior to the start of the study and was conducted in accordance with local customs and traditions. In addition, at any time any participant feeling uncomfortable during the process had the right to withdraw from the study immediately.

Application of CBPR Principles

Seven core principles of community-based participatory research (CBPR) will be applied throughout the entire process of developing hazard specific preparedness in Community X utilizing the aforementioned FEMA preparedness cycle. These include: 1) building on strengths and resources; 2) power sharing 3) co-learning; 4) capacity building; 5) system development; 6) disseminating finding and knowledge to all; and 7) a commitment to sustainability (Minkler & Wallerstein, 2008).

Building on the strengths and assets within the community is an important principle in CBPR. Rather than focusing on the negative or inadequacies, researchers and the community focus on identifying key strengths within the community such as motivated leaders, knowledgeable residents, established networks or relationships,
relevant skill sets, and other resources and then develop these strengths to empower and improve community challenges (Minkler & Wallerstein, 2008; Pelling, 2007).

Power sharing is an important key principle in CBPR. Researchers and the community establish a partnership that shares control and provides equitable participation and collaboration throughout the entire research process (De Koning & Martin, 1996; Green et al., 1995; Hatch et al., 1993; Israel et al., 1998; Minkler & Wallerstein, 2008; Park et al., 1993; Stringer, 2007). Trust plays a significant role.

Co-learning is a process of reciprocation or learning from each other. The researcher can learn about the communities’ beliefs, administrative structures, social practices, and the community can learn how to conduct research and how to facilitate a systematic process of solving problems from the researcher (Chambers, 1994; Freire, 1973; Meheux, 2007; Minkler & Wallerstein, 2008; Stringer, 2007).

Capacity building relative to CBPR is the process of teaching the community to self-evaluate or self-assess their current resources and abilities. Community members are helped to build competence in identifying short-falls or gaps, develop strategies to assist with filling those gaps and addressing the problem, and implement those strategies (Meheux, 2007; Minkler & Wallerstein, 2008).

System development involves developing a system that is repeatable through the utilization of the processes learned and developed during capacity building for the purpose of maintaining and sustaining the program (Minkler & Wallerstein, 2008; Pelling, 2007).

Commitment to sustainability is the desire and action of establishing alternative funding streams, maintaining resources, relationships, and updating or modifying plans as appropriate to sustain a level of readiness from the individual level to the community and beyond (Minkler & Wallerstein, 2008).

Dissemination of both findings and knowledge to all is the final key principle in the CBPR process. This principle involves the sharing of all information and data with all partners throughout the entire length of the process and the development of a dissemination plan for the distribution of the final product or research finding (Minkler & Wallerstein, 2008).
A community-based approach is customized to the locale, which increases the chance of developing a socially, geographically, economically and culturally acceptable mitigation and preparedness program for the community (Kumar 2002). This approach empowers community members who understand their situation the best to identify their own problems, needs and priorities (Abarquez & Murshed, 2004; Vrolijks, 1998). The overall purpose of this research is to better understand how a participatory approach helps facilitate a vulnerable community in Hawaii to address and prepare for a disaster.

**Human Subjects**

The sensitivity of the information and the rights of the community and individuals that participated in study 2 and 3 are extremely important. An application was submitted to the Committee on Human Studies at the University of Hawaii prior to the start of the research. In addition, a meeting to determine the use of the information from the study, and intellectual property, the protocol for the release, dissemination of information and the process for handling any disputes was held with the community.

**Community**

I partnered with a small shoreline community in rural Hawaii that had a population of about 100. It is one of the most isolated communities in the State of Hawaii and extremely vulnerable. The community requested that their name and identity be withheld. As a consequence, I have agreed not to provide the community’s name and other information that might lead to their identity. In addition, the names of agencies within the community will not be used or referenced.

**Purpose**

The purpose of this dissertation was threefold: (1) examine through a systematic literature review the utilization of CBPR and its core principles in previously conducted interventions aimed at helping communities plan for and minimize the impact of natural disasters on their communities; (2) partner with and engage a vulnerable community in Hawaii in conducting a hazard-specific vulnerability and capability assessment utilizing PhotoVoice and the core principles of CBPR; and (3) partner with and engage the same vulnerable community in Hawaii to develop and test a community-based training and exercise program based on results of the assessment and incorporating core principles of CBPR, for purposes of building community capacity in disaster preparedness.
Research Questions

This three-paper dissertation strives to answer three research questions. Research Question #1 is: What is the current literature on how community-based participatory research (CBPR) methods are utilized in assisting communities with the development of contextually appropriate natural disaster mitigation and reduction strategies?

Even though CBPR methods have been practiced for more than four decades, its use in disaster preparedness is still fairly new. There are a lot of unknowns with regard to use of CBPR in this context, such as how CBPR methods have been utilized in disaster preparedness and how deeply its principles are operationalized or actualized as a true participatory approach. A systematic literature review will provide insight into its use as an approach in disaster-reduction. In addition, it will provide a collection of CBPR principle-based studies for reference in conducting future studies. It is also expected that the knowledge gained from this review can be used to promote this participatory approach as a complement to the current top-down approach to develop more contextually appropriate and sustainable disaster preparedness strategies and plans to potentially reduce the impact of natural disasters on at-risk communities.

Research Question #2 is: “How does the community perceive its vulnerabilities and capabilities to a natural disaster, as expressed through PhotoVoice?” The assessment of a community’s vulnerabilities and capabilities is an integral part of the preparedness process (Perry & Lindell, 2003; FEMA, 2010). It provides a process for the community to view and discuss its weaknesses and capabilities with regard to specific hazards. Understanding these vulnerabilities and capabilities will provide the community with the necessary information to develop solutions or strategies that decrease vulnerabilities through strengthening capacity or capability. The well-developed internal infrastructure and cultural diversity of the study community were the main reasons PhotoVoice was chosen. As a qualitative method, it aims to reverse the traditional power roles by valuing the knowledge of the participant as the primary source. In addition, PhotoVoice can provide a deeper and more detailed insight into the cultural, social and geographical context of the community than many other qualitative tools through photographic expression. The process offers a unique opportunity to see and understand the world
through their eyes. It is believed that PhotoVoice will lead to a culturally rich and in-depth perspective into the vulnerabilities and capabilities in this community.

Research Question #3 is: “Does a CBPR-based approach to developing and delivering disaster preparedness training and exercise enhance the acceptability of the program, capacity and confidence of trainees, and sustainability of the process?” There are three important components of every disaster preparedness process: planning, training, and exercising (Perry & Lindell, 2003; FEMA, 2010). The assessment gap analysis and strategies portion of the process, often referred to as the plan, will be conducted in the research question two (RQ2) study. Once the assessment, gap analysis and strategies are developed, capacity or capability gaps previously identified are addressed through training and exercising. Traditionally, subject matter experts external to the community are recruited to provide the training and conduct exercises necessary to build capacity (Chen & Chan, 2006; Chan, et al., 2010; Scott & Carson, 2009). Unfortunately, this approach often results in dependence on external experts.

This study will employ a community-based participatory approach to partner with Community X to plan, develop and implement a community disaster training course and exercise. Skills previously identified as capability gaps in research study #2 will be developed and strengthened through community-based training, including a hands-on disaster exercise. This process is invaluable in the refinement and improvement of a community’s level of preparedness prior to a real-world event (Homeland Security, 2007; Perry & Lindell, 2004). A survey will be provided to the participants prior to the training and at the conclusion of the exercise to measure the change in capacity and confidence of trainees in the following areas: communications, first aid, search and rescue, helicopter safety and landing zone setup, and ICS job action sheets. In addition, the following five core principles of CBPR will be evaluated on the post-survey: the acceptability of the program, power sharing, dissemination of information, system development, and sustainability of the process. This study will have positive benefits to the community and will potentially demonstrate the success or failure of an innovative approach to building a sustainable capacity within a vulnerable community in the United States.
CHAPTER 2

A SYSTEMATIC REVIEW OF THE USE OF COMMUNITY-BASED PARTICIPATORY RESEARCH IN NATURAL DISASTER RISK REDUCTION

ABSTRACT

Background: Natural disasters significantly impact both our general population and our vulnerable populations indiscriminately, resulting in substantial loss of life, property, and wages. The traditional approach to helping communities prepare for and mitigate the impact of natural disaster is often top-down, which fails to take into consideration the specific needs, resources, and capacities of the vulnerable communities. A community-based approach to natural disaster preparedness is slowly gaining support and seems to successfully meet the needs of vulnerable communities.

Objective: To systematically review the literature on community-based participatory interventions to help vulnerable communities prepare for and minimize impacts of natural disasters on their communities.

Methods: A systematic literature review was conducted in three major databases utilizing the following search terms: community-based participatory research, participatory research, action research, participatory, vulnerable, and disaster. For inclusion in the review, the article must have included an intervention, focused on natural disasters and employed a community-based participatory research (CBPR) approach incorporating 6 of 7 critical core CBPR principles.

Results: Fourteen articles met the inclusion criteria. The 14 CBPR articles reviewed all described some degree of application of key CBPR principles, including bi-directional flow of information, utilization of strengths and assets within the community, co-learning, capacity building, power sharing, and system development within their research. Even though the commitment to sustainability was weakly operationalized overall, CBPR was shown to be an effective method to assist with the development of a culturally, socially, fiscally, and geographically appropriate disaster mitigation and reduction strategies.

Conclusion: CBPR is an effective way of building community capacity and empowerment in preparing for, responding to, and recovering from a natural disaster.
However, only 14 articles were found, suggesting that more research involving CBPR in disaster preparedness, response, and recovery needs to be conducted to decrease the gap in literature. Researchers proposing to use CBPR methods should honor and document their operationalization of critical CBPR principles.

**Key words:** community-based participatory research, participatory research, action research, participatory, disaster, and vulnerable
Research Question

What is the current literature on how community-based participatory research (CBPR) methods are utilized in assisting communities with the development of contextually appropriate natural disaster mitigation and reduction strategies?

Introduction

A detailed and systematic review of the scientific literature on the utilization of community-based participatory research (CBPR) in natural disaster preparedness was completed in my 4th semester of the DrPH program and accepted as my Qualifying Paper. However, 2011 was an extremely active year for natural disasters such as the Australian floods, New Zealand earthquake and the tsunami in northern Japan. As a result, it is believed that additional CBPR studies relative to natural disaster preparedness may have been published within this last year and an update to the literature review is appropriate. This study will potentially build on the previous literature review. The same systematic process using a validated guideline will be employed to update and refine the review. This literature review intends to provide a basis of understanding of using CBPR in assessing and preparing at-risk communities for natural disasters through the application of both tools and critical principles. It is expected that the knowledge gained from this review can be used to promote this participatory approach in the development of more effective, contextual appropriate and sustainable disaster preparedness strategies to potentially reduce the impact of natural disasters on at-risk communities. This updated and refined literature review will be used as the justification and foundation for the research that will follow in this three part dissertation study.

Methods

Study Design

A systematic literature review is a process of reviewing the existing scientific literature on a specific topic to address a research question employing a validated peer-reviewed protocol (Hemingway, 2009). A validated protocol assists the researcher in identifying relevant literature, selecting appropriate the studies, evaluating them based on specific criteria, and summarizing the results of scientific literature in an unbiased manner (Hemingway, 2009; PRISMA, 2009). This study conducted a systematic
literature review to address research question one (RQ1) employing the PRISMA protocol.

**Sampling and Procedure**

The literature review included studies published in peer-reviewed scientific journals and other relevant literature published. The following search terms were selected: community-based participatory research, participatory research, participatory, action research, disaster, and vulnerable populations. Using varied combinations of these terms and not limiting the years, searches were performed in PubMed-MEDLINE, Academic Search Premiere, Web of Science, Sociological Abstracts, and eLibrary. Reference lists of relevant articles were reviewed as well.

<table>
<thead>
<tr>
<th>Search Terms</th>
<th>PubMed-MEDLINE</th>
<th>Academic Search Premier</th>
<th>Web of Science</th>
<th>Sociological Abstracts</th>
<th>eLibrary</th>
<th>Citation Chasing</th>
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</thead>
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<tr>
<td>Community-based participatory research AND disaster AND vulnerable</td>
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<td>1</td>
<td>1</td>
<td>0</td>
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<td></td>
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<tr>
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<td>7</td>
<td>9</td>
<td>2</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Participatory research AND disaster AND vulnerable</td>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Participatory research AND disaster</td>
<td>47</td>
<td>29</td>
<td>43</td>
<td>33</td>
<td>48</td>
<td></td>
</tr>
<tr>
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<td>108</td>
<td>101</td>
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<td></td>
</tr>
<tr>
<td>Action research AND disaster AND vulnerable</td>
<td>142</td>
<td>1</td>
<td>15</td>
<td>9</td>
<td>46</td>
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</tr>
<tr>
<td>Total (N=970)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>969</strong></td>
</tr>
</tbody>
</table>

A total of 969 citations were retrieved (Table 1.1). A thorough review of all of the titles was performed to remove duplicate citations (Figure 1). The remaining 477 citations were retrieved for full text review and systematically reviewed for the following criteria: The implementation of an intervention, relevance to natural disasters, and the implementation of a CBPR approach (Table 1.2). The following definitions of a natural
disaster by Lindell and Prater (2003) and CBPR by Minkler and Wallerstein (2008) were used to assist with this relevance determination:

- “Natural disasters are extreme geological, meteorological, or hydrological events such as earthquakes, hurricanes, floods, tsunamis, etc. that surpass the capacities and capabilities of the impacted communities to effectively cope or manage” (Lindell & Prater, 2003, pp. 176).

- Community-based participatory research is a collaboration or partnership that provides the necessary tools for communities to solve their problems. It may facilitate these fundamental principles of participatory research: co-learning, capacity building, empowerment and power sharing, cyclical system development, builds on strengths and resources within the community, disseminates findings and knowledge gained to all and a commitment to sustainability (Minkler & Wallerstein, 2008).

Of the 477 articles reviewed, 298 were excluded because they did not describe an intervention; rather they stated positions with regard to using participatory research methods in disaster preparedness and response. Another 110 articles were excluded because they did not involve natural disasters. Lastly, 54 articles did not meet the minimum 6 of the 7 key principles of CBPR (Table 1.2). An additional relevant study was found through citation chasing, for a total of 14 articles included in the review.

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Database Search Indices</th>
</tr>
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<tr>
<td></td>
<td>PubMed-MEDLINE</td>
</tr>
<tr>
<td>Non-interventional research</td>
<td>92</td>
</tr>
<tr>
<td>Not focused on natural disasters</td>
<td>66</td>
</tr>
<tr>
<td>Did not describe the 6 of 7 CBPR principles</td>
<td>37</td>
</tr>
</tbody>
</table>
Further detail on the articles that did not operationalize 6 of 7 key CBPR principles is provided in Table 2.3. While many of them employed techniques such as surveys, key informant interview, and focus groups, the primarily the objective of these studies appeared to be to extract data from communities rather than to engage them in learning how to collect and analyze their own data, and to use it to develop solutions. Thus, most lacked activities that operationalized capacity building, power-sharing, system development, the dissemination of information to all, and commitment to sustainability (Table 2.3).

<table>
<thead>
<tr>
<th>Table 2.3 Evaluation Summary of the 54 Excluded Non-CBPR Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Builds on Strengths and Resources</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Figure 2.1 Flow Chart
Results
This section provides a summary of each of the 14 community-based participatory research studies in the area of disasters that honored at least 6 of the 7 critical core CBPR principles (Table 2.4).

Ikeda, Sato, and Fukuzono (2007) conducted a community-based participatory study in several urban communities prone to flooding in the Japanese cities of Nagoya, Shimada and Fujisawa. The study utilized a “participatory disaster risk communication platform” to assist or facilitate local communities and residents in building a socially, culturally, locally appropriate and economically sustainable capacity to develop locally relevant strategies for the flood damage reduction.

<table>
<thead>
<tr>
<th>Integrated Community-Based Disaster Management Program in Taiwan: A Case Study of Shang-An Village (Chen, et al., 2006)</th>
<th>Build on Strengths &amp; Resources</th>
<th>Power Sharing</th>
<th>Promotes Co-learning</th>
<th>Capacity Building</th>
<th>System Development</th>
<th>Disseminates Findings &amp; Knowledge to All</th>
<th>Commitment to Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participatory methods of incorporating scientific w/ traditional knowledge for volcanic hazard management on Ambae Island, Vanuatu (Cronin, 2003)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Asset building through community participation: restocking pastoralists following drought in northern Kenya. (Lesorogol, 2009)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Towards an integrated management framework for emerging disaster risks in Japan (Ikeda, et al., 2007)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Community and University Participation in Disaster-Relief Recovery: An Example from Eastern North Carolina (Farquhar &amp; Dobson, 2004)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (Limited)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Flash Flood Preparedness in Colestian Province of Iran (Ardalan et al., 2010)</td>
<td>Yes</td>
<td>Yes (Limited)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (Limited)</td>
<td>Yes</td>
</tr>
<tr>
<td>Doing Social Volcanology: Exploring Volcanic Culture in Indonesia (Donovan, 2009)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (Limited)</td>
<td>Yes (Limited)</td>
<td>No</td>
</tr>
<tr>
<td>Reflections on Use of Participatory Disaster Risk Reduction (Mercer, et al., 2007)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
At workshops, local residents, non-governmental organizations, and some subject-matter experts participated in tailored disaster risk management lectures and in meetings to share disaster information, to map risks within the community, and to develop strategies to reduce those risks and test those management strategies through realistic scenarios. The study noted that when information was shared using an equitable bidirectional approach, both residents or local participants and other local stakeholders were able to gain a deeper and better understanding of the level of vulnerability and need for effective flood management strategies facilitated through lectures and interactive learning sessions. The interactive sessions consisted of flood scenarios that facilitated participants through the process of assessing and identifying risk, developing strategies, and making management decisions. These sessions increased the level of awareness of flood risks and capacity to prepare and develop effective strategies. They also helped members identify risks not previously discussed, such as “traffic accidents, fires, robbery, and environmental or landscape degradation” (Ikeda et al., 2007, p. 278). The data accumulated from both the questionnaires and the discussions during the workshops were utilized to measure the community’s response to the sessions and its effectiveness. In
addition, the results from the discussion sessions were incorporated into an online computer-based program to assist residents of those communities in better preparing and more effectively managing floods.

Chen, Liu, and Chan (2006) utilized a case study approach to report on the piloting of an integrated community-based disaster management program in Shang-An village in Taiwan. The objective of the program was to enable community awareness of hazard mitigation, strengthen capability to lessen or reduce the impact of natural disasters, and develop an organization to conduct sustainable risk reduction. The village consisted of 1,505 residents. Interested community residents were invited to take part in the process. The process was divided into 6 steps: Step 1 - orient the community to objectives, implementation plans and expectations, and divide into smaller groups by neighborhood; Step 2 - within groups, map the community’s history of the natural hazards such as hurricanes, earthquakes, and flooding to determine level of risk; Step 3 - assess and map vulnerabilities; Step 4 - develop a list of problems with regard to hazards and vulnerabilities, and brainstorm potential solutions and strategies; Step 5 - establish a community-based disaster management organization with a framework or structure; and Step 6 - share all of the results and information accumulated and processed with the broader community.

The article described how participants worked together to identify potential hazards, assess risk, discover problems, and identify strategies. For example, after assessing risk and identifying hazard, community participants collectively brainstormed strategies/solutions with regard to their residents, services, specific facilities, and structures previously identified as most at risk. The solutions or strategies were then organized according to capability and responsibility in the following categories: family, community, and government. EMS personnel and fire fighters taught community participants relevant skills such as first aid, search and rescue techniques, and communication skills with walkie-talkies necessary to respond to their community’s immediate needs following a natural disaster. The application of the skills and knowledge acquired by the process was evaluated through a disaster scenario exercise. The disaster scenario exercise provided the community with a realistic perspective of how effective the strategies/solutions previously developed were in disaster-reduction. A
community database was established to assist with the effort to sustain the level of preparedness. The database is an information warehouse and a community bulletin developed to increase awareness and improve communication related to disasters.

Donovan (2010) conducted a community-based participatory study in 2 villages on the southern side of Mount Merapi in Indonesia, utilizing activities such as hazard mapping, timelines, ranking exercises, emergency plans, etc. in two workshops designed to improve preparedness, response, and risk reduction related to the active volcano. The participatory process revealed that cultural beliefs and socio-economics significantly influenced the emergency plans, hazard perceptions, and vulnerability of the community. For example, the majority of residents derived their income from their livestock. In the event of an eruption, most said they were reluctant to leave their livestock behind out of fear that the livestock might die or starve to death. In addition, residents believe that spiritual creatures called *makhluk alus* determine their fate. As a result, residents have refused to evacuate in fear of upsetting these creatures. Rather, they would provide offerings and wait for a special sign such as lightning and unusual animal movements from these creatures to evacuate. The participatory process facilitated the community participants in developing a written, culturally appropriate and acceptable emergency evacuation plan for their community. The emergency plan required both a traditional and official warning to evacuate. For example, in the event of an eruption of Mount Merapi, the Pelem Sari village required the following: a physical observation of the eruption or a traditional sign such as unusual animal movements and intense lightning known as *wisik* to be witnessed by a villager, an emergency siren sounding or announcement from the government, a chant to Merapi be performed, an assembly of all villagers for a meeting to decide the course of action, and the implementation of that action. The study showed that providing a voice to the community was advantageous in the development of a socially and culturally acceptable emergency action plan.

Mercer, Kelman, Lloyd, and Suchet-Pearson (2008) conducted community-based participatory research in 3 rural communities (Kumalu, Singas, Baliau) in Papua, New Guinea to explore the utilization of a process framework that integrated indigenous and scientific knowledge through a researcher and community collaboration to reduce their vulnerability to environmental hazards. The study involved the following participatory
techniques: mapping, timelines, matrix ranking, trend analysis, diagrams, daily activities, and livelihood analysis. The process framework encompassed the community identifying intrinsic factors (e.g., the loss of natural barriers due to development, construction, change in farming or agricultural practices, and loss of indigenous knowledge) and extrinsic factors (e.g., globalization, geographical structures, land boundaries), identifying and ranking past and present indigenous and scientific strategies to reduce those vulnerabilities, and lastly integrating the best of both strategies. For example, one idea was to use both traditional bush materials and alternative modern materials to build houses. Traditional bush materials allows air to freely flow through the houses resulting in less damage or collapse but often lacks strength against extremely high winds. The use of modern alternative materials with indigenous or traditional architectural designs would provide the added strength needed to further reduce structural damage. The research showed that the participatory process framework was a successful tool in the development and establishment of a collaborative community vulnerability reduction strategy utilizing both indigenous and scientific knowledge as evidenced by final product.

Pfeiffer, Glaser, Vencatesan, Drescher, and Glaser (2008) conducted a participatory mapping study in two marginalized neighborhoods and one middle-income neighborhood of southern Chennai (Madras) in India to evaluate the utilization of participatory mapping as a tool in analyzing and evaluating environmental areas of risk and socio-economic areas of risk perception to reduce the impact of flooding. Every year, these communities continue to be impacted more heavily by flooding. Interviews, historical timelines, community map drawing, and discussion groups were utilized to raise awareness of flood risk and vulnerability and to facilitate the development of effective strategies. When the locally drawn maps were compared with geo-referenced satellite maps, differences were discovered. A decreased water body, reduced agricultural area, and a larger-than-previously-documented settlement area in the marshlands were realized. The visualization of the maps and interactive discussions and strategy sessions with community members, administrators, and politicians helped significantly with increasing awareness of the local problem. As a result, policy makers developed a better understanding of the various dimensions of flooding, coping mechanisms, and local perceptions.
Ardalan et al. (2010) conducted a controlled study with 15 intervention villages and 16 control villages prone to flash floods in Golestan Province in Iran to enhance and improve community preparedness and response in the event of flash flooding. The 15 intervention villages and 16 control villages represented total populations of 11,302 and 11,718 respectively. Risk mapping was the primary tool used in the intervention villages. It is a visual participatory process of identifying levels and types of risk by placing those items or structures such as settlements, infrastructure, vulnerable populations and resources on a map of the village. Pre-assessment and post-assessment surveys, as well as an exercise drill, were administered to both the intervention and control villages to assess the intervention. The outcomes from the pre-assessment and post-assessment surveys between the intervention villages and control villages were compared to determine the effect of the intervention. A multiple regression analysis was applied to the results to adjust for sex, age, socioeconomic factors, experience and education. The results showed that the intervention villages were more successful than the control villages in improving their villages’ flash flood preparedness in terms of risk mapping, preparation of emergency supplies, family preparedness, and assisting vulnerable populations. The results also revealed a positive association between risk perception and engaging in preparedness activities. For example, participants who attended preparedness meetings and engaged in risk mapping were found to be more motivated to become involved in other preparedness activities such as exercise drills. The intervention villages were also more likely to plan for or take an active role in assisting vulnerable members in time of emergency than the control villages. All results were statistically significant.

Cronin, Gaylord, Charley, Alloway, Wallace, and Esau (2003) applied a community-based participatory approach to a vulnerable community on the volcanic Island of Ambae in Vanuatu to mitigate the impacts of volcanic hazards on the community. The study also utilized a best practices approach of incorporating indigenous and scientific knowledge for volcanic hazards, risk assessment and awareness. The following participatory techniques were employed: historical timelines, daily and seasonal timelines, community mapping, listing and ranking needs, community volcano emergency plan diagram, etc. Five work groups were formed, consisting of 3 men’s
groups, one women’s group, and a chief’s group. In Vanuatu’s social structure, there are norms about what men, women, and chiefs say to each other and how they express it in front of each other. In an effort to facilitate diverse ideas and thoughts, the groups were divided according gender and along hierarchical lines. All information was presented to the whole community for feedback. This participatory approach was successful in achieving all of its outcomes. The approach resulted in the identification of five potential refuge points for evacuees, a volcano hazard plan, a warning system flow plan, and the establishment of a disaster committee for sustainability.

Howell (2000) conducted a community-based participatory case study through the NGO Action-Aid-Ethiopia with leaders from 102 of the poorest farming families in Dalocha, Ethiopia that were impacted by food shortages due to excessive rain and pest infestation of the crops. Small groups were formed. Each group was tasked with identifying community problems and determining associated causes and possible solutions. After all groups identified the problems, determined the causes, and developed potential solutions, each group presented their findings to the larger community group for feedback and acceptance. Community problems such as hunger due increased cost of food grain, deflation of livestock prices, selling and renting of farm land, and animal disease were determined to be the major challenges within the communities. The working groups also determined through consensus that sporadic rainfall, flooding, army worm infestation, and high grain prices were the relevant causes. Finally, the suggested solutions from the community groups after collective community feedback consisted of providing a soft loan with zero interest to be paid off in 2 to 3 years, providing wheat seed and fertilizers credit to those farmers that lost their crops due to army worms, and receiving training in the saving and storage of grain. This community-based approach was successful in engaging and empowering the community and increasing awareness and capacity through self-discovery. In addition, the proposed community solutions were adopted by the Disaster Prevention Committee, which distributes emergency relief following a disaster in that area.

Lesorogol (2009) utilized a case study approach to report on the application of a community-based participatory approach in the drought stricken Samburu district of northern Kenya to increase the capability and capacity of its resident pastoralists. The
drought from 1990 to 1993 resulted in catastrophic losses in livestock for the communities. The Kenyan and German governments partnered with the pastoralists to provide technical assistance and facilitate them through the process of discovering solutions for their problem for a sustainable future. During first stage of the process, pastoralists were facilitated through the process of identifying and analyzing the problem to develop solutions utilizing a variety of participatory tools. The community identified food shortage due to the catastrophic loss of animals during the drought as the problem with the highest priority. The community determined that the restocking of animals to the poor families in need was a possible solution. The government assisted the community with operationalizing the solution through the development of a community action plan. The community action plan consisted of forming an oversight committee, developing selection criteria for potential recipients, raising contributions, and actively recruiting outside support to assist with the monitoring of families. Families were chosen and prioritized for restocking via a wealth-ranking system introduced by the facilitators. All community members’ names were placed on cards and those cards were arranged by the community in order of poorest to wealthiest. The committee approached wealthy livestock owners and asked for donations of livestock. Three hundred to one thousand livestock animals were received from generous community members to restock the poor. The community oversight committee was tasked with monitoring the process of the program and reporting all findings during the community meetings. In an effort to measure the success of the program or intervention, the government circulated a survey. The survey results revealed that after 1 year the herd numbers had increased on average of 10%. In addition, milk and social status for all recipients increased significantly. The survey results showed an extremely successful solution to a community problem. Furthermore, the establishment of an oversight committee assisted with the sustainability of program.

Farquhar and Dobson (2004) conducted a case study on the application of a community-based participatory research in the flood-impacted areas of rural eastern North Carolina following Hurricane Floyd. The University of North Carolina partnered with the Relief Aid Project (RAP), a coalition of local organizations partnering with survivors to address and solve unmet needs and reported discriminatory practices by local
and state government. Bi-monthly meetings were held between the university and RAP to discuss the project. The University and RAP agreed on the development and utilization of a flood survivor qualitative survey to capture the relocation experiences, living conditions, potential threats to health, and loss of community of survivors. Five community residents were recruited and trained by both the RAP and the university to administer the verbal survey. Two hundred and seventy residents of the temporary housing site completed a survey, and data were analyzed by the University. The results showed that 44% percent of the respondents were unable to find affordable housing within their community. In addition, complicated paperwork and restrictive eligibility criteria were reported to be significant barriers to finding housing. More than 33% of the respondents reported significant health related issues such as chest pain, anxiety, headaches, stomach aches, and loss of appetite due to stress and adverse living conditions. Lastly, more than 76% of the respondents reported the importance of flood survivors being included in the decision making process. A conference was organized to present the information and findings to flood survivors, grassroots organizations, and agency representatives. RAP also presented the information to the state legislature and governmental agencies to advocate for policy change. The presentation resulted in the state emergency management office extending the temporary housing duration of stay by an additional 6 months and facilitated the formation of an advocacy group called the Survivor’s Organizing Council consisting of flood survivors. The Survivor’s Organizing Council’s mission is to sustain advocacy for affordable housing, loans and grants, and decision making power.

Yamada, Kakimoto, Yamamoto, Fujimi and Tanaka (2011) conducted a community-based participatory flood risk communication case study in the flood prone community of Kosen in Kumamoto, Japan. The study employed the Plan-Do-Check-Action (PDCA) framework to assist the community in increasing flood hazard awareness, knowledge, and preparedness through the development of community flood plan. The study consisted of four facilitator-driven workshops and one flood evacuation drill. The first 2 workshops consisted of approximately 33 residents, 1 - 2 local government officials, 1 non-profit organization, and 14 - 19 university staff. These 2 workshops focused on defining and understanding what flood risk communication is, how we
perceive flood risk, how to read flood hazard maps, and the process of developing a community-based hazard and evacuation route map. The third workshop consisted of the following two parts: a virtual desktop drill and a large-scale community flood evacuation drill. The virtual desktop drill or tabletop employed a facilitator to navigate the participants through the simulated community flood scenario. Cellular phones were the primary means of communication for evacuation orders. The community utilized the knowledge and the previously developed community-based hazard and evacuation route map to walk through the scenario. Participants increased their skill in reading the community hazard and evacuation maps during an event, raised their perception of flood risk, but seemed to struggle with quickly identifying dangerous places or challenges for those more physically challenged. A large-scale community flood evacuation drill was conducted approximately 3 months later involving 52 households, 55 adults and 31 children. The goals of the drill were to identify the types of dangers that exist along the evacuation route, develop the ability to choose the safest evacuation route, develop a sense of the time it takes to walk to the evacuation site, and determine the needed time to communicate with community members in an emergency. Injests such as obstructed pathways and evacuation routes were put into the exercise to facilitate participants in deciding on new appropriate routes to evacuate. The final workshop consisted of disseminating and discussing the results from the questionnaires following each workshop and the drills and providing an opportunity for community feedback with regard to their plan and processes for flood evacuation. The findings suggested that the time to evacuation from low lying areas to the current upland evacuation site is too long for the elderly, physically challenged and other vulnerable individuals. It was suggested that additional evacuation sites need to be established to accommodate these residents. The findings also suggested that this participatory process was effective in increasing awareness and knowledge with regard to flood risk and the process for evacuating.

Lopez-Marrero and Tschakert (2011) conducted a community-based participatory study in two vulnerable flood prone fishing communities in Puerto Rico using participatory concept mapping, participatory sketch mapping, and participatory listing and ranking of strategies to assist both communities in reducing their level of vulnerability through increasing their knowledge and awareness of the causes of floods,
their exposure zones and identifying feasible and efficient strategies to lower their risk. Vulnerable communities were chosen based on their low poverty and unemployment level, low literacy rates, and substandard home conditions. Two focus groups were formed. One consisted of residents from those communities and the other emergency managers within the municipality. During the participatory concept mapping session, participants were asked to brainstorm all potential causes of floods and write each cause on a separate card. Those who were unable to express the cause in writing were encouraged to express it graphically. Then, each group arranged each of their cards on a large sheet of paper in the way that it related to the causes of floods. After each group finished, both were compared and contrasted, and an aggregate map consisting of both was developed. The results from the concept mapping showed that the general causes of floods within the communities were well identified. In addition, the influence of human activity on flooding, which is often not acknowledged, was identified as a cause. The second session consisted of participatory sketch mapping. Each focus group was given a satellite map of their community with a transparent overlay and asked to identify, define and draw areas within their community that have a high, medium, and low exposure to floods. Groups were also asked to draw arrows representing the flow of water. Each community produced a map for themselves, and the emergency managers produced a map for both communities. Then each map was digitized via Geographic Information System (GIS) and compared. There were similarities among groups in the patterns of water flow and flood zones. Both groups identified that low elevations and areas near the river were at highest risk. However, residents identified some important factors for high exposure that the emergency managers did not, which highlights the importance of participatory planning. The final session consisted of participatory listing and ranking of strategies. Participants in each focus group were asked to brainstorm possible strategies to minimize the impact of floods within their community. Then each group ranked the strategies first in terms of their efficiency in reducing floods and then in terms of perceived feasibility. Participants would also discuss their rationale for each choice. The finding from the participatory listing and ranking of strategies revealed both technical and non-technical ones. Community orientation and awareness, collaboration, the development of local preparedness plans, and the creation of community committees for
implementation were some of the strategies extracted. These findings suggest the importance of a complimentary approach using both residents and emergency managers or “outsiders” to develop relationships, knowledge, awareness, and strategies for reducing the impact of floods.

Catalani, Veneziale, Campbell, Herbst, Butler, Springgate and Minkler (2011) conducted a community-based participatory study in Central City, New Orleans employing videovoice to assist the community in discovering and advocating their needs and issues following Hurricane Katrina. Participants were recruited via flyers within the community, announcements at local social services, arts, religious, and health organizations and word of mouth. There were sixteen participants in this study consisting of 10 community members, 2 academics, 2 filmmakers and 2 support staff. A 1 week training session was conducted consisting of videovoice processes/procedures, project objectives and timelines, community health concerns, ethics and safety in video use and equipment operation. All participants were provided with a video camera and instructed to capture environmental footage showing neighborhood assets and needs over the subsequent 12 weeks. They were also instructed to capture in-depth interviews with former neighborhood residents and directors of neighborhood organizations and public services. Interviews lasted approximately 30 minutes and used a semi-structured guide that focused on community assets and needs. All interviews were transcribed. Weekly follow-up sessions were conducted. Each participant presented 2 to 5 minutes of footage to the group. Questions based on the pneumonic SHOWD (What do we See? What is Happening? How is it relevant to Our situation? Why is it a problem? What can be Done to fix or improve it?”) were used to facilitate the discussions and uncover meaning and identify issues and themes. Interviews were processed using grounded theory. Each week, participants collectively selected the clips that they felt best represented the community assets and needs. The following three core themes emerged: housing, economic development and education. For example, residents expressed their frustration with respect to the slow pace of planning and rebuilding of homes following the Hurricane Katrina. The final product, a three-part film consisting of those themes, was shown to the entire community for feedback with regard to content and to potentially identify additional themes that were not displayed. Two hundred people came to the
community screening and shared verbal comments and completed a written evaluation. Eighty three percent of those watching agreed that the three themes were the ones that they cared about the most. The only negative comment mentioned was the lack of youth participation and perspective in the project. The final version of the film was copied onto DVDs and disseminated to all participants and community leaders. In addition, the film was posted on YouTube and shared online to reach others. With regard to sustainability, funding from a major foundation grant was acquired to assist with sustaining community videovoice projects. The findings from this study suggest that this process can successfully engage, stimulate dialogue, and empower vulnerable communities to self-assess and discover a common voice. In addition, the testimonies and footage are powerful tools in getting a voice and advocating for positive change.

Gaillard and Pangilinan (2010) conducted a community-based participatory mapping study in the province of Pampanga in the Philippines to develop stronger knowledge and raise awareness of hazards, vulnerability, capacity, and risk within their flood prone community. Participants were recruitment from the first-year cohort of students at the community City College of San Fernando. Thirty-five participated in the study. Participants were provided the objectives and steps in participatory mapping. The process was divided into 6 steps: Step 1 - participants plotted the different villages within the City of San Fernando using push pins that contained the name the village; Step 2 - participants then added major roads throughout the city using green yarn; Step 3 - the participants plotted their house and the type of materials that it is made of using different colors of cylindrical pushpins to represent two-story homes, one-story cement homes, one story homes made of mixed materials and one-story homes built with light materials such as wood and palm leaves; Step 4 - participants added information on vulnerable population members living in their home such as children less than 5 years old, pregnant women, elderly above 60 years old and people with disabilities and chronic diseases using small ball-like pushpins; Step 5 - participants plotted rivers that flow throughout the city and flood prone area with blue yarn; and Step 6 - participants plotted moderate and severe flooding areas with brown and yellow yarn. Finally the map was used to facilitate discussions with regard to origins of disasters, houses in proximity of known flood areas, vulnerabilities, and capacities of all during a flood. The discussion
ended with strategy considerations to reduce the impact of flooding on their community. Participants were able to visualize their home in proximity to flood areas and better understand their own and their family’s vulnerabilities. Even the affluent participants discovered that their houses are extremely vulnerable to flooding. The study found that participatory mapping is an inexpensive and resource-light process or method that assists participants in developing the ability to analyze disaster risks through overlapping hazard prone areas and vulnerable assets and needs.

**Discussion**

The acceptance and utilization of a CBPR approach for disaster management and mitigation has been steadily increasing. In fact, in 2005 the United Nations declared the importance of community participation or involvement in disaster-reduction (UNISDR, 2005). However, the term “participatory research” seems to be somewhat overused (Twigg et al., 2001). Minkler and Wallerstein (2008) define community-based participatory research as a collaboration or partnership with the community that fundamentally involves co-learning, capacity building, and empowerment, etc. However, many of the articles identified through the database searches seemed to have been superficially labeled as “participatory research,” consisting of unidirectional teaching or extracting activities, rather than activities to promote co-learning and skills transfer (Christoplos et al., 2001). The articles often reported the use of one or more of the following: surveys, pretest and post-test, focus groups and key informant interviews. Although these methods or techniques can be used in participatory projects to promote self-discovery, capacity building, co-learning, or empowerment of the community, in the excluded articles it appears that they were used unidirectionally or to extract information from the community. Thus, in the field of disaster-reduction or management, many of the studies that call themselves “participatory” seem to be participatory only in name, not in action (Twigg et al., 2001).

CBPR should facilitate communities through the process of discovering solutions for themselves (Ivanitz, 1999). To build that level of capacity, to be called CBPR, a project should at minimum embrace co-learning, capacity building, power sharing, system development, and the dissemination of information to all, and build on the strength and assets of the community. A critical evaluation of each of the 69 studies was
conducted to determine the extent of which each operationalized the critical core principles (See Tables 1.3 and 1.4). Only 14 of the 69 articles presented in this literature review contained those 6 participatory critical core principles.

Capacity building or the process of enhancing the capacity of all participants involved is an important core principle. All 14 of the studies showed a high level of capacity building. Risk mapping, historical time lining, listing and ranking were some of the major tools utilized to build capacity. All of these methods encourage the transfer of ideas and knowledge among all participants, assist communities with understanding their level and location of highest risk, and provide the community with a local culturally contextual skill that can be applied to other disasters and events for updating and sustaining a level of readiness.

Co-learning is also a critical principle of participatory research. It is an essential element in the process of self-discovering solutions for the community’s problems through a bidirectional exchange of skills, knowledge, and capacity (De Koning & Martin, 1996; Freire, 1973; Israel et al., 1998; Stringer 2007, Minkler and Wallerstein, 2008). All 14 of the selected research articles within this literature review embraced the co-learning principle. Discussion groups, exercises and activities encouraged bidirectional learning from all participants.

The sharing of all data among the researcher, the community, and other stakeholders is extremely important. All 14 of the research articles showed that a high level of bi-directional information flow typically occurred during the workshops, integrated committee or group meetings and presentations. However, 4 of the studies were limited in their sharing of all of the information or data with the community. For example, it appears that the studies by Donovan (2009) and Ardalan et al. (2010) did not involve sharing of data from their additional surveys and interviews with the community participants. The Pfeiffer (2008) and the Gaillard and Pangilinan (2010) studies provided the hand-drawn maps to all participants, but did not mention the distribution of the final product to the community. Developing a written agreement or plan to distribute the final product to the community partners is an important part of the CBPR process. None of the 14 selected studies mentioned having a written plan or agreement to distribute the final product to their community partners.
System development is another critical principle of CBPR. The understanding and establishment of a process that includes assessing the community, defining the problem, developing a methodology, collecting and analyzing the data, interpreting the data, determining the action to take, disseminating the results and establishing a mechanism for sustainability is important (Minkler and Wallerstein, 2008). That process will assist with refining and maintaining programs and building community capacity to apply those skills to other challenges within the community. All 14 studies involved system development through a repeatable process. However, 6 out of 14 demonstrated limited operationalization of this principle. Specifically, the Pfeiffer et al. (2008), Mercer et al. (2009), and Donovan (2009) studies did not describe a maintenance plan. As a result, the length of retention of the skills and knowledge obtained may be significantly short limiting the community’s ability to repeat or iterate the process. For example, the Pfeiffer et al. (2008) study utilized specialized technicians to digitize the hazard and vulnerability maps drawn by the Chennai community work group and integrate them with the current digital satellite images to create a more comprehensive and accurate map to utilize for developing disaster-reduction strategies. The Chennai community may retain the knowledge of risk mapping to a limited degree, but did not receive the training to maintain the technical skill of digitizing the map and integrating it with satellite images.

The establishment of an equal partnership/power sharing between the community and the researcher within the research process is another important principle in participatory research. All but 4 of the articles reviewed showed a high level of equity as partners and in sharing power. For example, in the Donovan (2009), Pfieffer (2008), Gaillard and Pangilinan (2010) and Yamada, et al. (2011) articles, a partnership with the community was established but power was not shared equally over the entire process. The researchers appeared to direct, lead and facilitate most of the activities and research. The dynamic between partnerships and people can be extremely complex to include historical, cultural events and experiences that may negatively impact the level of trust and depth of the relationship (Minkler & Wallerstein, 2008). The process of trust and relationship building often takes time. It is not clear why the researchers chose an approach that limited power sharing, but often is the result of financial, time, and resource constraints.
Commitment to sustainability was the least followed principle (see Table 1.3). Only seven out of 14 articles had a sustainability plan for the project. Even though there is an increased level of potential sustainment from the empowerment, capacity building and the power-sharing process, it is still limited. The development of a long-term or sustainability plan is still essential for the continuation of the program or project when funding ends (Minkler & Wallerstein, 2008; Meheux, 2007). A good example of an approach to sustain a community-driven disaster-reduction program was described by Ardalan et al. (2010). They identified the importance of conducting a systems approach incorporating the community program into the Golestan Provincial Disaster Plan and Program to assist with its future development and retention of the needed level of funding for sustainment.

Limitations

There are a several limitations associated with this literature review. A primary limitation is publication bias. Publication bias may limit the number of research studies published on the utilization of a CBPR approach in disaster preparedness compared with more traditional or conventional approaches that may be deemed by reviewers and editors more significant and scientific. Another limitation is researcher bias. Researchers often design studies to maximize perceived interest, potential for publication, and funding and to minimize time of study. This frequently results in a “participatory” approach that fails to operationalize the key principles of CBPR. Terminology is another potential limitation. Even though the key terms were carefully selected to maximize the search, different terms are often used to represent the same thing. The terms CBPR, participatory research, and action research were included as search terms. However, disaster, natural disaster, participatory research and action research may be called or termed differently in other countries and specialties, resulting in missed articles. As a result, it is possible that some studies may have been overlooked. Search sources are another limitation. Not all studies may be indexed in the databases chosen for the search. Although multiple well-known databases were chosen, the researcher acknowledges that some studies may be missed.

Another consideration is that the use of CBPR in the field of disaster-reduction or management is still fairly new. It was not until about five to seven years ago that the UN and other organizations started to endorse this research approach for
disaster-reduction and preparedness. Although the use of this approach is slowly increasing, the number of articles reporting on its use in the field of disaster preparedness and recovery is still fairly limited. In addition, only one of the 14 included CBPR studies was from the U.S. The top-down approach to disaster preparedness, response, mitigation and recovery in developed Western nations remains heavily endorsed and supported. In fact, in 2005, in the U.S., the top-down national structured framework for disaster-reduction and preparedness termed the National Incident Management System was presidentially mandated with a federal fiscal incentive for adoption by all local, tribal, state and federal agencies that respond or may respond in the event of a natural disaster. As a result, in the U.S., the focus of time, funding, energy and resources has and continues to be a top-down directive approach to disaster preparedness.

A limitation of CBPR is that it requires a lot of time, money, and the ability to share power. It can take a considerable amount of time to build and develop trust and a relationship with a community as well as decide on an approach that is mutually agreeable. In addition, it is difficult for many researchers to relinquish full control. This may discourage some researchers.

Lastly, many of the studies either lacked an evaluation of the CBPR approach or a sustained evaluation plan. Disaster risk reduction strategies need to be frequently tested or evaluated to determine their level of effectiveness and relevance. In lieu of a real natural disaster, the tools utilized to evaluate disaster risk reduction strategies are tabletop, functional and full-scale exercises. Exercises allow the community to expose flaws or challenges within the strategies, maintain a state of readiness, and ensure that the strategies are still relevant.

**Conclusion**

Every disaster is unique, and every community is unique. CBPR puts the risk assessment and solution generation into a community’s cultural, social, geographic and economic context. This literature review has provided insight into the use of CBPR in assisting vulnerable communities in increasing awareness and the process of discovering solutions relative to natural disasters in Ethiopia, Japan, Puerto Rico, Philippines, Papua New Guinea, Vanuatu, Iran, Indonesia, Kenya, India, Taiwan and the U.S. When done
properly with commitment, CBPR has shown to be a successful method to assist with the development of a culturally, socially, fiscally, and geographically appropriate disaster mitigation and reduction plans and strategies. The results of the 14 research articles are reflective of this success. However, more studies are needed to convince countries that use top-down approaches, like the U.S., to pursue more participatory approaches. True CBPR provides the community with a tool to help address and interpret problems and sustain solutions. Hopefully, this review will help guide the design of future research toward adapting CBPR-based intervention to assist in the development of disaster-reduction strategies in vulnerable communities.
CHAPTER 3
PHOTOVOICE: ASSISTING VULNERABLE AT-RISK COMMUNITIES IN DEVELOPING DISASTER-REDUCTION STRATEGIES TO LESSON THE IMPACT OF NATURAL DISASTERS

ABSTRACT

Background: The traditional centralized disaster preparedness approach fails to take into consideration the unique geographic, historic, cultural, social needs of vulnerable at-risk communities. It often puts vulnerable communities more at risk by directing them to follow a one-size-fits-all model. A community-based participatory approach increases awareness and customizes the disaster-reduction strategies to meet a community’s unique needs and decrease their vulnerabilities.

Methods: A vulnerable at-risk community participated in a PhotoVoice project to identify and categorize their vulnerabilities and capabilities, identify gaps, and develop solution or strategies to reduce their vulnerability to a tsunami.

Results: Forty-two vulnerabilities and 50 capabilities within the community were identified and then categorized through photo presentations and discussion sessions. These were sorted into 17 themes including communications, accessibility, historic and cultural, emergency notification, food and water. Based on the vulnerability and capability assessment, 13 gaps were then identified and discussed, yielding 16 feasible strategies to reduce the community’s vulnerability.

Conclusions: PhotoVoice was found to be a successful community-based participatory process that can assist a vulnerable at-risk community with the development of contextually appropriate disaster-reduction strategies through visual dialogue, increased community awareness, engagement, and capacity building.
Research Question

How does the community perceive its vulnerabilities and capabilities to a natural disaster, as expressed through PhotoVoice?

Introduction

Traditionally, communities ask outside experts to conduct vulnerability and capability assessments and provide recommendations (Mercer, 2008). The experts would gather the appropriate information from their perspective utilizing their own experience, and sometimes conduct interviews with some of the residents or leaders to gather additional information. The information would be processed externally by the expert, and recommendations would be made based on the outsider’s experience, knowledge and trends. This often resulted in some misinterpretations or misunderstandings and recommendations that were not culturally, socially, or fiscally appropriate for the community and a dependence on external resources (Wisner, 2004, Burton, 1992). Even though an expert’s external perspective can be advantageous in that it may identify unrecognized vulnerabilities, capabilities, gaps and other relevant disaster preparedness items that the community may not even consider, by itself, it is inadequate because it fails to take into consideration the unique issues within community (Mercer, 2008, Cronin, 1999).

In contrast, community-based participatory research (CBPR) uses the community members, relevant stakeholders and the researcher as the subject matter experts to conduct the assessments, and develop recommendations (Minkler & Wallerstein, 2008). Focus groups and/or work groups consisting of residents within the community, relevant stakeholders and the researcher apply a community-based tool to conduct the assessments, gather the data, and make recommendations (Mercer, 2008; Cronin, 1999). This blended approach enhances the perspective beyond what a sole individual or organization could accomplish. CBPR marries the knowledge and ideas of both the community and the expert or researcher, yielding a more comprehensive and contextually appropriate series of recommendations. In addition, CBPR shares the process with the community, which increases community capacity through enhanced community awareness, system development, empowerment, and sustainability. Choosing an appropriate community-based tool to achieve the appropriate depth of perspective to influence positive change at
all levels within the community with regard to disaster preparedness is extremely important (Chambers, 1992).

PhotoVoice, a qualitative research method, employs photography as the means of expression that enables people to identify, reflect and communicate strengths, capacities, vulnerabilities and needs within their community through their own eyes as a basis for improvement and change (Minkler & Wallerstein, 2008; Wang & Burris, 1997). It provides a deeper perspective than the other CBPR tools by allowing everyone the opportunity to see the world through the eyes of community residents, rather than just hearing words. PhotoVoice was developed and first operationalized by Wang and Burris in 1994, which used the technique to conduct a needs assessment on rural women in China (Wang & Burris, 1994). Evidence of its specific application in disaster preparedness is limited in the published literature; however, PhotoVoice has been utilized extensively and successfully in assisting communities in conducting contextually appropriate needs assessments and community assessment around the world (Berbes-Blasquez, 2012; Lew et al., 2011; Minkler & Wallerstein, 2008; Newman, 2010; Sanders, 2010; Wang & Burris, 1994).

PhotoVoice was chosen for this study for the following reasons: (1) the initial photographic process engages individual participants to critically think, search, locate, and capture images of their vulnerabilities and capacities relative to a specific hazard or problem, which promotes a stronger level of awareness of their community; (2) Images are a more effective platform for stimulating dialogue and may result in deeper perspectives (Harper, 2002); (3) The photographs provide a visual catalog of the perceived vulnerabilities and associated capacities within the community for future reference and discussion; and (4) The process has been validated as a community and needs assessment tool.

In this study, PhotoVoice provides a means for the community to view and discuss its weaknesses and capabilities with regard to specific hazards. Understanding these vulnerabilities and capabilities provides the community with the necessary information to increase individual and community awareness and develop solutions or strategies that decrease vulnerabilities through strengthening capacity or capability. Community awareness and internal capacity are essential in saving lives. For example, in
Japan following the 9.1 earthquake, lack of community awareness and dependence on technology and external resources resulted in the loss of many lives (Suppasri et al., 2012; Carafano, 2011).

**Methods**

**Study Approach**

The researcher engaged and partnered with Community X, a geographically vulnerable at-risk community on one of the Hawaiian Islands, to co-develop a community preparedness plan for a specific natural hazard encompassing the first two components of the preparedness cycle. Community X chose tsunami as the natural hazard for this study based on their concerns and needs. The researcher and community utilized Wang’s 1999 validated PhotoVoice process framework while operationalizing the seven core principles of CBPR to conduct the vulnerability and capability assessment, gap analysis and solution sessions. These core principles include: 1) building on strengths and resources; 2) power sharing; 3) co-learning; 4) capacity building; 5) system development; 6) disseminating finding and knowledge to all; and 7) a commitment to sustainability (Minkler & Wallerstein, 2008). These principles were incorporated in the following manner:

In this study, the strengths and resources within the selected community were highlighted and enhanced. The community participants utilized photography to capture current community capabilities and resources with respect to identified vulnerabilities and discuss how each lessens or reduces specific vulnerabilities. These capabilities and resources were highlighted and evaluated through a group capability gap analysis to determine how to enhance or build on them from resources within the community as well as externally.

Power was shared between the community and the researcher. The community participants appointed a leader through consensus. That leader co-facilitated the study with the researcher. Prior to the start of the study, community participants and the researcher discussed and decided on the appropriate process to resolve any disputes that may arise during the study. Final decision making in all areas involved the researcher, leaders and the community participants.
The community learned from the researcher the skills of how to conduct and facilitate a research level participatory assessment, gap analysis and strategy development session utilizing PhotoVoice. In addition, the community learned how to process and interpret the data. At the same time, the researcher learned more about the community culture, its perceived vulnerabilities specific to a disaster and the associated capabilities within the community identified to reduce the level of vulnerability. Also, the researcher learned how the community works together to discover their own solutions or strategies for reducing their vulnerabilities.

The study provided the community with the skills necessary to conduct a systematic process framework of assessing their own vulnerabilities with respect to any specific hazard, identifying their current capabilities that can be utilized in addressing those vulnerabilities as well as identifying gaps and discovering solutions for those gaps or shortfalls.

The process of conducting the assessments, identifying capabilities and gaps and developing solution for a specific hazard was designed to be replicable. The community was given the knowledge and the tools to be able to repeat the research process for either updating or for conducting new hazard preparedness plans. The process was designed to accommodate any and all natural hazards. For example, the community will be able to follow the same process for developing tsunamis, earthquakes, flooding, and wildfires preparedness plans.

All of the findings from the vulnerability and capability assessment were distributed initially via paper or electronic source to all community members participating in the work group. After work group participants provided feedback, the findings were disseminated to all residents within the community for additional input and feedback. In addition, the gap analysis and potential solutions for those gaps were disseminated to all within the community for additional feedback and comments. This occurred throughout the entire length of the study. At the completion of the study, the final results and write-up were made available via paper or electronically.

A level of short-term sustainability became present inherently as a result of the capacity building. Also, the study utilized the FEMA preparedness cycle to meet federal compliance standards in order to qualify for federal funding should some become
available. Federal funding would assist the community with purchasing additional equipment and resources to augment or enhance existing capabilities and provide a level of short term sustainability. Lastly, the researcher continues to work with the community to establish timelines for review of the assessments and strategies in order to update the preparedness plan as conditions and resources may change. This should lead to a longer level of sustainability.

**Location and Site Selection Criteria**

Community X is a remote community located on one of the seven inhabited islands. The daily population is estimated at less than 100 with fluctuations due to tourism. Access to and from the community is fairly limited. Some supplies, such as perishable food and freight, are flown in daily but others arrive on a barge once a year. Community X was chosen as the site for this participatory study based on the following criteria: geographical isolation, limited resources, limited access, good internal organization, open-mindedness toward outsiders, and willingness to develop an emergency plan.

**Sample and Recruitment**

The researcher worked with the community administrators to openly invite all community members to attend an information and orientation session. The session took place in the community meeting hall and concluded with inviting the attendees to participate in the project. The inclusion criteria to participate in this project include (1) Adult 18 years and older, (2) Resident within the community, and (3) Committed to the entire length of the project. Sixteen (16) residents agreed to participate in the study. Five working groups were formed to ensure smaller group sizes so that everyone would have an opportunity within the group to vocalize. The leader or leaders within the working groups were determined by its members and cultural protocol. For instance, participants openly suggested names of potential leaders within their working group. Then, those names were discussed openly until a consensus on one name was reached.

**Study Procedure**

Caroline Wang’s validated process framework was utilized with some small adaptations (Wang, 1999).

**Step 1: Orientation and information session.**
The initial community meeting was held at the community meeting hall which was determined by the leaders. The meeting consisted of an orientation and information session with regard to this project. It was from this meeting that the participants were recruited. The following agenda was conducted.

- Goals and objectives of the project
- Risk, vulnerability and capacity assessment: Why and how is it relevant? What is the process?
- PhotoVoice: What is it? How is it done? What is the process?
- Discuss community and research expectations
- Conflict resolution plan and procedures – how will we resolve problems or conflicts?
- Discuss how the information will be used, the dissemination plan and the relationship between the community and the researcher.
- Recruitment of volunteers from the community to participate in the study.

**Step 2: Obtaining consent.**

Written informed consent was read and explained to all participants at the orientation and information session. The consent form contained a statement of activities and significance, delineated specific potential risks and benefits, and explained that participation was voluntary and anyone at any time could withdraw from the project for any reason. Each interested participant was required to sign the consent form prior to participation in the project. In addition, the consent stated that photographs of individuals were not be permitted without the expressed written release from that individual, and a set of written release forms was provided to each participant. Sixteen signed consent forms were collected.

**Step 3: Discussing framing questions for taking pictures.**

Each participant received a paper copy of the two framing questions:

- What vulnerabilities with respect to this hazard exist within your community? (I.e. people, objects, buildings, environment)
- What capabilities does my community have to address the occurrence of this hazard? (i.e communication/alert devices, supplies, plans, vehicles, natural buffers, sustainment, safe areas, etc.)
In addition, the following definitions of vulnerability and capacity were utilized to help guide participants in the task:

- **Vulnerability** is defined as “the susceptibility of life, property, or environment to damage if a hazard occurs” (May, 2000).
- **Capacity** is defined as “A combination of all strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability” (UN/ISDR, 2004).

Participants from the working groups collectively brainstormed and discussed ways in which they might portray answers to the framing questions and suggested any additional ones that were relevant to answering our research question. Responses were documented on a paper easel and additional framing questions incorporated as determined by the community and the researcher.

**Step 4: Training participants and distribution of cameras**

*Ethics and safe practices photography training*

Photographs are powerful representations. It is imperative that the researcher and participants are sensitive and respect privacy. Intentionally or unintentionally embarrassing someone publicly or upsetting someone as a result of a photograph is not the objective. It was suggested that participants take pictures of objects rather than individuals. However, if a participant felt it relevant to the theme to take an individual’s picture, they had to obtain a signed release form from that individual prior to taking their picture. As noted, photo release forms were distributed during this discussion. Participants were also instructed not to take pictures of illegal activities even if it was related to the themes for safety reasons.

*Technical training*

All participants were trained in how to use the camera and techniques of photography prior to distribution. This included but was not limited to the general operation of the camera such as power on and off, using the flash, reviewing the pictures
taken on the camera screen. Also, participants were trained on how to ensure a picture was taken in focus.

**Camera distribution and photography assignment**

There were several options regarding the type of camera that can be used in PhotoVoice including digital, Polaroid cameras, Holga cameras, and disposable cameras (Wang, 1999). Given the inability to develop film in the remote community and the potential physical challenge and distraction of having to carry up to 24 Polaroid pictures per photographer, film cameras were not considered practical. The researcher and the community chose reusable digital cameras in this study. Six digital cameras were loaned to each group for a period of three days. Participants were asked to each take up to 12 pictures per framing question or up to 24 photos. Any persons who was physically challenged and unable to physically focus the camera, push the buttons, etc. was paired with another member of the working group to assist. After taking up to 12 pictures per framing question or up to 24, each group member or participant was asked to transfer those pictures to the researcher’s computer for storage. The researcher was physically present in the community for the duration of picture taking to ensure that the pictures were put into the computer and that any questions, needs or concerns could be addressed quickly. The leaders of the working groups were responsible to ensure that each member of their group had an adequate opportunity to take their photos. At the end of the 3 days, all of the digital cameras were collected from the group leaders.

**Step 5: Selecting the Photos and Sharing**

**Working Group Photo Sharing Session**

Each group leader facilitated the session. The researcher was present to observe and assist as appropriate. During this session, each working group met to share the photographs taken. Each working group was asked to share their photos in a round robin for each framing question that expresses their perception of vulnerability and capacity. The participant was asked to present their photos in front of their group reflecting the following:

- Briefly describe the photo
- Is it a vulnerability or capacity?
- Why is it a vulnerability or capacity? Does it have a personal story?
Large group sharing and discussion session

After all participants shared their photos with their group, each group was asked to present their pictures representing vulnerabilities and capabilities and present them to the other groups. Each group was given 45 to 60 minutes to present their photographs to all groups collectively. However, if more time was needed for the presentations, it was provided. Each photo was described, categorized (vulnerability or capacity) and justified with an explanation of why and how it was thought to be either a vulnerability or capacity/capability.

Two easel boards were set up to document all of the vulnerabilities and capabilities separately. The group leaders and the researcher co-facilitated the session. However, the group leaders were the primary facilitators. At the conclusion of session, as a collective, all the vulnerabilities and capabilities documented were reviewed, and evaluated to determine their completeness. Any additional vulnerabilities and capabilities not listed were discussed and added. This session was tape recorded and transcribed to ensure that all of the details were captured.

Step 6: Priorities, Gaps and Solutions

Work Group

Based on the information collected in the previous session, all work groups collectively brainstormed capability gaps and possible mitigation solutions and documented priorities for the identified gaps. Three easel boards were set up to document the priorities, gaps and solutions separately. The group leaders and the researcher co-facilitated the group work. The following questions helped guide the group.

- Given a specific vulnerability, how can we reduce that level of vulnerability?
- What specific things can we do to increase our internal capability in order to reduce our vulnerability to this hazard?
- Who are or should be responsible for certain actions? Should there be any backups or redundancies?
- What are the community’s priorities with regard to the identified strategies? List them in the order of importance.

At the conclusion of session, the final agreed upon priorities, gaps and solutions or strategies documented were reviewed and evaluated to determine their completeness.
Data Analysis

Analysis occurred on two levels (community and academic) in an effort to ensure quality of data. The working groups as a collective analyzed the data documented on the two easels for emerging themes, categories or concepts. The group leaders and researcher co-facilitated this session. This basic type of analysis was adequate for sustainability and maintaining interest in the process.

The secondary or academic level of analysis was conducted by the lead researcher. The audio recording from Step 6 was transcribed verbatim in its entirety from the digital recording and coded. Each line of the transcript was numbered to assist with the coding process that followed. The process of grounded theory coding was utilized to assist with the extraction of both the implicit and explicit within the data. Grounded theory is a qualitative research method. It employs a systematic process of analysis to generate contextual theory constructs from the data to expand or develop a better understanding about a problem or issue (Corbin & Strauss, 2007). Grounded theory was chosen for its ability to provide deeper insight and explanation into the community’s perceptions of their vulnerabilities and capabilities to a tsunami (Charmaz, 2006). Through the analysis of connections, patterns and coding, several emerging themes evolved explaining those perceptions. Initial coding involved a line by line process analysis. Each respondent line within the transcript was analyzed for explicit and implicit actions possibly at play within the statements and also to discern what processes might be at play. Each coding statement was then placed next to its corresponding line or paragraph. After the initial coding, a focused coding process was conducted on each of the codes to determine frequency of occurrence among the other codes and common themes. Both the initial and the focused coding results were placed in a side by side table to facilitate ease of interpretation.

Results

Primary Data Analysis

Sixteen residents participated in the study. A total of 90 photographs were taken representing perceived vulnerabilities and capabilities within the communities relative to the impact of a tsunami. A number of photos were of the ocean shoreline, which surrounds the community on three sides. Others were of the airstrip with a capacity of
12-seater (or smaller) airplanes, the harbor that sees one or two supply ships per month, and the 2-mile trail up a steep cliff; these represent the only ways into and out of the community. Others shared photos of signs such as the visitor’s quarters representing their concern for visitors, guests and tourists, and tsunami evacuation signs that show the direction to evacuate to higher ground, as well as pictures of heavy machinery such as back hoes, fork lifts that can assist with recovery, and rebuilding, and the community and Civil Defense sirens that provide warning to the community, etc.

The picture presentations and in-depth discussions yielded 42 perceived vulnerabilities and 50 perceived capabilities. Those vulnerabilities and capabilities were analyzed for commonality or themes. Participants and the researcher identified 18 vulnerability and 17 capability themes. The vulnerability themes consisted of communications, accessibility, historic and cultural, emergency notification, long-term care, food and water, fuel, power and electricity, pets, transportation, hygiene, people, wildlife, documents, medical and trauma, heavy equipment, shelter and personal property (see Table 3.1).

Table 3.1 Vulnerabilities Identified

<table>
<thead>
<tr>
<th>Categories of Vulnerability</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical and Cultural</td>
<td>Historic and artifact storage facility and its contents are located in the inundation zone; loose scrap materials and construction materials not secured such as metal, roofing materials, etc. piled outside could become projectiles in the event of tsunami damaging historic storage facility; air conditioner used to maintain constant temperature of historic items in storage is on ground in the inundation zone and could get wet compromising historical items; cemetery – potential dis-internments and trees falling and destroying head stones.</td>
</tr>
<tr>
<td>Accessibility to community</td>
<td>Isolated community (remote); trail to and from topside Island X – Steep, 26 switchbacks, 3 plus miles; trail bridge susceptible to collapse if earthquake occurs as well as rocks could make the trail inaccessible; part of the trail runs along the coastline; airport is in the inundation zone; dock/pier; there are many dry stream beds that have bridges and channel to the ocean. A tsunami would potentially destroy those bridges making areas of the community difficult to access and exit.</td>
</tr>
<tr>
<td>Hygiene</td>
<td>Toilets</td>
</tr>
<tr>
<td>People</td>
<td>Tourists; residents; guests/visitors</td>
</tr>
</tbody>
</table>
Table 3.1 (Continued) Vulnerabilities Identified

<table>
<thead>
<tr>
<th>Categories of Vulnerability</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power/Electricity</td>
<td>Power lines run down the Pali into the community in the inundation zone; generator for the Nursing facility is in the inundation zone; airport portable generator; 100 kw generator wire at 220.</td>
</tr>
<tr>
<td>Communication</td>
<td>Telephone lines and fiberoptic lines run along the trail which includes portion of the coastline; satellite phone (Iridium) located in a building inside the inundation zone; Base station satellite phone is mounted in the nursing facility that is located in the inundation zone; T-1 system located at the nursing facility for internet is in the inundation zone; Airport Satellite phone.</td>
</tr>
<tr>
<td>Wild Life and Animals</td>
<td>Mules; Sea Turtles and Other Sea Animals; Pets</td>
</tr>
<tr>
<td>Transportation</td>
<td>Gas station is located near the water. Risk of contamination with saltwater; Vehicles with partially filled or low gasoline levels; inaccessibility of the gasoline pumps 24 hours a day; vehicles parked along the water.</td>
</tr>
<tr>
<td>Medical and Trauma Care</td>
<td>Level of emergency care providers is extremely limited only one EMT and first responder; Population susceptible to acute injuries and chronic complications</td>
</tr>
<tr>
<td>Emergency Notification</td>
<td>During a normal day, the population is often unable to hear the State activated sirens in the community because of the trade winds; the community siren does not have voice to direct community. It is used for all emergencies including daily; Residents do not know who to contact or report to with regard to a tsunami; Voice from the vehicle PA systems does not travel very far.</td>
</tr>
<tr>
<td>Food and Water</td>
<td>Community store is located in the inundation zone; heater meals are being stored in the warehouse next to the ocean; water tanks for the community might be at risk of being destroyed from boulders if earthquake occurs; Family members from topside searching for family members.</td>
</tr>
<tr>
<td>Essential Data/File Loss</td>
<td>Visitor center containing records of all guest, etc. is in the inundation zone; Computer hard drive containing personnel records located in the inundation zone (only copy).</td>
</tr>
<tr>
<td>Psychological</td>
<td>General community mindset. A level of complacency exists or rather a level of dependence on specific individuals or agencies.</td>
</tr>
<tr>
<td>Personal Property</td>
<td>Home theft</td>
</tr>
</tbody>
</table>

The capabilities themes identified were similar to vulnerabilities. Those themes included access, fuel, heavy equipment, people, historic and cultural, communication, transportation, electricity/power, food and water, emergency notification, pets, hygiene, emergency/rescue equipment, medical and trauma, long-term care, shelter, and mobility.
of some data (Table 3.2). An informal additional review by other community members was conducted to determine additional themes, vulnerabilities, or capabilities but yielded none.

Table 3.2 Capability Assessment

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Knowledge</td>
<td>Residents’ knowledge of the community; experience with previous tsunami events and evacuations.</td>
</tr>
<tr>
<td>Power/Electricity</td>
<td>Care home generator (if still intact and functional); Portable generator (100kw); Airport portable generator</td>
</tr>
<tr>
<td>Accessibility to community</td>
<td>Trail - provides access to both the community and Island X topside if unaffected; New Trail Bridge (offers greater level of sustainability because of new construction); Airport – Access and extract point if still intact; Dock (ocean access) if still intact following tsunami; Helicopter Landing Zone near evacuation zone.</td>
</tr>
<tr>
<td>Recovery Equipment</td>
<td>Backhoe; Bucket truck; Tractor; Grater; Shredder</td>
</tr>
<tr>
<td>Communication</td>
<td>Community information board – provides a tool for information sharing; Iridium Portable Satellite phone in the Nursing home; Base Station Satellite phone with two portable handheld in the Nursing Home; Airport Satellite phone; Telephones if lines are still intact; Hall X HAM radio base station; Light house – repeater for dispatch (high location)</td>
</tr>
<tr>
<td>Evacuation site</td>
<td>Response containers at evacuation site; Directional signs (tsunami evacuation signs direct everyone towards evacuation zone); Evacuation site – 360 feet above sea level.</td>
</tr>
<tr>
<td>Transportation</td>
<td>Tour bus – can be used for evacuation; Truck for transport; Personal owned vehicles (residents); Portable diesel barrels on pallet ready for transport; 2000 gallons of diesel at water tank storage facility.</td>
</tr>
<tr>
<td>Emergency Notification</td>
<td>Community information board – provides a tool for information sharing; Community Siren; SCD Sirens; A 2 agency trucks and the structural fire engine with PA systems and sirens; Civil Air Patrol historically does a fly voice notification; Guest rules (guests need to be escorted by a sponsor) provide an easier means of notifying or communicating with the guest through the sponsor.</td>
</tr>
<tr>
<td>Food and Water</td>
<td>Heater meals in the event of an evacuation located in warehouse closest to ocean; Community store - (Food); Some agency specific emergency go packs contain food; Water jugs (supply water); portable kitchen with gas stoves and 40 gallons of propane; Hunting (wild pig, deer, goat); Water faucet (potable) at evacuation site</td>
</tr>
<tr>
<td>Emergency and Rescue Equipment and Supplies</td>
<td>Cert bags, rope climbing equipment; Historic preservation trailer – mobile tools and generator; Wild land Fire truck – rescue and EMS supplies</td>
</tr>
</tbody>
</table>
Table 3.2 (Continued) Capability Assessment

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical and Trauma Care</td>
<td>EMS equipment (AED, Oxygen, EMS kit); Ambulance (stocked with medical and trauma supplies); Pre-assigned individuals to transport AED in the event of a disaster; Structural Fire Engine contains EMS supplies; 1 Certified EMT and wilderness first responder; 2 Long-term care RNs.</td>
</tr>
<tr>
<td>Shelter</td>
<td>Camping gear/equipment; Evacuation site shelter (under construction)</td>
</tr>
<tr>
<td>Natural Buffers</td>
<td>Natural buffers such as bushes and trees</td>
</tr>
<tr>
<td>Moving Supplies</td>
<td>Fork lift; Flatbed truck</td>
</tr>
<tr>
<td>Traffic Control</td>
<td>Cattle crossing bridge (use to control vehicles)</td>
</tr>
<tr>
<td>Meeting Place</td>
<td>Community Hall (meeting area) fairly high ground. Utilized as a meeting place or gathering place of those individuals assigned to assist with a slow evacuation.</td>
</tr>
</tbody>
</table>

The 42 perceived vulnerabilities and 50 perceived capabilities were then organized under those categories by the researcher and participants and formatted into a side by side match up (Table 3.3). The results from the vulnerability and capability assessment were used for the gap analysis and strategy development session, as well as for a future training and exercise development. The results will also become part of the community’s Emergency Operations Plan document. The photographs were formatted into two PowerPoint presentations, one titled “vulnerabilities” and the other “capabilities.” These PowerPoint presentations will be used by the community as a photographic catalog of their vulnerabilities and capabilities for future updates, reference and assist with potential future funding and policy change.

Table 3.3 Vulnerability and Capability Comparison

<table>
<thead>
<tr>
<th>Vulnerability</th>
<th>Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication:</td>
<td><strong>Communication:</strong> Telephones – land line (If operational); Iridium Satellite phones are portable; Hall X HAM radio if detached and transported; Light house – repeater for VHF radios (high location); Community information board; Airport Satellite phone</td>
</tr>
<tr>
<td>Power/Electricity:</td>
<td><strong>Power/Electricity:</strong> Care home generator if not destroyed by tsunami; Airport portable generator</td>
</tr>
<tr>
<td>Pets:</td>
<td><strong>Pets:</strong> Many dogs, cats and other pets in community</td>
</tr>
<tr>
<td>Wildlife and Animals:</td>
<td><strong>Wildlife and Animals:</strong> Sea Turtles; Mules</td>
</tr>
<tr>
<td>Vulnerability</td>
<td>Capabilities</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Accessibility to the community</strong>: Isolated community (remote); trail; airport; dock; community bridges.</td>
<td><strong>Accessibility to the community</strong>: Trail – if intact, provides access; New Trail Bridge (offers greater level of sustainability due to new construction); Both Airport and dock if intact be an access and extract point.</td>
</tr>
<tr>
<td><strong>Fuel</strong>: Gas station is located near the water; time to load the barrels and transport to evacuation site; keys to the gas station pumps are not always accessible.</td>
<td><strong>Fuel</strong>: Portable diesel barrels on pallet ready for transport; 2000 gallons of diesel at water tank storage facility</td>
</tr>
<tr>
<td><strong>Food and Water</strong>: Community store; ready meals; water tanks for the community.</td>
<td><strong>Food and Water</strong>: Ready meals; community store; portable water jugs; hunting (Pig, goat, deer) (hunting rifle); Drinkable or potable water access point (faucet) located at evacuation site.</td>
</tr>
<tr>
<td><strong>Historic and Cultural</strong>: Cemetery risk of dis-internment; Historic and Artifact storage facility &amp; contents</td>
<td><strong>Historic and Cultural</strong>: natural buffers as bushes and trees provide minimal protection to a cemetery.</td>
</tr>
<tr>
<td><strong>Hygiene</strong>: Toilets</td>
<td><strong>Hygiene</strong>: Portable Toilets are planned to be placed on a pallet on high ground and be transported to at Evacuation Zone</td>
</tr>
<tr>
<td><strong>People within the community</strong>: Guests and Tourists – lack of knowledge and information with regard to what to do in the event of a disaster; Residents – individual and community awareness and potential complacency. Evacuation directional signs not complete.</td>
<td><strong>People within the community</strong>: Tsunami Evacuation directional signs to Evacuation Zone; Safe zone – Evacuation zone; residents’ knowledge of the community.</td>
</tr>
<tr>
<td><strong>Transportation</strong>: Keys for agency vehicles are not located in a central accessible location; Both agencies vehicles are parked daily in the inundation zone</td>
<td><strong>Transportation</strong>: Both agency and resident vehicles available to assist with transporting to evacuation site; tour bus if time permits</td>
</tr>
<tr>
<td><strong>Documents</strong>: Agency personnel records and computer hard drive; Visitor center records of guests, Community administration files</td>
<td><strong>Documents</strong>: Administrator of community has a plan to quickly evacuate with essential administrative files</td>
</tr>
<tr>
<td><strong>Heavy Equipment</strong>: Backhoe, grater, lawn mower, forklifts, Boom truck, shredder,</td>
<td><strong>Heavy Equipment</strong>: If heavy equipment is evacuated to evacuation zone, it can later be used for operations.</td>
</tr>
<tr>
<td><strong>Shelter</strong>: Homes and building in the community are in the inundation zone.</td>
<td><strong>Shelter</strong>: Evacuation site – under construction will have a covered area soon; camping equipment (some tents)</td>
</tr>
<tr>
<td><strong>Emergency Notification</strong>: State activated sirens; the community siren; Residents do not know who to call or contact to report information; mobile PA system on difficult to hear; unable to hear sirens on beach.</td>
<td><strong>Emergency Notification</strong>: Community Siren; SCD Sirens when heard; Trucks and structural fire engine with PA system and Siren; Civil Air Patrol voice notification.</td>
</tr>
<tr>
<td><strong>Long-term Care</strong>: Nursing home; beds; dialysis machines; oxygen equipment; medications; patients.</td>
<td><strong>Long-term Care</strong>: Long-term RNs; portable medication box; nursing home evacuation plan; portable oxygen.</td>
</tr>
<tr>
<td><strong>Personal Property</strong>: Home theft</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.3 (Continued) Vulnerability and Capability Comparison

<table>
<thead>
<tr>
<th>Vulnerability</th>
<th>Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical and Trauma Care: Level of emergency care providers is extremely limited only one EMT and first responder; Population susceptible to acute injuries and chronic complications</td>
<td>Medical and Trauma Care: EMS equipment (AED, Oxygen, EMS kit); Ambulance &amp; supplies; Pre-assigned individuals with AED; Certified EMT and wilderness first responder.</td>
</tr>
</tbody>
</table>

Secondary Data Analysis (Grounded Theory)

A data analysis of the transcribed manuscript conducted using grounded theory resulted in the emergence of several common themes similar to those discovered by the participants in the primary analysis. Those themes were organized under the following three categories: Vulnerability, capability, strategy.

Eighteen themes emerged under vulnerabilities. Those themes included communications, access, emergency notification, electricity/power, fuel, food and water, historical and cultural, animals and wildlife, people, long-term care, transportation, data/documents, heavy equipment, medical and trauma, pets, shelter, hygiene, personal property. Some of the major reasons expressed by residents for this feeling of vulnerability were the community’s location in the tsunami inundation zone, potential limited evacuation time, limited planning collaboration and corroboration between agencies within the community, limited accessibility to the community, and vulnerable populations such as visitors and guests.

Seventeen themes emerged under capabilities, including access, fuel, heavy equipment, people, natural buffers, communication, transportation, electricity/power, food and water, emergency notification, pets, hygiene, emergency/rescue equipment, medical and trauma, long-term care, shelter, and mobility of some data. The participants acknowledged that multiple means of communication, ready meals, potable water, emergency notification, evacuation site directional signs, and the evacuation site were established in an effort to try to reduce their level of vulnerability. However, the participants also acknowledged that even though the level of capability within the community may seem abundant, gaps do exist and many of those capabilities are currently located in the inundation zone. With a short tsunami arrival time scenario,
many of the capabilities such as food, heavy equipment, some of the vehicles may be left behind and could potentially become a casualty of the tsunami and potentially useless.

Participants suggested various strategies to improve their capability and reduce their level vulnerability. Those strategies encompassed the following seven categories: Food, access, emergency notification, communications, essential computer files and transportation. For example, participants cited prepositioning their prepackaged survivor meals on higher ground and hunting as two potential strategies for reducing food vulnerability in the event of a rapid evacuation due to a tsunami. The area around the evacuation site is rich in wildlife and fruits such as pig, goat, guava, mango, etc. It was acknowledged that the natural abundance of food at the evacuation site is a viable option that would reduce placing community members at risk loading and transporting food in the inundation zone with a rapid approaching tsunami.

A strategy to ensure access to the evacuation site by all vehicles was also acknowledged. Participants expressed concern over the ability of the cattle guard to accommodate the weight of some of the heavier vehicles during an evacuation to the evacuation site. The cattle guard is the only access point to the evacuation site. Should the cattle guard fail, it would make access extremely difficult. Participants cited the utilization of a side gate for those heavier vehicles as a potential strategy to reduce that concern and potential risk.

Two strategies were cited to reduce the vulnerability of the vehicles. Participants expressed concern over the inaccessibility of some of the community specific vehicles such as vans, etc. that are issued to individuals and the vulnerability of the community vehicles parked next to the water. Participants suggested the establishment of a central key box as a potential strategy to increase accessibility to those vehicles that will potentially be utilized for evacuation and the establishment of a parking lot on higher ground to reduce the vulnerability of the vehicles near typically parked near the water.

Other strategies participants cited were related to emergency notification, communication, and computer data/file loss. Participants mentioned that heavy winds and the inability to distinguish the community siren from other types of emergencies have made community tsunami specific notification extremely difficult. Installing a community PA system, conducting door to door notifications and using PA systems in
three community vehicles were acknowledged as potential strategies to reduce this vulnerability and improve tsunami emergency notification. Moving the HAM radio antenna and base station to the evacuation site, permanently rigging 2 vehicles with portable HAM radios and backing up essential computer files either externally or on external hard drives were also discussed as potential strategies to decrease the vulnerability of the computer data files and increase communication capability options at the evacuation site.

**Gap Analysis**

The gap analysis identified 13 perceived gaps in the community’s capabilities (see Table 3.4). Those gaps were categorized into the following eleven areas: Emergency notification, communications, historic and cultural, planning and coordination, awareness, training and exercising, transportation, transporting of food, evacuation location, power and sustainability. For example, participants acknowledged that in a rapidly approaching tsunami, the community’s current emergency notification capabilities are not optimal and are extremely time consuming placing some at risk. The lack of a community PA system makes providing broad disaster specific notifications and directions difficult and potentially dangerous.

The participants acknowledge the importance of planning and coordination and identified the following three gaps under this category: the lack of defined responsibilities and coordination, absence of a master tsunami emergency operations plan and the lack of a pet plan. Even though there are some defined roles within the community, participants acknowledge that there is clearly a need and a desire for improved coordination, more defined responsibilities and a master plan with regard to community evacuation and disaster response. Participants also acknowledged the lack of a pet plan. Many of the residents have dogs, cats and other pets, but had not previously considered them in the evacuation process.

**Table 3.4 Gap Analysis with Potential Strategies**

<table>
<thead>
<tr>
<th>Gap</th>
<th>Potential Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power: A large portable generator is not wired to 110. As a result, it cannot currently be used for backup power.</td>
<td>Have the portable generator rewired from 220 to 110. Then, store the generator at the evacuation site.</td>
</tr>
<tr>
<td>Gap</td>
<td>Potential Strategy</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Planning and Coordination: A lack of clearly defined responsibilities and coordination, the absence of a master tsunami emergency operations plan and the lack of a pet plan.</td>
<td>Work with the community to clearly establish responsibilities and improve coordination; develop a simple community master tsunami emergency operation plan and pet plan.</td>
</tr>
<tr>
<td>Emergency Notification: The lack of a community PA system makes providing broad disaster specific notifications and directions difficult and potentially dangerous. Currently there is not any means to distinguish a long distance tsunami from a short distance rapidly approaching one.</td>
<td>Purchase a federally compliant community PA System to use to advise and direct the community during an event. Temporarily use the structural fire engine and the two agency vehicles with PA systems to advise and direct population. Train the community to assist with the short arrival time tsunamis notification, by having everyone in their cars honk their horns as they drive up to evacuation site.</td>
</tr>
<tr>
<td>Evacuation Location: Signage to evacuation site (tsunami evacuation zone directional signs do not continue all the way to the evacuation site).</td>
<td>Purchase more tsunami evacuation signs to continue all the way to the evacuation zone site to direct evacuees; also consider having traffic guides directing evacuees to the site until signs are in place.</td>
</tr>
<tr>
<td>Training and Exercising: Training and exercising (Sustainability and Preparation)</td>
<td>Develop community level training and preparedness capacity and sustainability.</td>
</tr>
<tr>
<td>Historic and Cultural: Unable to identify and re- Intern those buried in the graveyards following a tsunami.</td>
<td></td>
</tr>
<tr>
<td>Power: A large portable generator is not wired to 110. As a result, it cannot currently be used for backup power.</td>
<td>Have the portable generator rewired from 220 to 110. Then, store the generator at the evacuation site.</td>
</tr>
<tr>
<td>Communications: Two-way communication with external agencies (currently must utilize dispatch to relay messages back and forth)</td>
<td>Install a satellite base station phone at the evacuation site; Also, consider the establishment of vehicles with portable HAM radio capability and communication redundancy; move the HAM radio antenna to evacuation site.</td>
</tr>
<tr>
<td>Transporting of Food: It is challenging to extract food and other essential items in a rapid manner to evacuation site within a 20 minutes.</td>
<td>Consider storing typed essential food on trays in the store so that it is easier to extract; Stage survival food at evacuation site or higher ground; Develop pre-packed kitchen utensil packs; Hunting</td>
</tr>
<tr>
<td>Awareness: Guests and Tourists – lack of knowledge and information with regard to what to do in the event of a disaster.</td>
<td>Develop informational brochures and leaflets to post and distribute to guests and tourists with regard to the actions to take in the event of a disaster. Also, consider an initial orientation with a historical briefing about community and either a short briefing or video/audio explaining what to do in the event a disaster in the community.</td>
</tr>
</tbody>
</table>
Table 3.4 (Continued) Gap Analysis with Potential Strategies

<table>
<thead>
<tr>
<th>Gap</th>
<th>Potential Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability: Lack of sustainability for emergency plan, training and awareness for tsunamis.</td>
<td>An annual Tsunami Awareness Month will be established. Activities will include community education and awareness training on tsunami, review of the evacuation plan and potentially an exercise.</td>
</tr>
<tr>
<td>Transportation: Lack of 24 hour access to fuel pump; lack of 24-hour accessibility to some of the community specific vehicles such as vans, etc. that are issued to individuals; lack of parking lot on higher ground to store vehicles.</td>
<td>Request own fuel pump for Agency X and/or request a set of keys for current fuel pump to ensure 24-hour access. Establish a centralized key box for community vehicles. Re-allocate an area on higher ground and designate as a parking lot to stage vehicles.</td>
</tr>
</tbody>
</table>

Awareness was another large gap that was identified. The community receives many tourists, guests and visitors every day and week. Those guests and tourist are unfamiliar with what to do and where to go in the event of a tsunami. The participants acknowledge that when guest, visitors and tourists arrive, there is not any information or education given on what to do in the event of tsunami. In fact, according to some participants, during the Japan tsunami evacuation, many visitors were standing outside the visitor’s quarters near the water unsure of what was happening and what to do.

Training and exercise and sustainability were also identified as gaps. Participants acknowledged a need for community level training and exercise to better prepare them for their worst case scenario which is the 20 minute tsunami from the Big Island. Currently, there is very little if any community level disaster training and exercising. Participants also noted that without a clear commitment to establishing a continual training and exercising process or program, sustainability will not occur.

The ability for the community to re-intern those bodily remains that may become dis-interred following a tsunami is another recognized historic and cultural gap. Within the community there are burial sites that consist of thousands of remains both marked and unmarked. If a dis-internment were to occur, participants acknowledge that it would be extremely difficult if not impossible to identify and re-intern all of the bodily remains.

**Strategy Development**

Sixteen potential strategies to decrease or eliminate the capability gaps resulted from the strategy development session (see Table 3.4). Those strategies were organized
into eleven categories (see Table 3.5) and prioritized into the following order: 1) Develop a master tsunami emergency operations plan; 2) Develop and implement the emergency notification strategy; 3) Conduct more training and exercises; 4) Work with the community to clearly establish responsibilities and improve coordination; 5) Develop pre-established emergency roles for rapid response; 6) Establish two way communication access at the evacuation site; 7) Re-wire and store the 100kw portable generators at the evacuation site; 8) Implement awareness strategy; 9) Implement food strategies; 10) Complete tsunami evacuation signage; and 11) Implement fuel strategies.

Table 3.5 Preparedness Priorities

<table>
<thead>
<tr>
<th>Tsunami Preparedness Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Develop a master tsunami emergency operations plan</td>
</tr>
<tr>
<td>2. Develop and implement the emergency notification strategy</td>
</tr>
<tr>
<td>3. Conduct more training and exercises</td>
</tr>
<tr>
<td>4. Work with community to clearly establish responsibilities and improve coordination.</td>
</tr>
<tr>
<td>5. Develop pre-established emergency roles for rapid response (Job-Action-Sheets)</td>
</tr>
<tr>
<td>6. Establish two way communication access at the evacuation site</td>
</tr>
<tr>
<td>7. Rewire and store the 100kw generator at evacuation site</td>
</tr>
<tr>
<td>8. Implement awareness strategy</td>
</tr>
<tr>
<td>9. Implement food strategies</td>
</tr>
<tr>
<td>10. Complete tsunami evacuation signage</td>
</tr>
<tr>
<td>11. Implement fuel strategies</td>
</tr>
</tbody>
</table>

Participants discussed and agreed that the responsibility to develop and/or implement these strategies will vary based on the strategy itself and the level of expertise. For example, the master tsunami emergency operations plan, the development and implementation of the emergency notification strategy, and pet plan should be facilitated by those within the community whose job is emergency response but involve all members of the community for input. Participants also suggested that activities such as the re-wiring and storage of the generator at the evacuation site, establishment of two-way communications at evacuation site, and signage should be taken care of by maintenance and the communications specialists within the community. Lastly, participants acknowledged that tsunami training and exercise should be the responsibility
of everyone but spearheaded and facilitated by the emergency response providers within the community.

**Discussion**

This community-based participatory approach provided an innovative process to facilitate an at-risk vulnerable community through a detailed contextually appropriate self-assessment to decrease its vulnerability to tsunami. The photographs and reflective data provided individual residents and the community with greater insight or awareness into their vulnerabilities, capabilities and gaps and offered a unique opportunity to see and understand the community through their eyes. The incorporation of lessons learned from external events such as American Samoa, Japan, etc. and the experience and knowledge of an outside expert during the sessions provided participants with important additional information that helped identify previously unrecognized gaps and consider new potential strategies. For example, even though the community has lots of pets, they were not initially mentioned as vulnerabilities. However, following a presentation that provided lessons learned from previous external disaster events regarding pets and the contents of the Pets Evacuation and Transportation Standards Act of 2006, participants decided that pets should be listed as vulnerabilities within the community and committed to the development of a community pet disaster plan. In another example, the community decided to adopt a community PA system as a potential strategy following its introduction from lessons learned by several communities to assist them with notifying the community of an impending tsunami and directing them accordingly.

This community-based participatory approach also increased internal capacity/capability and developed a level of sustainability. This approach not only built capacity through increasing community and individual awareness and developing strategies to decrease their vulnerabilities, it taught the community the entire process so that they can perpetuate it. Actively guided through a step by step vulnerability and capability assessment, gap analysis and strategy development session, the community was able to develop the knowledge, skills and equipment needed independently conduct this process by themselves to either update, or address another risk or disaster. Consequently, a level of sustainability was also established. The community also displayed a commitment to sustainability by developing a tsunami awareness month.
During this month, tsunami plan review and revision, and activities would occur that increase and sustain the community’s level of readiness.

Limitations and Challenges

One limitation of this study is that it is very contextually specific. This was purposeful. Each community has its own unique social, cultural, economic and geographical challenges. In order to assist unique communities with developing contextually appropriate disaster preparedness, one must customize the approach. One size does not fit all. As a consequence, the generalizability of this study may be limited across contexts and populations. However, the processes and procedures are best practices that can be replicable.

A second limitation of this study may be in the sampling technique. This study selected participants utilizing a convenience sampling technique. Convenience sampling is a non-random sampling technique that recruits subjects or participants based on their accessibility and proximity to the researcher. Participants chosen for this study were volunteers who may have had a unique interest in disaster preparedness and the project. It is possible that due to the non-random selection of the participants, the sample was not a true representation of the community.

A third limitation is time. It was very challenging to schedule the sessions in a timely manner. Many of the participants had busy work schedules and ongoing projects within the community. Even though the community valued this project, it needed to be scheduled in coordination with many things. As a result, the study encountered some delays. This seems a natural part of a community-based participatory research project. It is important to plan and maintain a level of flexibility.

Conclusion

The assessment of a community’s vulnerabilities and capabilities is an integral part of the preparedness process (Perry & Lindell, 2003; FEMA, 2010). It provides a process for the community to view and discuss its weaknesses and capabilities with regard to specific hazards. Understanding these vulnerabilities and capabilities provides the community with the necessary information to develop solutions or strategies that decrease their vulnerabilities through strengthening capacity or capability. PhotoVoice
provides a unique community-based participatory approach to conducting a vulnerability and capability assessment which is the foundation for any disaster plan.

This is the first time that PhotoVoice has been used to conduct a vulnerability, capability, gap analysis and strategy development session for disaster preparedness. The process successfully engaged a vulnerable community, increased both individual and community level awareness to a natural disaster, enhanced their capability through identifying gaps and developing solutions to reduce their vulnerability, and developed a capability to conduct their own self-assessment relative to disaster. Community awareness and internal capacity are essential in saving lives. For example, in Japan following the 9.1 earthquake, lack of community awareness and dependence on technology and external resources resulted in the loss of many lives (Suppasri et al., 2012; Carafano, 2011). Often, vulnerable communities are on their own for days, weeks and possibly months prior to assistance arriving. For example, a remote fishing village in Hadenya, Japan was completely isolated following the tsunami of 2011 and had to survive on their own for twelve days before emergency assistance arrived (Fackler, 2011). It is imperative that vulnerable communities are given the capability to develop contextually appropriate strategies to sustain themselves and meet their needs in the event of a disaster.
CHAPTER 4
TRAINING, EXERCISING AND EVALUATION

ABSTRACT

**Background:** Training, exercising and evaluation are important in strengthening capacity and in testing, refining, and improving disaster reduction strategies and plans. Traditionally, disaster preparedness training and exercises are conducted by a subject-matter expert external to the community. Unfortunately, this approach only builds and strengthens capacity within the community for a limited time and lacks long-term sustainability. A community-based participatory approach has the potential to resolve this challenge. Rather than relying on an external infrastructure, the community focuses on building an internal training infrastructure within the community. The community becomes a partner and active participant in the development, planning, and implementation of the training and exercise.

**Method:** A one-group, pre-post-survey design was used to assess changes in participants self-rated perceptions following the development and implementation of the community training and exercise program.

**Results:** The community helped develop and lead a training and exercise related to tsunami preparedness. Members also helped develop the evaluation tools. A bootstrap pair sample analysis on the pre- and post-survey demonstrated significant increases in the means in all skill areas (p<.05). The majority of participants agreed that CBPR principles were reflected in the training and exercise program.

**Conclusion:** Incorporating CBPR principles into the training, exercise, and evaluation approach enhanced the acceptability of the program, the capacity and confidence of community trainees, and the sustainability process. Community members measurably increased their capacity in skill areas taught. In addition, the exercise built confidence, further enhanced some of the skills, and successfully exposed some limitations in the community’s tsunami evacuation plan. The internal training and evaluation infrastructure that this community built will assist them in decreasing their external reliance and increase their sustainability.
Research Question

Does a CBPR-based approach to developing and delivering disaster preparedness training and exercise enhance the acceptability of the program, capacity and confidence of trainees, and sustainability of the process?

Introduction

Training, exercise and evaluation are extremely important components of a comprehensive preparedness cycle (Perry & Lindell, 2003; FEMA, 2010). These components follow assessment and strategy development. Their objectives are to strengthen capacity, and test, refine and improve disaster-reduction strategies and plans.

Traditional disaster training and exercises are usually conducted by a subject-matter expert external to the community (Scott et al., 2009; Gershon, et al., 2009; Peterson & Perry, 1999; Kuranci et al., 2005). A community identifies or has an outside agency identify vulnerabilities, capabilities, and skill or capability gaps in disaster preparedness relative to a specific hazard. A request is made to receive specialized training to fill the gaps and/or an exercise to evaluate the plan and the skill that will be learned. Then, an instructor or cadre of instructors provide the training or exercise to the community and return shortly thereafter to their organization or agency (Chen & Chan, 2006; Gershon, et al., 2009; Scott, et al., 2009). Unfortunately, even though this approach does build and strengthen a certain level of capacity within the community, it is only for a limited time and lacks sustainability. All skills and plans need to be continually practiced and refreshed in order to maintain a level of competency. Unless there is an opportunity to practice these skills in real-world application of training and exercising, skill competency deteriorates significantly (Williams, 2009; Anderson, et al., 2011). In addition, without an internal training infrastructure, a level of external reliance develops in order to maintain the skill competency.

In contrast, a community-based participatory research approach to disaster training and exercise involves the community as a partner and active participant in the development, planning, and implementation of the training and exercise. Typically, the researcher and the community review their vulnerability and capability assessment and gap analysis to determine the communities training needs. Once the training needs are identified and prioritized by the community, subject-matter experts are sought to provide
a train-the-trainer based on those needs and ideally the community training is co-facilitated by the community. A training group consisting of community participants chosen by their community for their potential as instructors attends the train-the-trainer course and then teaches the skills acquired to the other members of the community. The disaster exercise also can be planned and developed by a community group, co-facilitated by the researcher. The community then implements the exercise to evaluate the skills learned in the training and determine strengths or best practices, gaps, or shortfalls in the disaster-reduction strategies. The preparedness plan is then refined and improved by the community, with the incorporation of the lessons learned from the exercise (Homeland Security, 2007; Perry & Lindell, 2004). Even though the application of this participatory approach is fairly new and reported in an extremely limited number of published research studies, the benefits of increased capacity building and longer sustainability are apparent in this participatory training and exercise approach.

All seven of the core CBPR principles will be operationalized in the co-development and implementation of this training and exercise process. Those principles include: 1) building on strengths and resources; 2) power sharing 3) co-learning; 4) capacity building; 5) system development; 6) disseminating finding and knowledge to all; and 7) a commitment to sustainability (Minkler & Wallerstein, 2008).

Using CBPR principles, this study aimed to assist Community X in their development, refinement, and improvement of their tsunami specific disaster preparedness plan and strategies and to strengthen capacity within the community to lessen the potential impact of disaster on the community. The next section of this chapter describes the method by which the training/exercise program was co-developed by the community, and presents the outline of the final curriculum/exercise. The methods section describes the co-development of tools used to evaluate the program, and the findings section presents the findings from the evaluation. The discussion addresses the strength and limitations of the study.

Training/Exercise Developed with Community

Methods for Co-Developing of Tsunami Preparedness Training

The training and exercise were developed over several sessions with the community. These included sessions to determine training needs, to develop training
To achieve the objective, and to develop the training curriculum and the disaster exercise. Each session is described here.

**Session I: Determining training needs (2 hours).**

The disaster training work group appointed a leader to facilitate the development process with the lead researcher. The group leader and lead researcher facilitated the group through a review of the previous PhotoVoice study consisting of the gap analysis and vulnerability and capabilities assessments to determine the community’s training needs with respect to a tsunami. Next, each member wrote down up to ten specific training needs that they consider most important relative to the specific disaster. Each participant in the working group had 10 minutes to vocalize their list of training needs. More time was provided as needed. Duplicates were discarded and the originals or non-duplicates were documented on an easel board by the designated scribe. Lastly, the group leader facilitated the training working group in prioritizing the list of training needs utilizing an anonymous voting process to ensure that all voices were heard. Each of the working group members individually wrote down a list of top ten training needs and ranked them numerically in order of importance. The leader then asked each member to vocalize their rankings. All responses were documented on the easel board with a number designating its ranking. Training needs were then ranked based on number of votes for each. The following training needs were identified for this community training: 1) First aid; 2) Communications; 3) Helicopter safety and landing zone setup; 4) Search and rescue; and 5) ICS Job Action Sheets.

**Session II: Determining training objectives (2 hours).**

The disaster training work group created training objectives for each training need previously identified. First, the group was facilitated to state specific measurable tasks within each area that was identified as a training need. For example, if the training need was first aid, the group was asked what specific skills within first aid do you wish them to learn? All of those skills mentioned were written on the easel. Second, the group was asked, to what degree do you expect them to perform the skills? Examples such as do you wish them perform the skill in accordance with a standard? And would you like them to perform the skill within a particular time frame? This information was also
written on an easel and combined with the specific task to form an objective (see Appendix H)

**Session III: Developing Community Disaster Training Curriculum and Program (8 hours).**

The lead researcher who is a FEMA Master Trainer in emergency management specializing in curriculum and program development put together a curriculum and program based on the training objectives determined by the community. A draft curriculum and program was disseminated to the training work group for discussion and feedback. Another work group session was then held, in which the following questions were addressed by the group:

- Does the training curriculum/content meet all of the objectives?
- Is the time frame appropriate and reasonable?
- Is the delivery method acceptable for the audience?
- Does the program succeed in filling the capability gaps identified?

The disaster training work group provided feedback to the lead research to finalize the program. The lead researcher inputted the feedback into a new version and that draft was submitted to the community for review.

**Session IV: Train-the-Trainer (2 hours).**

A request for those with any background in first aid, communications, search and rescue, and helicopter safety and LZ setup, and Incident Command System ICS position or role training and a desire to become a trainer yielded six participants who agreed to become community trainers/instructors. A former helicopter mechanic, wilderness first responder, HAM radio and communication specialist, and an EMT with ICS experience volunteered to participate as instructor candidates. In an effort to build greater capacity and sustainability, community instructor candidates were trained in the delivery of the hands-on skills for the program. The lead researcher utilized himself and 3 other subject-matter experts in the various disciplines as instructors/mentors. The train-the-trainer course contained the following:

- Objectives for each skill station and the skill or skills involved.
- A procedure rubric for each skill
- A demonstration and explanation of the skill from the instructors
• Skill practice and competency evaluation based on the rubric
• Teaching practice – each individual demonstrated teaching the skill. An instructor was next to all trainers to ensure quality and consistency.

**Session V. Developing the Disaster Exercise.**

A disaster exercise working group consisting of six non-randomly selected participants developed an exercise design plan to test the skills and knowledge learned and in the training and the strategies in the prior study. The development was facilitated by both the lead researcher and working group leader. A semi-structured exercise-design format by the Federal Emergency Management Agency was adapted and developed consisting of the following elements (FEMA, 2010):

- Scope
- Statement of purpose
- Objectives
- Narrative
- Major and detailed events
- Expected actions
- Logistic and supply needs

**Conducting the Training and Exercise**

Written informed consent was read and explained to all participants. The consent form contained a statement of activities and significance, specific potential risks and benefits, understanding that participation was voluntary and anyone at any time can withdraw from the project for any reason. Each interested participant was required to sign the consent form prior to participation in the project.

The disaster training work group (community trainers) and the subject-matter expert trainers worked with the community to secure a main hall and other venues for the training. The local disaster response team provided the first aid and helicopter landing zone supplies for the training at no cost. Based on feedback from the community, the working group developed a schedule that offered multiple opportunities or times for each of the following skill areas: first aid, search and rescue, job action sheets, communications, helicopter safety and landing zone setup over the course of the 1.5 days. In addition, the longest course being offered was determined to be only 1 hour and the
shortest 20 minutes. Participants and the lead researcher then drafted a schedule that provided two to three opportunities or times for each skill area over those 1.5 days (see Appendix I). The schedule was then disseminated to the community. In addition, participants were given the option of choosing and attending only the skill stations that they were interested in or needed. The skill stations each had a trainer working group member (community trainer) and a subject-matter expert instructor mentor to assist.

The community disaster exercise working group and the lead researcher worked together to secure appropriate venue sites for the disaster exercise in Community X. The community trainee group consisting of 22 non-randomized participants from the community which is about 25% of the entire population engaged in a 2-hour full scale functional disaster simulation exercise based on the exercise design developed by the community trainers working group. The goal of the exercise was to evaluate the strengths of the capabilities, strategies, and recently acquired skills developed during the planning process. The local disaster response team provided the training equipment and other needed additional supplies for the exercise at no cost. Non–participating community members were notified well in advance of the disaster exercise and reminded to reduce stress levels.

Methods

Study Design

A one-group, pre-post-survey design was used to evaluate the training and exercise program. We specifically wanted to assess changes in participant’s self-rated perceptions of their current level of preparedness in skill areas identified in first aid, helicopter safety and landing zone setup, search and rescue, communications, and ICS job action sheets.

Sample and Recruitment

Participants from the previous study were encouraged to participate in the evaluation of the training and exercise. Open recruitment was facilitated through community meetings and their leaders to achieve a disaster training work group consisting of six participants and an intervention group consisting of 22 participants. The inclusion criteria to participate in this project included (1) adult 18 years and older, (2) resident of the community, and (3) commitment for the entire length of the project. The
leader of the work group was determined by its members or cultural protocol. The same process of selecting a work group leader employed in the previous study was followed.

**Measures**

Given the uniqueness of this approach and the community involved, as well as the lack of an existing tool that fits with the purpose of this study, the quantitative pre and post-survey was co-developed by the researcher and the community training work group. Our aim was to develop measures to assess the outcomes of acceptability of the program, and Minkler and Wallerstein’s CBPR principles of power sharing, dissemination of information and sustainability of the process and system development. The Study 3 work group consisted of six community participants from Community X selected under the same criteria as the previous study.

**Pre and Post-survey Tool Development**

A survey subgroup consisting of the lead researcher and participants within the training working group interested in learning how to develop a survey was formed. The subgroup was provided a copy of the training and exercise objectives and a paper copy of the definitions for the CBPR principles by Minkler and Wallerstein. Examples for each area of the training and exercise program were discussed, including acceptability of the program, confidence with new skills, sustainability of the process, system development, power sharing, dissemination of information, first aid objectives, communication objectives, helicopter landing zone objectives, search and rescue objectives, and ICS Job Action Sheets objectives.

The subgroup and researcher conducted a brainstorming session to develop one to three questions for each area specific questions to measure before and after responses in the above areas. All questions were documented. Also, all questions considered by the subgroup were formatted to generate a 5-point Likert scale response. The lead researcher presented the typical 5-point Likert scale response choices based on current practice and literature search. The subgroup decided on the following Likert scale response choices: Strongly Agree; Agree; Neutral; Disagree; and Strongly Disagree. The researcher and the subgroup determined the written instructions for the survey.

A draft of the pre-post-survey was written by the lead researcher based on the subgroups decisions. The draft was then reviewed by the subgroup to determine face
validity. In other words, they evaluated the survey to determine if it measured what it is supposed to measure. The subgroup read each question and determined if it measured the areas previously discussed. A final version was drafted incorporating any changes (see Appendix F).

**Administration of the Pre-Survey (10 minutes)**

The pre-survey was administered prior to the start of the training activities. The intervention training group consisting of 22 participants was provided with a pen and a pre-survey to complete. Pre-survey instructions were given and questions with regard to those instructions were answered prior to the start of the survey. Participants were given 10 minutes to complete the short survey. Once completed, all pre-surveys were collected and secured.

**Administration of the Post-Survey (20 minutes)**

The post-survey was administered following the completion of the exercise. The survey questions with regard to the first aid, helicopter landing zone, ICS job action sheets, communication and search and rescue were identical to questions asked on the pretest. The survey questions addressing acceptability, sustainability, power sharing, dissemination of information and system development only appeared on the post-survey. The training intervention group consisting of 22 participants was provided with a pen and a post-survey to complete. Post-survey instructions were read to the group and questions with regard to those instructions were answered prior to the start of the survey as needed. Participants were given 20 minutes to complete the survey. Once completed, all post-surveys were collected and secured by the lead researcher.

**Evaluation Process for the Community Exercise.**

Members of the trainer working group, lead researcher and the subject-matter expert instructor mentors evaluated the exercise as a whole based on the objectives and expected actions written in the exercise design plan.

**After Action Review.**

All participants in the exercise as well as the trainers gathered immediately following the exercise to review how things went and lessons learned. A designated scribe documented the responses. In a 30-minute semi-structured discussion format, participants including trainers were asked to discuss the following: 1) What worked well?
2) What did not work well? And 3) how can we improve? All responses were captured in an after action report that will be disseminated to all participants and trainers (see Appendix J).

Data Analysis Process

SPSS software (version 21.0) was utilized to analyze the data from the pre-surveys and post-surveys. Consistent with the steps outlined by Tabachnick & Fidell (2007), all data will be screened prior to analysis. To ensure the accuracy of the data file, the original data was proofread against the computerized data file. Second, data was closely examined for missing values, and normality of research variables. The level of significance will be established at an alpha level of 0.05. Data values were coded in the following manner: Strongly Agree = 5; Agree = 4; Neutral = 3; Disagree = 2; and Strongly Disagree = 1. Given the small sample size and the non-normal distribution of the variables being measured, a paired sample analysis, Bootstrap, was chosen to examine the mean difference between the survey questions that appeared both on the pre-survey and the post-survey. In addition, a descriptive frequency statistic was conducted on the post-survey questions results data with regard to the acceptability of the program and the other CBPR principles.

Results

Training and Exercise Planning Work Group

Six residents participated in the planning and training and exercise development portion. After reviewing the vulnerabilities, capabilities and gaps, the working group was able to identify a total of 18 training needs (Table 3.1). Those training needs were then organized into eight categories and prioritized into the following order: 1) Evacuation; 2) Medical/first aid; 3) Basic communications; 4) Role position training; 5) Care home evacuation; 6) Fatality management; 7) Tsunami awareness month with activities; and 8) Rescue and recovery.

Training Objectives

Out of the above 8 categories, participants within the working group chose the following 5 skill areas to focus on for the community training: evacuation specific roles and responsibilities, first aid, helicopter landing zone (LZ), search and rescue, and communication. Participants then brainstormed specific skills within each of these 5
areas needing to be developed resulting in the formulation of twenty two actionable objectives written using a standardized format (See Appendix H). Those objectives were the basis for the content of each skill area.

**Quantitative Data Analysis of Community Training**

Both the primary and secondary analysis of the pre and post-surveys by both the community working group and the researcher yielded the same results. Twenty two residents within the community participated in the training and completed both a pre and post-survey. All completed pre and post-surveys were retrieved. All data was screened for missing variables. Inspection of the data showed no missing values. A Bootstrap paired sample statistical analysis conducted by the lead researcher using SPSS 21.0 on the confidence and capacity built in communication, search and rescue, first aid, helicopter safety and landing zone setup, and ICS positions or roles following the training and exercise showed an increase in all of the means and a significance of less than 0.05 suggesting that confidence and capacity was increased (see Table 4.1). The larger the mean difference, the greater the positive change in confidence and capacity.

**Table 4.1 Bootstrap Paired Sample Test**

<table>
<thead>
<tr>
<th>(Q#PostSurvey – Q#PreSurvey)</th>
<th>N</th>
<th>Mean difference</th>
<th>Significance P&lt;0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence in use of the portable satellite phone</td>
<td>15</td>
<td>1.80</td>
<td>0.001</td>
</tr>
<tr>
<td>Confidence in the use of the HAM radio</td>
<td>12</td>
<td>1.33</td>
<td>0.007</td>
</tr>
<tr>
<td>Confidence in marking the building for a search</td>
<td>11</td>
<td>1.46</td>
<td>0.002</td>
</tr>
<tr>
<td>Confidence in extricating a victim from a building</td>
<td>11</td>
<td>1.18</td>
<td>0.005</td>
</tr>
<tr>
<td>Confidence in my ICS knowledge of my role and responsibilities</td>
<td>18</td>
<td>1.83</td>
<td>0.001</td>
</tr>
<tr>
<td>Confidence in my ability to carry out my role in a disaster</td>
<td>18</td>
<td>1.67</td>
<td>0.001</td>
</tr>
<tr>
<td>Confidence in my knowledge of common tsunami injuries</td>
<td>8</td>
<td>1.38</td>
<td>0.001</td>
</tr>
<tr>
<td>Confidence in my ability to apply dressing and bandage wound</td>
<td>8</td>
<td>1.25</td>
<td>0.018</td>
</tr>
<tr>
<td>Confidence in my ability to apply a splint</td>
<td>8</td>
<td>1.38</td>
<td>0.017</td>
</tr>
<tr>
<td>Confidence in my ability to clean wounds</td>
<td>8</td>
<td>1.13</td>
<td>0.025</td>
</tr>
<tr>
<td>Confidence in my ability to control bleeding</td>
<td>8</td>
<td>1.25</td>
<td>0.008</td>
</tr>
<tr>
<td>Confidence in my ability to establish a daytime helicopter LZ</td>
<td>13</td>
<td>2.00</td>
<td>0.001</td>
</tr>
<tr>
<td>Confidence in my ability to establish a night helicopter LZ</td>
<td>13</td>
<td>2.15</td>
<td>0.001</td>
</tr>
<tr>
<td>Confidence in my knowledge of helicopter safety</td>
<td>13</td>
<td>1.92</td>
<td>0.002</td>
</tr>
</tbody>
</table>

**Participants’ Perspective on the Community-Based Participatory Program**
The lead researcher conducted a univariate analysis in SPSS 21.0 looking at the frequency in responses from section 1 of the post-survey. In total, 22 views were expressed on the post-survey about the acceptability of the program, dissemination of information, sustainability, power-sharing and system development (Table 4.2). Twenty two (100%) agreed that this community-based program was appropriate for the community and recommend continuing it. In addition, 20 (90.9%) prefer this type of blended community-based approach compared with the traditional outside-expert-only approach.

When asked about sustainability, 21 (95.4%) of the participants agreed that their newly trained community instructors have been provided the skills needed to better assist the community with maintaining and sustaining its community level tsunami readiness. Also, the majority, 21 (95.4%), supported the idea that holding an annual tsunami awareness month with training, education and exercises would help the community maintain its level of readiness.

With regard to the dissemination of information within the program, 21 (95.4%) agreed that they had been informed of the community distribution plan for the results from this pre and post-survey as well as the after-action-report from the training and exercise. In addition, 21 (95.4%) also agreed that they had received a copy of both the training needs and the exercise plan, so that they could not only be aware of the content but could also provide feedback.

Twenty (90.9%) agreed that the community member instructors were the primary instructors during the community training supporting the objective of power sharing between the community and research group. In addition, 22 (100%) agreed that the subject-matter expert instructor mentors from outside of the community played a supportive role during the community training and exercise.

Lastly, the majority of participants, 17 (77.2%) agreed that the community has acquired the skills necessary to repeat this training and exercise process. Five (22.7%) had no opinion with regard to this statement.

Table 4.2 Descriptive Statistic: Frequency

<table>
<thead>
<tr>
<th>Q1</th>
<th>Acceptability: Program appropriate for community</th>
<th>N</th>
<th>Mean</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>22</td>
<td>4.55</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.2 (Continued) Descriptive Statistic: Frequency

<table>
<thead>
<tr>
<th>Q1</th>
<th>Agree (n=10)</th>
<th>Strongly Agree (n=12)</th>
<th>N</th>
<th>Mean</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability: Provided the skill needed to maintain &amp; sustain</td>
<td>Agree (n=14)</td>
<td>Strongly Agree (n=11)</td>
<td>22</td>
<td>4.27</td>
<td>63.6</td>
</tr>
<tr>
<td>Q2</td>
<td>Disagree (n=1)</td>
<td>Agree (n=7)</td>
<td>Strongly Agree (n=14)</td>
<td>22</td>
<td>4.55</td>
</tr>
<tr>
<td>Power Sharing: Community members were the primary instructors</td>
<td>Disagree (n=1)</td>
<td>Neutral (n=1)</td>
<td>Agree (n=15)</td>
<td>Strongly Agree (n=5)</td>
<td>22</td>
</tr>
<tr>
<td>System Development: Community has skills to repeat process</td>
<td>Neutral (n=5)</td>
<td>Agree (n=14)</td>
<td>Strongly Agree (n=3)</td>
<td>22</td>
<td>3.91</td>
</tr>
</tbody>
</table>

Exercise After-Action-Report Results
Community exercise participants reported the following items that went well during the tsunami exercise: 1) Successful evacuation of participants from their home or work within 20 minutes; 2) No vehicle bottlenecks; 3) PA notification vehicles were able to deliver emergency notifications and navigate throughout the entire community within 17 minutes; 4) Successful conduct of external communication using HAM radio and iridium satellite phone; 5) Establishment of a helicopter night and daytime landing zone; 6) Successful conduct of search and rescue simulated operation; and 7) Medical care provision for a simulated illness.

The community exercise participants listed these items as not having worked so well: 1) Internal point to point communication via community radios was spotty; 2) PA system notifications were difficult to hear inside the home and offices; 3) There was some confusion regarding assigned roles and responsibilities; and 4) Some residents were not successfully transported from their residence to the evacuation site.

The community and the lead researcher collaboratively recommended the following to improve some of the challenges: 1) Consider posting individual at the half distance marks to relay information or use alternative communication devices such as portable HAM radios within the community; 2) Implement the honking horn protocol for rapid approaching tsunami to alert everyone; 3) Pre-assign community residents with cars to take neighbors without vehicles to evacuation site; and 4) conduct more exercises and functional exercises to assist with better understanding ones role and responsibilities.

Discussion

This community-based participatory approach effectively developed and implemented a community-based training, exercise and evaluation program to reduce Community X’s vulnerability to a tsunami. The community planning work group sessions built capacity by providing an organizational framework that walked the community participants through the process of identifying their training needs, prioritizing them, developing measurable objectives for each one, and designing both an evaluation tool and an exercise to assess the delivery of the training and effectiveness of the tsunami evacuation plan.

The community training program development process built on the strengths and resources within the community. Subject-matter experts within the community were
utilized as instructors for the training. For example, a former military helicopter mechanic volunteered to become the community trainer or instructor for the helicopter landing zone safety and setup course. In another example, a wilderness first responder within the community volunteered to become an instructor for the first aid course. A resident who is a licensed HAM radio operator became the lead instructor for the HAM radio and satellite phone course. Lastly, an EMT with experience in incident management became the community instructor for the ICS roles.

This community-based approach increased internal capacity on two levels. On a process level, the community and exercise planning group was guided through a step by step process of how to develop, plan and implement a community training and exercise program. As a consequence, that group will be able to independently repeat this process from the skills that they have learned. This was supported in the post-survey results that showed that the majority thought that the community could repeat this process. On an individual level, residents built capacity through the development of relative skills that will assist others in the event of a tsunami in that community. This was supported from the change in the mean from pre to post-survey. All areas showed a significant increase representing improved confidence and ability in the skill.

This community showed a level of commitment to sustainability. The community decided to designate one month a year as tsunami awareness month. This idea was supported in the post-survey by a majority, (95%) of participants. Every year, during that month, community education, training and an exercise will be conducted. This will help the community to maintain and sustain its level of awareness and preparedness. However, it will take continual effort by all to ensure sustainability. This limitation may be further addressed by encouraging the community to form a disaster preparedness committee to at least annually employ the framework learned to update and maintain the training and strategies for this specific disaster as well as develop strategies for other potential natural disasters. For example, a disaster committee formed in a community in Vanuatu as a consequence of the community-based participatory research study conducted by Cronin et al. (2004) seemed to assist that community with maintaining and sustaining a level of readiness. This was evident in the one year follow-up (Cronin, 2004).
Limitations

There are several potential limitations in this study. This study was very context specific. The curriculum, exercise plan and results from the pre and post survey are likely limited across both contexts and populations. However, this was purposeful. Each community has its own unique social, cultural, financial and geographical challenges (Kumar, 2002). In order to assist to meet these unique needs, disaster preparedness must customize (Pearce, 2002). A universal approach does not satisfy every community’s needs and may lead to greater vulnerability in some communities (Wisner, 2004; Burton, 1993).

Even though the training needs assessment, training objectives and curriculum, exercise plan and design, after-action-report feedback and the results from the pre and post survey may not be generalizable, the incorporation of evidence based organizational frameworks or processes are best practices and can be replicable. For instance, the preparedness framework for training, exercise and evaluation in this study was taken from the FEMA preparedness cycle which is a best practice standard for disaster preparedness in the United States (FEMA, 2010). The FEMA preparedness cycle adapted the “plan-do-check-act (PDCA) concept into its model. The PDCA is an evidence-based best practice method that has been used in disaster preparedness research and continual risk management (Matsuda &Okada, 2006; Cervi & Fazzino, 2012).

A second limitation may in the selection of participants. This study utilized a convenience sampling technique. Convenience sampling is a non-random sampling technique that recruits subjects or participants based on their accessibility and proximity to the researcher. Participants chosen for this study were volunteers who have a unique interest in disaster preparedness and the project. It is possible that due to the non-random selection of the participants, the sample may not be truly representative of the community. However, the sample did represent more than 25% of the entire population within the community.

Another limitation in this study was the variability of the sample size within the skill stations. Each of the modulated skill stations/courses were interest based. Even though 22 residents participated in the overall training, participants attended only the skill areas that they were interested in. As a consequence, the number of participants
attending the different skill stations was variable. For example, the First Aid module only had 8 participants. In contrast, the ICS job action sheets module had 18 participants. Even though capacity was built in the low participation areas, it reflects a lack of interest in the larger group of participants. This may suggest that either the module is not perceived as needed or the topic is so specialized that some may be intimidated. This will be an important follow-up conversational topic at the community meeting.

A fourth limitation may be in the process of evaluation of the strategies and training. A well-designed exercise can provide one of the best ways of evaluating disaster preparedness strategies and training. However, it cannot replace a real event. The level of artificiality inherent in all exercise designs cannot be completely eliminated. Unfortunately, the only true test will be the effectiveness of the strategies and training during and/or following the impact of a real natural disaster.

A fifth limitation may be in the lack of a follow-up over time. Even though a strong degree of capacity was built and a sustainability plan established, it is difficult to measure how effective the program will be over time. Many variables can negatively impact community preparedness over time such as personal and community priorities, increase in resident complacency, reduction in funding, etc. A 1-to-3-year follow-up would provide evidence of the impact of some of those influencing factors on the program and the degree of effectiveness of the community-based participatory disaster preparedness program. This will be discussed with the community and a potential follow-up study recommended.

**Conclusion**

Training, exercise and evaluation are not only the final components of the disaster preparedness process but also extremely important (FEMA, 2010). They are essential in building and developing the needed preparedness capabilities within the community as well as evaluating, refining and improving the established or proposed strategies for vulnerability reduction. The incorporation of a CBPR approach into this established best practice framework enhanced the acceptability of the program, capacity and confidence of community trainees and the sustainability process. Community members measurably increased their capacity and confidence in first aid, search and rescue, communications and helicopter LZ safety and setup. The exercise built confidence, further enhanced
some of the skills and successfully exposed some limitation in the community’s internal communication and emergency notification equipment, accountability process and other areas which will assist the community with refining and improving their evacuation plan. However, all skills and plans need to be continually practiced and refreshed in order to maintain and sustain a level of competency and readiness. The internal training infrastructure that this community built through learning the process of training, exercising and evaluation as well as developing a cadre of instructors within the community will assist in increasing their level of sustainability and decrease their level of external reliance. However, even though this researcher plans to follow-up with the community, the onus now falls on the community to continue the process. The community’s commitment to the establishment of an annual tsunami awareness month is an important first step toward sustaining this process.
CHAPTER 5
OVERALL CONCLUSIONS AND RECOMMENDATIONS

Overall Discussion

The systematic literature review provided insight into how CBPR methods had been utilized in disaster preparedness research, how its principles have been operationalized (or not), and gaps or limitations. Fourteen interventional studies that focused on natural disasters and operationalized the CBPR principles of capacity building, co-learning, dissemination of information, building on strengths and resources within the community, power sharing, and system development were identified. These studies did show success in assisting vulnerable communities with developing culturally, socially, fiscally and geographically appropriate disaster mitigation and reduction strategies. However, a few studies showed a limited level of depth of power sharing, system development, dissemination of information, and commitment to sustainability. The lack of time, funding, and ability to share or relinquish power were commonly cited as reasons for these limitations. Another potential reason for low commitment to sustainability is the assumption that a commitment to capacity building will result in sustainability. Granted, there will be a residual level of sustainability due to capacity building, but without commitment to practice and maintenance, the information and knowledge will fade over time (Homeland Security, 2007; Perry & Lindell, 2004).

Thirteen out of the 14 interventional studies lacked evaluation or a sustained evaluation plan. Disaster risk reduction strategies need to be frequently tested or evaluated to determine their level of effectiveness and relevance. In absence of a real natural disaster, communities need to engage in simulated events such as tabletop, functional, or full-scale exercises to evaluate their strategies. Even though there is a level of artificiality to exercises, they will expose flaws or challenges within strategies and give the community the opportunity to practice protocols and procedures relative to a disaster.

The lessons learned from the systematic literature review helped guide the development of studies 2 and 3. All of the core CBPR principles were applied in a process that developed a contextually appropriate tsunami preparedness plan with a vulnerable community in Hawaii, utilizing an adapted FEMA Disaster Preparedness Cycle as a framework (See figure 1.1).
**Building on the Strengths and Assets**

Building on the strengths and assets within Community X was strongly operationalized. Utilizing an innovative method called PhotoVoice, community participants employed photography and the strength in knowledge of their community and its history to capture and identify 42 vulnerabilities and 50 capabilities within the community relative to a rapid approaching tsunami. During the sharing process, community participants learned of some vulnerabilities and capabilities that they had not previously considered strengthening their level of awareness. For example, because the community siren is used for all emergencies, residents are unable to discern whether the siren is for a tsunami of long duration, short duration, or another type of emergency. Community participants also considered resources and capabilities within the community and some outside to reduce identified gaps. Lastly, five subject-matter experts within the community with a background in first aid, helicopter safety, incident command system, search and rescue, or communications were trained as primary instructors and led the community training.

**Power Sharing**

Power was shared between the community and the researcher. Prior to the start of studies 2 and 3, community participants and the researcher discussed and decided on the appropriate process to resolve any disputes that may arise. Final decision making in all areas involved the researcher, participant leaders, and community participants. All sessions, with the exception of the train-the-trainer and the community training, were co-facilitated by the lead researcher and the appointed leader of the working group or groups. The community trainers were the primary instructors during the community training, while the outside subject-matter expert instructors/mentors were in a support role.

**Capacity Building**

Participants learned all four components of the disaster preparedness cycle needed for developing a disaster plan. Study 2 provided the community participants the knowledge and skills necessary to conduct a best-practice, systematic-process framework of assessing their own vulnerabilities with respect to a specific hazard, identifying their current capabilities and resources relative to those vulnerabilities, identifying gaps, and developing strategies to reduce their vulnerabilities. Study 3 completed the preparedness
cycle by providing the community the knowledge and skills to conduct a training needs assessment relative to a natural disaster, prioritize their training needs, develop measurable objectives, identifying and developing community level instructors, and developing, planning, and implementing an exercise and evaluation plan. In addition, the community created a tsunami evacuation plan that incorporated the vulnerability and capability assessment, gap analysis, and strategies. In addition, the community has the lessons learned from the exercise and evaluation to modify or improve the plan.

**Dissemination of Information**

All of the findings from the vulnerability and capability assessment, gap analysis, strategy development session, training needs assessment and objectives, and exercise design sessions were distributed initially via paper to all community members participating in the work group. Electronic copies of that data were also sent to the work group leader(s) and others within the work group interested in an electronic copy. After the work group participants provided feedback and the draft was updated, the findings were disseminated to other residents within the community via community protocol for additional input and feedback. Results from the pre and post-surveys were distributed to all community members in the training and exercise working group electronically. After feedback from them, a draft will be distributed to other residents via community protocol.

**Co-learning**

The community learned the skills of how to conduct a vulnerability and capability assessment, gap analysis, and strategy development session using the PhotoVoice method. They learned how to develop, plan, and implement a training exercise and evaluation program. The community also learned about the lessons learned from both the 2009 American Samoa tsunami and the 2011 Japan tsunami, typical tsunami injuries, the Pets Evacuation and Transportation Standards Act of 2006, and about the researcher. At the same time, the researcher learned about the community’s culture and history, decision making process and protocol, vulnerabilities, capabilities, gaps and strategies.

**System Development**

The community was given the knowledge and the tools to be able to repeat this process of developing a disaster-preparedness plan using all four components of the disaster preparedness cycle for either updating or conducting a new hazard plan. The
framework was designed to be flexible and accommodate all natural hazards. For instance, the community could follow the same process for developing preparedness plans for flooding, wildfires, hurricanes, etc.

**Commitment to Sustainability**

A level of short-term sustainability was established with the level of capacity that was built. A unique element of Study 3 was the building of an internal training infrastructure within this community. This is fairly unusual. Typically, subject-matter experts from outside of the community develop and conduct the training. However, Study 3 facilitated the community through the process of developing, planning, and implementing a training and exercise program. Then, five subject-matter experts within the community were developed as instructors and led the community training. This was designed to empower the community, decrease the level of external dependence, and provide sustainability of skills recently developed. Also, the working group was asked to come up with an idea to sustain and maintain their level of readiness. They decided to establish an annual tsunami awareness month, during which they conduct community education and training and review the plan. Feedback from the post-survey shows a lot of support. This should assist with long-term sustainability. I also recommend forming a disaster preparedness committee. In the Cronin et al. study (2004), the community formed a committee and seemed to be rather successful after a 1 year follow-up.

**Overall Limitations**

One of the limitations of Studies 2 and 3 was the sample size. Participants were selected using a convenience sampling technique. The participants who usually volunteer for this type of study are those with a unique interest in disaster preparedness and the project. Study 2 had 16 participants. Even though it is within the range that I anticipated, it is possible that the sample was not a true representation of the community, with a population of about 100. Trust and history also seemed play role in recruitment. I had a few residents decline participation because of the consent form signature requirement. This community has a history of negative consequences from research studies. I attempted to change some minds through participating in community social events and spending time with residents. I believe it helped, but was not enough. More time was needed. Also, participation seemed to vary depending on type of activity. For example,
the training and exercise planning group consisted of only six members from the community. Planning typically is not very exciting and usually draws a specific type of person. In contrast, 22 residents volunteered to participate in the community training portion. To counter this variability and attempt to gain a better representation of the community, copies of all of the assessments, strategies, training needs, etc. were distributed to all residents for feedback.

Another limitation was time. Community-based participatory research takes time to establish relationships and align schedules. Even though I had established relationships with many of the residents, they seemed to be more guarded than usual. I was able to break through many of the walls, but it takes a significant amount of time to establish an appropriate level of trust. Also, schedules often get delayed by weeks to months. As priorities began to shift within the community as community events developed, schedules had to be adjusted two to three times. It is important that CBPR researchers be extremely flexible in their schedule and time frame.

A third limitation was generalizability. CBPR is contextually specific. Each community has its unique social, cultural, economic and geographical challenges. In order for the intervention to be effective, the community must customize the results. One size does not fit all. However, processes and procedures can be replicable because they are best practices. The FEMA disaster-preparedness framework is a best-practice model. It also aligns with the plan-act-do-check model. Also, PhotoVoice is also a best-practice evidence-based approach to conducting needs assessment. Strict adherence to the protocols was followed.

**Directions for Future Research**

Although the use of community-based participatory research or CBPR in natural disaster preparedness and mitigation is slowly increasing, the literature review in Chapter 2 revealed the extremely low number of interventional research studies published. More research needs to be conducted to increase the volume and evidence base of CBPR in disaster preparedness and mitigation and to change the current top-down paradigm to a more blended approach.

Future CBPR research needs to focus on employing a framework that operationalizes all of the core principles. Many interventional studies found during the
literature review were labeled as CBPR but only involved the community in extraction activities such as surveys or focus groups. The community did not play a role in the process. Studies 2 and 3 within this dissertation are good examples of how successful a community and researcher can be if all those principles are utilized.

Future research should also consider building internal training infrastructures within communities as a means to sustain disaster readiness over time. Sustainability is one of the least operationalized principles, but is essential in the community’s ability to maintain skills learned and developed. Study 3 is a good example of how a community can develop, plan, implement, and evaluate a community-based training and exercise program.

Lastly, future research should consider including a 1- and 3-year follow-up in their study. Commitment to sustainability is not only in the present, but over time. Many variables can lessen preparedness, such as change in community and personal priorities, reduction in funding, increase in resident complacency as time progresses without a disaster, community dynamics, etc. It is impossible to know for sure if the intervention will endure over time. A 1-to-3-year follow-up would provide evidence of how effective the community-based participatory approach was and can examine influencing factors that may positively or negatively impact the community’s capacity.

Overall Conclusion

The top down disaster preparedness approach by itself does not take into consideration the community’s unique needs. One size does not fit all. The United States, Japan, and other countries that are currently using this traditional approach should instead reconsider a CBPR approach to disaster management. Communities may be on their own for hours to days to weeks following an earthquake or natural disaster. Communities need to be part of the process. This dissertation study is a good example of how to successfully implement all of the CBPR principles while facilitating a community through a best-practices process of developing a community-based disaster preparedness plan. In addition, PhotoVoice proved to be a successful tool in capturing vulnerabilities and capabilities and facilitating the participants through a process of identifying gaps and developing solutions. Hopefully, this study will become a model for future studies and
help facilitate a paradigm shift toward a more community-centered approach to disaster-preparedness.
Appendix A
Consent Form to Participate Study #2 (Page 1)

(PhotoVoice Study)
University of Hawai'i

Consent to Participate in Research Project:
Utilizing community-based participatory research to develop strategies to lessen the impact of natural disasters among vulnerable communities in the community.

My name is Chris Crabtree, MPA, CHEP. I am a DrPH student at the University of Hawai’i at Manoa (UH), in the Department of Public Health Science. The purpose of this study is to examine the usefulness of the community-based participatory research in helping vulnerable and at-risk communities in Hawaii develop contextually appropriate disaster-reduction strategies to lessen the impact of natural disasters.

I am asking you to participate in this project because you are a part of the community.

Project Description - Activities and Time Commitment: PhotoVoice is a method of utilizing photography that enables people to identify, express, reflect and communicate their community’s strengths, capacities, vulnerabilities and needs within their community through their own eyes as a basis for improvement and positive change. Participants must attend the orientation session that may last up to 4 hours. The study will consist of the utilization of digital cameras that will be provided with training and as a loan. Participants will be asked to photograph vulnerabilities and capacities in their community-based on specific guidelines. Participants will be separated into 1 to 2 working groups depending on the number of participants. Working group sessions will consist of picture sharing, explanations of relevance, gaps, priorities and solutions. It is estimated that there will be approximately 7 – 8 sessions. These sessions will vary in time length. Some sessions may last in during of up to 3 - 4 hours. If there is more than 1 working group, a larger group session will always follow the smaller groups to allow for sharing and consensus.

Benefits and Risks: I believe the direct benefit to you in participating in this research project will be greater awareness of your community’s vulnerabilities and capabilities, gaps or shortfalls, and strategies to lessen your vulnerabilities in the event of a natural disaster. In addition, you will learn how to conduct a vulnerability and capability assessment, gap analysis. This process will be extremely valuable given that it can be replicated for all natural disasters, continuing to make your community more aware and better prepared. I believe there is little or no risk to you in participating in this project. If, however, you are uncomfortable or stressed by a topic at any time you may take a break or withdraw from the project altogether.
Appendix A
Consent Form to Participate Study #2 (Page 2)

Confidentiality and Privacy: During this research project, I will keep all data from the study in a secure location. Only I will have access to the data, although legally authorized agencies, including the University of Hawai'i Committee on Human Studies, have the right to review research records.

At the conclusion of the PhotoVoice sessions and discussions, I will provide you with a copy of the notes and results for feedback to ensure that you are satisfied with my level of detail. When I report the results of my research project, and in my typed transcripts, I will not use your name or any other personally identifying information. Instead, I will use a pseudonym (fake name) for your name. If you would like a summary of the findings from my final report, please contact me at the number listed near the end of this consent form.

Voluntary Participation: Participation in this research project is voluntary. You can choose freely to participate or not to participate. In addition, at any point during this project, you can withdraw your permission without any penalty.

Questions: If you have any questions about this project, please contact me at via phone (808) 341-8546 or e-mail at ccrabtre@hawaii.edu. If you have any questions about your rights as a research participant, in this project, you can contact the University of Hawai‘i, Committee on Human Studies (CHS), by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu.

Please keep the prior portion of this consent form for your records.
If you agree to participate in this project, please sign the following signature portion of this consent form and return it to me. I will be available at the orientation/recruitment session to collect the forms from interested participants.

Signature(s) for Consent: I agree to participate in the research project entitled, Utilizing community-based participatory research to develop strategies to lessen the impact of natural disasters. I understand that I can change my mind about participating in this project, at any time, by notifying the researcher.

Your Name (Print): ________________________________
Your Signature: __________________________________
Date: ________________________________
Appendix B
Photo Release Form

Photo Release Form

Return Release to:  [Name of organization]______________________________
[Address]________________________________________________________________________
[Phone]________________________________________________________________________
[Fax]________________________________________________________________________
[Email]________________________________________________________________________

I give to ______________________ [Name of organization], partners, and assigns, unlimited permission to copyright and use photographs that may include me in presentations, as long as they do not identify me by name or through other background information. I hereby waive any right that I (and Minor) may have to inspect or approve the copy and/or finished product or products that have may be used in connection therewith or the use to which it may be applied.

Name of person photographed (please print): ______________________________________________________________________

Street address, city, state and zip code:

________________________________________________________________________

Signature: ___________________________ Date: ________

(Form adapted from Collective Leadership Works)
HANDBOOK 7F: PHOTOVoice ETHICS: SAFETY, IMPACT, AND OBLIGATION

Photovoice is, by design, intended to include participants in participatory inquiry. They become documentary photographers at their site; their objective is to take pictures of activities, events, symbols, and people (photo subjects) that best respond to the framing (trigger) questions. The impact of this work can extend to include:

- The photovoice photographers,
- The photo subjects, and
- The broader community that experiences the stories and photos through the Community Gallery.

Although safety and ethical considerations will vary across situations and rarely lend themselves to standard solutions, we can benefit from consideration of the following issues and questions.

Safety

Photovoice participants are asked to photograph the work of their community. They may document elements of strength and issues of concern. Recording these elements for public dissemination could have negative repercussions for the participant – as the photo is being taken or after the photo and explanation of it have been disseminated. Here are some concerns and what we will instruct photovoice participants to do in practice.

<table>
<thead>
<tr>
<th>KEY CONCERNS</th>
<th>YOUR PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential risks to photovoice photographers from putting themselves in dangerous settings or situations.</td>
<td>Give careful thought to the context and content of your photos – the communities in which you live, the issues you will be exploring, and the situations you might get into while documenting your work.</td>
</tr>
<tr>
<td>Potential risks to photovoice photographers from photo subjects.</td>
<td>Because you know your neighborhoods better than we do, we encourage you to use your street sense.</td>
</tr>
<tr>
<td>Potential risks to photovoice photographers from being identified in connection with their photos and stories.</td>
<td>“Shooting smart” – maintaining your personal safety – is of highest priority. No photo is worth personal danger.</td>
</tr>
<tr>
<td></td>
<td>Remember that there are alternative ways to present issues (e.g., through abstract representation).</td>
</tr>
<tr>
<td></td>
<td>Take your photos in public spaces (from which participants can photograph without being seen as trespassing) versus private property.</td>
</tr>
</tbody>
</table>

www.themounionorder.org

Shared Leadership Works
Appendix C
Ethics Handout (Page 2)

Subjects of Photographs
The evaluation team and the photovoice participants have an ethical responsibility to their photo subjects. We want to emphasize that photovoice photographs are meant for dissemination. For this reason, there is no point in taking photos that cannot be shown for lack of the subject’s permission through the release form. Here is our key concern and what we instruct photovoice participants to do in practice.

<table>
<thead>
<tr>
<th>KEY CONCERNS</th>
<th>YOUR PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Potential risks to photo subjects from being identified in connection with particular situations or activities in photos.</td>
<td>■ As a documentary photographer, you must respect the privacy of others. If someone does not want his or her picture taken, don’t take it.</td>
</tr>
<tr>
<td>■ It is essential that photo subjects sign a release form to be photographed. We have included forms. For children or youth under the age of 18, you will need approval from a parent or guardian. This is provided for on the release form. Please make more copies if you need them.</td>
<td>■ Please emphasize to photo subjects that the photographs are meant for dissemination. Photos cannot be shown without a subject’s release.</td>
</tr>
<tr>
<td>■ Again, there are ways to portray issues of concern that don’t require showing individuals.</td>
<td>■ ■</td>
</tr>
</tbody>
</table>

Impact on Your Community

<table>
<thead>
<tr>
<th>KEY CONCERNS</th>
<th>YOUR PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Potential risks to your community as a whole through generating conflict around issues or negative image.</td>
<td>■ Because of your background using a number of dissemination tools, we are confident that you understand the importance of weighing potential for collective good against potential for both individual and collective harm.</td>
</tr>
</tbody>
</table>

Obligation of the Evaluation Team

<table>
<thead>
<tr>
<th>KEY CONCERNS</th>
<th>YOUR PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ The photovoice process puts the evaluation team in a close partnership with site participants. The effectiveness of our work is based on bonds of trust and our commitment that participant stories and voices be meaningful.</td>
<td>■ Because of your background using a number of dissemination tools, we are confident that you understand the importance of weighing potential for collective good against potential for both individual and collective harm.</td>
</tr>
</tbody>
</table>

continued next page
Appendix C
Ethics Handout (Page 3)

<table>
<thead>
<tr>
<th>KEY CONCERNS</th>
<th>YOUR PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the same time, we know that you are</td>
<td>We will strive to build a participatory</td>
</tr>
<tr>
<td>invested in the photovoice process and data.</td>
<td>component through ongoing phases of analysis.</td>
</tr>
<tr>
<td>Because of the many potential uses for</td>
<td>You will be a part of the decision-making process in how the photos and</td>
</tr>
<tr>
<td>these data, we will share stories in a variety</td>
<td>stories will be disseminated.</td>
</tr>
<tr>
<td>of ways for a variety of purposes.</td>
<td>We will strive to balance agendas through finding “both/and” solutions</td>
</tr>
<tr>
<td></td>
<td>and multiple avenues for dissemination that meet the needs of various</td>
</tr>
<tr>
<td></td>
<td>stakeholders.</td>
</tr>
</tbody>
</table>

Appendix D
FEMA Preparedness Cycle

(FEMA, 2010)
Figure 4.0
Appendix E
Consent Form to Participate (Page 1)
(Training and Exercise Study)

University of Hawai‘i
Consent to Participate in Research Project:
Utilizing community-based participatory research to develop strategies to lessen the impact of natural disasters among vulnerable communities in the Community X.

My name is Chris Crabtree, MPA, CHEP. I am a DrPH student at the University of Hawai‘i at Manoa (UH), in the Department of Public Health Science. The purpose of this study is to examine the usefulness of the community-based participatory research in helping vulnerable and at-risk communities in Hawaii develop contextually appropriate disaster-reduction strategies to lessen the impact of natural disasters.

I am asking you to participate in this project because you are part of this community.

Project Description - Activities and Time Commitment: Participatory training and exercise is a method of partnering with the community to develop customized training that meet the community’s training needs and also partners with them to develop a hazard specific exercise to plan or test and improve the disaster preparedness in your community. Participants in the training and exercise development work group will receive an orientation briefing at the beginning of the first session which may last up to 2 – 3 hours. Activities will be separated into two parts (Part I and Part II).

Part I: This part will consist of 1 working group of 5 – 8 participants. The activities will consist of planning, developing and implementing a 40 hour disaster training course and 6 hour exercise in partnership with the researcher who is a FEMA Master Trainer. In addition, those who wish to be in this working group will be attending an 8-hour train-the-trainer course to become a skills instructor. Lastly, participants will assist with the development of pre-post-survey to distribute to the participants and complete at the beginning of the training and at the conclusion of the exercise. Participants should expect to attend 5 - 7 sessions ranging in length between 2 - 4 hours. Some days may consist of multiple sessions.

Part II: This part will consist of 1 large intervention group consisting of 15 to 40 participants. The activities will consist of both a 40-hour community disaster training and a 6-hour exercise. The 40-hour community disaster training will consist of curriculum developed by your fellow community members and the lead researcher in Part I. A 6-hour exercise will immediately follow the training the next day. All participants will be asked to attend all assigned sessions, complete both the pre-survey and post-survey and participate in the after action review immediately following the exercise.
Benefits and Risks: I believe the direct benefit to you in participating in this research project will be training in skills specific to your community’s needs and an opportunity to test those skills learned and the disaster-reduction strategies and the lessons learned from the exercise will be invaluable in your preparedness as a community. In addition, those in Part I will develop the skills of how to plan, develop and implement training. This will be instrumental in the community’s sustainability efforts. Furthermore, the community will have trained instructors in disaster skills that can provide classes and updates in those skills. Lastly, this process is replicable. You and the community will have the tools to replicate the entire process to prepare for other hazards or disasters. I believe there is little or no risk to you in participating in this project. If, however, you are uncomfortable or stressed by a topic at any time you may take a break or withdraw from the project altogether. I believe there is little or no risk to you in participating in this project. If, however, you are uncomfortable or stressed by a topic at any time you may take a break or withdraw from the project altogether.

Confidentiality and Privacy: During this research project, I will keep all data from the study in a secure location. Only I will have access to the data, although legally authorized agencies, including the University of Hawai‘i Committee on Human Studies, have the right to review research records.

At the conclusion of each session, I will provide you with a copy of the notes and results for feedback to ensure that you are satisfied with my level of detail. When I report and type the results of our research project, I will not use your name or any other personally identifying information. Instead, I will use a pseudonym (fake name) for your name. If you would like a summary of the findings from my final report, please contact me at the number listed near the end of this consent form.

Voluntary Participation: Participation in this research project is voluntary. You can choose freely to participate or not to participate. In addition, at any point during this project, you can withdraw your permission without any penalty.

Questions: If you have any questions about this project, please contact me at via phone (808) 341-8546 or e-mail at ccrabtre@hawaii.edu. If you have any questions about your rights as a research participant, in this project, you can contact the University of Hawai‘i, Committee on Human Studies (CHS), by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu.

Please keep the prior portion of this consent form for your records.
If you agree to participate in this project, please sign the following signature portion of this consent form and return it to me. I will be available at the orientation/recruitment session to collect the forms from interested participants.
Signature(s) for Consent:
I agree to participate in the research project entitled, Utilizing community-based participatory research to develop strategies to lessen the impact of natural disasters. I understand that I can change my mind about participating in this project, at any time, by notifying the researcher.

Your Name (Print): _____________________________________________

Your Signature: _____________________________________________

Date: ____________________________
Appendix F
Study #3 Pre-Survey (Page 1)

Tsunami Preparedness Training and Exercise Pre-Survey

Name:_________________________ Date:________

Likert Scale  5 – strongly agree  4 – agree  3 – neutral  2 – disagree  1 – strongly disagree

Instructions:
How well do you agree with the following statements? Please choose and fill in the circle that corresponds best with your level of agreement.

Please complete only the stations that you are attending.

Communications

1. I am confident in my ability to establish an effective signal and externally call with the satellite phone in accordance with manufacturer’s recommendations.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

2. I am confident in my ability to establish antenna, operate and communicate messages using a HAM radio in accordance with national standards from the evacuation site within 20 minutes.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

Search and Rescue

1. I am confident in my ability to effectively search and mark a home or building for survivors following a tsunami in accordance with national standards.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

2. I am confident in my ability to package and extricate a patient.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree
Appendix F
Study #3 Pre-Survey (Page 2)

Tsunami Preparedness Training and Exercise Pre-Survey

Please complete only the stations that you are attending.

ICS Role and Responsibility for Specific Positions
1. I am confident in my knowledge of my ICS role and responsibilities in accordance with my Job Action Sheets (JAS) for a tsunami.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

2. I am confident in my ability to carry out my assigned command roles and responsibilities in accordance with JAS in a simulated environment.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

First Aid
1. I am confident in my knowledge of common tsunami injuries and illnesses.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

2. I am confident in my ability to apply a dressing and appropriate bandage to wound in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

3. I am confident in my ability to apply a splint in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

4. I am confident in my ability to clean wounds in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

5. I am confident in my ability to control bleeding control in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree
Appendix F
Study #3 Pre-Survey (Page 3)

Tsunami Preparedness Training and Exercise Pre-Survey

Please complete only the stations that you are attending.

Helicopter Landing Zone (LZ)
1. I am confident in my ability to establish an LZ in a timely manner during the day and in accordance with national standards.
   ○ Strongly Agree ○ Agree ○ Neutral ○ Disagree ○ Strongly Disagree

2. I am confident in my ability to establish a night LZ in a timely manner and in accordance with national standards.
   ○ Strongly Agree ○ Agree ○ Neutral ○ Disagree ○ Strongly Disagree

3. I am confident in my knowledge of helicopter safety in accordance with industry standards.
   ○ Strongly Agree ○ Agree ○ Neutral ○ Disagree ○ Strongly Disagree
Tsunami Preparedness Training and Exercise Post-Survey

Name: ________________________________ Date: __________

Likert Scale  5 – strongly agree  4 – agree  3 – neutral  2 – disagree  1 – strongly disagree

Instructions:
How well do you agree with the following statements? Please choose and fill in the circle that corresponds best with your level of agreement.

Section 1: Please respond to all statements

1. This community-based preparedness training and exercise program was appropriate for our community needs.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

2. I recommend continuing this type of community-based training and exercise.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

3. I prefer a community-based combined preparedness approach (Community and an outside expert or experts collaborating together equally) versus an outside expert only based approach.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

4. Our newly trained community preparedness instructors have been provided the skills needed to assist Kalaupapa in its ability to better maintain and sustain a community level of tsunami readiness.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

5. The establishment of a community tsunami awareness month once a year with training, education and, an exercise will help us maintain our level of tsunami readiness.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

6. I have been informed of the community distribution plan for the results from the pretest and post-test as well as the after-action-report from the training and exercise.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree
Appendix G
Study #3 Post-Survey (Page 2)

Tsunami Preparedness Training and Exercise Post-Survey

Section 1 (Continued): Please respond to all statements

7. I received a copy of the community training needs assessment and exercise plan.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

8. Community members were the primary instructors in the training.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

9. Outside instructors (Hawaii DMAT) played a supportive role.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

10. The community has acquired the skills necessary to repeat this training and exercise process.
    ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

Section 2: Please complete only the stations that you attended and completed.

Communications

1. I am confident in my ability to establish an effective signal and externally call with the satellite phone in accordance with manufacturer’s recommendations.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree

2. I am confident in my ability to establish antenna, operate and communicate messages using a HAM radio in accordance with national standards within 20 minutes.
   ○ Strongly Agree  ○ Agree  ○ Neutral  ○ Disagree  ○ Strongly Disagree
Appendix G
Study #3 Post-Survey (Page 3)

Tsunami Preparedness Training and Exercise Post-Survey

Section 2 (Continued): Please complete only the stations that you attended and completed.

ICS Role and Responsibility for Specific Positions
1. I am confident in my knowledge of my ICS role and responsibilities in accordance with my Job Action Sheets (JAS) for a tsunami.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

2. I am confident in my ability to carry out my assigned command roles and responsibilities in accordance with JAS in a simulated environment.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

Helicopter Landing Zone (LZ)
1. I am confident in my ability to establish an LZ in a timely manner during the day and in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

2. I am confident in my ability to establish a night LZ in a timely manner and in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

3. I am confident in my knowledge of helicopter safety in accordance with industry standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree
Appendix G
Study #3 Post-Survey (Page 4)

Tsunami Preparedness Training and Exercise Post-Survey

Section 2 (Continued): Please complete only the stations that you attended and completed.

First Aid

1. I am confident in my knowledge of common tsunami injuries and illnesses.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

2. I am confident in my ability to apply a dressing and appropriate bandage to wound in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

3. I am confident in my ability to apply a splint in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

4. I am confident in my ability to clean wounds in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree

5. I am confident in my ability to control bleeding control in accordance with national standards.
   - Strongly Agree
   - Agree
   - Neutral
   - Disagree
   - Strongly Disagree
January 2013 Tsunami Disaster Training Program

Train-the-Trainer: Tuesday, January 29\textsuperscript{th} from 9am to 11am.

Train-the-Trainer Participants: 5 resident instructors and 4 outside instructors including the lead researcher.

Community Training: From Tuesday, January 29\textsuperscript{th} from 12:00pm to 3:30pm to Wednesday January 30\textsuperscript{th} from 9:00am to 11:00am.

Community Training Participants: Residents

Training Topics:

1) Communications

2) ICS Role and Responsibility for Specific Positions

3) First Aid

4) Helicopter LZ

5) Search and Rescue
Training Objectives:

Communications

Demonstrate the ability to establish an effective signal and externally call with the iridium satellite phone in accordance with manufacturer’s recommendations.

Demonstrate the ability to establish antenna, operate and communicate messages using a HAM radio in accordance with national standards from the evacuation site within 20 minutes.

ICS Role and Responsibility for Specific Positions

Demonstrate knowledge of the Incident Commander’s roles and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the Operations Chief’s roles and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the PA Notification team’s roles and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the Transportation’s Officer’s role and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the Communications Chief’s role and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the Logistics Chief’s role and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the spotter’s role and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the Helicopter LZ unit leader role and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate knowledge of the Evacuation site manager’s roles and responsibilities in accordance with associated Job Action Sheets for a tsunami.

Demonstrate the ability to carry out assigned command roles and responsibilities in accordance with JAS in a simulated environment.
Appendix H
Tsunami Disaster Training Program (Page 3)

Training Objectives (Continued):

First Aid

Demonstrate knowledge of common tsunami injuries and illnesses.

Demonstrate the ability to apply a dressing and appropriate bandage to wound in accordance with national standards.

Demonstrate the ability to apply a splint in accordance with national standards.

Demonstrate the ability to clean wounds in accordance with national standards.

Demonstrate bleeding control.

Helicopter LZ

Demonstrate the ability to establish an LZ in a timely manner and in accordance with national standards. (Night and Day)

Demonstrate the ability to communicate air to ground utilizing the VHS radios in accordance with radio operation standards.

Demonstrate knowledge of helicopter safety in accordance with industry standards.

Search and Rescue

Demonstrate the ability to effectively search and mark a home or building for survivors following a tsunami in accordance with national standards.

Demonstrate the ability to package and extricate a patient.
# Appendix I
Community Training Schedule

## January 29\(^{th}\), 2013 Training
### Tuesday

<table>
<thead>
<tr>
<th>Search and Rescue Class (1 hour)</th>
<th>12pm – 1pm</th>
<th>2:30pm – 3:30pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: TBA</td>
<td>Location: TBA</td>
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<table>
<thead>
<tr>
<th>First Aid Class (1 hour)</th>
<th>1:15pm – 2:15pm</th>
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<tbody>
<tr>
<td>Location: TBA</td>
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</table>

<table>
<thead>
<tr>
<th>Emergency HAM Radio Use Class (20 minutes)</th>
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<tbody>
<tr>
<td>12:00pm – 12:20pm</td>
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<tr>
<td>Location: TBA</td>
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<table>
<thead>
<tr>
<th>Satellite Phone Use Class (30 minutes)</th>
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</thead>
<tbody>
<tr>
<td>12:45pm – 1:15pm</td>
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<tr>
<td>Location: TBA</td>
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<table>
<thead>
<tr>
<th>Helicopter Landing Zone Training Class (1 hour)</th>
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</thead>
<tbody>
<tr>
<td>12:00pm – 1:00pm</td>
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<tr>
<td>Location: TBA</td>
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</table>

## January 30\(^{th}\), 2013 Training
### Wednesday

<table>
<thead>
<tr>
<th>First Aid Class (1 hour)</th>
<th>9am – 10am</th>
<th>10am – 11am</th>
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<tbody>
<tr>
<td>Location: TBA</td>
<td>Location: TBA</td>
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<table>
<thead>
<tr>
<th>Emergency HAM Radio Use Class (20 minutes)</th>
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<tr>
<td>9am – 9:20am</td>
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<td>Location: TBA</td>
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<table>
<thead>
<tr>
<th>Satellite Phone Use Class (30 minutes)</th>
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<tr>
<td>9:15 – 9:45am</td>
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<td>Location: TBA</td>
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<table>
<thead>
<tr>
<th>Helicopter Landing Zone Training Class (1 hour)</th>
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<tbody>
<tr>
<td>10am – 11am</td>
</tr>
<tr>
<td>Location: TBA</td>
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</table>
Rapid Tsunami Exercise  
After-Action-Report 01/30/2013

What Worked:

All participants were able to safely and rapidly evacuate the community from their work or residence to the evacuation site within 20 minutes.

The vehicle PA system notification with a pre-scripted announcement was initiated within 5 minutes following official notification of a simulated rapid approaching tsunami and successfully navigated through the entire community within 17 minutes.

The community siren was activated immediately following notification of a rapidly approaching tsunami.

A spotter was quickly assigned and deployed to X Crater with binoculars and Agency radio within 10 minutes following notification.

Vehicles were able to reach the evacuation site easily without bottlenecking.

Parking at evacuation site was well directed and organized.

A helicopter landing zone for day time and night time operations was established using set up kit components within 20 minutes in accordance with national standards.

A simulated patient with a medical condition was rapidly identified and quickly treated and managed in accordance with standards of care.

The Community Spotter successfully conducted ongoing communications with the assigned Operations Section Chief regarding simulated tide change status and community impact.

External communications with Oahu via HAM radio from evacuation site was successfully established.

External communications with Oahu via Iridium Satellite phone from evacuation site was successfully established.
What Worked (Continued)

Relevant ICS specific positions were initiated at evacuation site in accordance with NIMS standards.

Community members assisted others and transported them rapidly to evacuation site.

What Were Some Of The Challenges:

Even though a PA system notification via 2 vehicles was successful in quickly deploying and covering the entire area, many residents stated that it was very difficult to hear.

Some residents did not get picked up due to mistaken communication or was overlooked due to the rushing.

There were some role and responsibility challenges with some ICS positions.

The point to point communication via VHF radio had limitations with distance. Within the community messages were able to be received but unable to transmit.

Some of the ICS positions did not have a radio communication device at evacuation site making it difficult to contact them. There was a situation in which someone needed to be contacted quickly to take care of an emerging situation but did not have a radio.

Due to the time constraint, some of the exercise objectives were not accomplished.

Improvement Plan Recommendations:

Consider an alternative backup portable communication device to send with strike teams to ensure that communication is not interrupted or impaired. For example, portable HAM radio or a Motorola turbo hand held. In addition, continue testing the 3 other channels and determine overall limitations.

Conduct table tops and functional exercises to strengthen ICS job roles and responsibilities. This will help those assigned or potentially assigned to better understand their roles and responsibilities.

Ensure that all assigned VHF radios are brought to the evacuation by typing them as essential and working with those that possess one to remember to bring it. Also, making sure other radios such as the two at the care home brought.
Appendix J (Page 2)
Community Exercise After-Action-Report

Improvement Plan Recommendations (Continued):

Determine who within the community does not have a vehicle and who may need assistance. Assign a neighbor with a vehicle to drive them up to the evacuation site. This will assist with resource allocation and improve accountability.

Continue to conduct training and exercises for rapid approaching tsunami scenarios. The more it is done, the more issues and gaps can be identified and worked out ahead of time.

Improve the notification system by continuing to teach the community to sound their horn in their vehicles while they drive up to the evacuation site. This will alleviate some of the challenges with hearing the PA system and provide a unique identifier or signal to immediately evacuate due to a rapidly approaching tsunami.

Continue to develop and exercise job action sheets to assist those assigned roles with being able to rapidly respond and facilitate the evacuation and sustainment of survivors at evacuation site.

Continue to develop and finish a draft rapid tsunami evacuation plan. This will help to maintain and sustain everyone being on the same page and reduce inefficiency and duplication of effort. It will also assist responding agencies external of the community by familiarizing them with capabilities and the evacuation site.

Facilitate the involvement of more community residents in trainings and evacuation exercise to prepare more.
January 2013 Tsunami Exercise Plan

Exercise and Type: 2013 Tsunami Field Training Exercise

Date: Wednesday, January 30th (TBD) from 12:15pm – 2:30pm

Participants: Community Residents

Type of Emergency: 20 – 30 minutes Tsunami generated from an 8.0 earthquake off of the Big Island.

Location: Community X and the Evacuation Site

Purpose of Exercise: The purpose of this disaster exercise is to evaluate the recently developed Tsunami Emergency Operations Plan and specific skills learned during the pre-exercise training.

Functions: Emergency Notification

- Dispatch – initial notification of inbound tsunami from Big Island with ETA of 20 minutes.
- Notification of agencies within the community
- Community Siren
  - Activating the siren
- PA System
  - Structural fire engine
  - Vehicles A (only other vehicle in community with PA system)
  - Pre-scripted message
  - Route taken

Evacuation:

- Spotter
- Parking
- Transportation
- Time
- ICS
Appendix K (Page 2)
Community Tsunami Exercise Plan

Functions (Continued):

Establishing Evacuation Site:
- Helicopter LZ
- Communications (HAM radio and Satellite)
- First Aid

Search and Rescue:
- Search a building or home
- Extricate the injured
- Mark the structure in accordance with national standards

Exercise Objectives:

1) Notify other agencies within the community immediately following official notification of a simulated rapid approaching tsunami via phone and radio.

2) Upon official notification appointed individual will immediately activate the community alarm.

3) Initiate PA system notification with pre-scripted announcement by assigned 2 person team within 5 minutes following deployment during a simulated 20 - 30 minute rapid approaching tsunami.

4) Deliver a clear, coherent and audible pre-scripted message to residents inside their homes while following the pre-designated route.

5) Evacuate the simulated population of the community to the evacuation site within 15 minutes via POV, State and government vehicles.

6) Deploy a spotter to X Crater with binoculars and VHS radio during a simulated rapid approaching tsunami event within 10 minutes following notification.

7) Conduct initial communication of tide change status with Operations Section Chief via VHS radio upon arrival.
Appendix K (Page 3)
Community Tsunami Exercise Plan

**Exercise Objectives (Continued):**

8) Maintain communication of tide change status with Operations Section Chief via VHS radio every 2 minutes or sooner depending on tide changes.

9) Initiate ICS structure in accordance with NIMS standards immediately following notification.

10) Establish Helicopter LZ utilizing set-up kit components at designated coordinates within 15 minutes for day time operation in accordance with industry standards.

11) Establish Helicopter LZ utilizing set-up kit components at designated coordinates within 15 minutes for night time operation in accordance with industry standards.

12) Establish external communications with HAM radio from evacuation site within 10 minutes.

13) Establish external communications with Iridium Satellite phone within 10 minutes.

14) Search a building and mark it in accordance with national standards during the designated search and rescue phase of the operation.

15) Apply dressing and bandage to wounds of simulated patients in accordance with national standards during simulated exercise.

16) Apply splints to fractured extremity in accordance with national standards.

**Exercise Narrative:**

At 12:30pm, an estimated 8.5 earthquake occurred off of the coast of the Big Island generating a massive tsunami with an estimated time of impact in Community X of 20 minutes. Recommendation is to immediately evacuate the population within the community and other low lying areas.
REFERENCES


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