

BARRIERS TO MITIGATION: INCENTIVES AND THE INFLUENCE OF SOCIAL  
NETWORKS

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Crystal Paul  
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The Undersigned Thesis Committee Approves the Thesis Titled

BARRIERS TO MITIGATION: INCENTIVES AND THE INFLUENCE OF SOCIAL  
NETWORKS

By  
Crystal Paul

APPROVED FOR THE DEPARTMENT OF SOCIOLOGY

---

Dr. James Daniel Lee,      Department of Sociology      Date

---

Dr. Carlos Garcia,      Department of Sociology      Date

---

Dr. Guna Selvaduray,      Department of Chemical  
and Materials Engineering      Date

APPROVED FOR THE UNIVERSITY

---

Associate Dean      Office of Graduate Studies and Research      Date

## ABSTRACT

### BARRIERS TO MITIGATION: INCENTIVES AND THE INFLUENCE OF SOCIAL NETWORKS

By Crystal Paul

This study is an expansion of previous research and a pilot study conducted on the barriers to hazard mitigation. Using a sample of 235 American Red Cross staff members and volunteers, factors such as the barriers and incentives around earthquake mitigation were assessed. Demographic characteristics and threat perceptions were also measured and compared to respondents' mitigation activities. While few demographic characteristics could be related to mitigation activity overall, findings were consistent with information found in the literature review and the pilot study. Barriers to mitigation were generally cost, time required, lack of information, and a feeling that it was unnecessary or useless. Incentives that were highly ranked were those that provided financial assistance or free items or services. Generally, respondents perceived that any earthquake that would happen in the near future had the potential to cause damage or injury. In turn, respondents had mitigated to varying degrees. It was found that respondents who knew someone who had mitigated were also more likely to practice mitigation, and respondents' relationships with individuals who had experienced damage or injury from an earthquake did have some positive influence on mitigation activity.

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## **I. Introduction**

The state of California contains several earthquake fault lines on which major earthquakes are expected to occur. While it is very difficult to make an accurate prediction of when and where an earthquake will happen, scientists have drawn conclusions about how those earthquakes will affect individuals and their property. For example, the California Seismic Safety Commission (2005) stated that in the next 10 years the expected damage caused by earthquakes will exceed 30 billion dollars and that three-quarters of all earthquake damage throughout the nation will occur within California. Further, relatively low cost and simplistic steps to retrofit one's home and mitigate for overall earthquake damage have been developed by researchers and proven effective (California Seismic Safety Commission 2005). Educational literature and awareness campaigns have been created and conducted by governmental and non-profit organizations to encourage the general public to participate in the mitigation of disaster damage to protect their families and homes. Still, despite the rather well known threat of an earthquake to occur in California, the efforts of governmental and non-profit campaigns to encourage mitigation, and the general ease of actually mitigating, the majority of the population does not widely participate in disaster mitigation (U.S. Geological Survey 2005).

The research presented here builds from the hypothesis that there are identifiable barriers or obstacles that prohibit individuals from practicing mitigation and that those barriers can be overcome. It is also assumed that there are

existing factors that prompt individuals to mitigate and that there is a need to identify what those factors are in order to better encourage widespread mitigation. The overall purpose of this study was to add to the body of literature around disaster mitigation, specifically focusing on the barriers to mitigation as well as incentives that would encourage mitigation. Moreover, this study was intended to add additional components to enhance the findings of previous research. For example, this study was particularly interested in the effect that social networks have on disaster mitigation activity. Through examination of the experiences that persons and their friends and family have had with mitigation in their own homes and bodily injury or damage to the home caused by earthquakes, this research attempts to determine whether these experiences encourage mitigation activity. Additionally, this research looks at the type of relationship that the individual has had with persons who experienced injury, damage or who had mitigated their homes already. The relationship analysis was intended to determine whether certain types of relationships, like closer familial bonds or geographical location, caused the respondent to mitigate more than other relationships would have.

This project is an expansion of a pilot study that was conducted in 2009. The sample for the research found here is American Red Cross staff and volunteers located in the San José, California area. This sample was chosen because it could be assumed that these volunteers would already be aware of

the importance of disaster mitigation and would be a good target group to better understand what barriers and incentives there are to mitigation.

In general, the findings for this study reveal that individuals do expect an earthquake to occur in the near future. Respondents expect that this earthquake will cause slight to moderate damage or bodily injury. It was found that cost, time, and lack of necessity were all barriers to mitigation among this sample. Incentives that respondents found attractive were mostly financial like free mitigation items or tax breaks. Evidence for the importance of social networks and their influence over mitigation was found, however further investigative research is needed.

As part of this research, a review of the literature will be presented in Chapter II and general theoretical background can be found in Chapter III. A review of the pilot study is located in Chapter IV. Methodology and a description of the survey instrument can be found in Chapter V.

Chapter VI states the findings of this study which include: a description of the sample, the perception of earthquake risk and severity of expected earthquakes, the level of mitigation among respondents, respondents' experience with earthquake injury or damage, the social influences on respondents' disaster mitigation activity, and incentives to encourage mitigation. Chapter VII outlines a general discussion of the findings and Chapter VIII provides suggestions for future research.

Overall conclusions will be drawn in Chapter IX. References can be found in the References section. The survey instrument is presented in the Appendix.

## **II. Review of the Literature**

Research has shown that both disaster preparedness and disaster mitigation are extremely important steps in the emergency preparation process. Both disaster mitigation and preparation are essential to ensuring that individuals and their homes are safe from injury or damage during a disaster occurrence and that those individuals have the items they need to sustain themselves until help can arrive. However, the prevalence of research that directly concerns earthquake hazard mitigation among individuals is very low (Lindell and Perry 2000; Mileti and Peek-Gottschlitch 2001; Perrings 2003). Disaster preparedness generally involves several steps in which a family may gather and store items as well as prepare evacuation plans and meeting spots to ensure safety in the event of a disaster. In contrast, mitigation requires individuals to take a different approach specifically towards reducing vulnerability to property damage or bodily injury in the event of a disaster. There are various actions individuals can take to mitigate their homes against disasters. Examples include securing water heaters and large furniture items into place as well as anchoring one's house to its foundation (U.S. Geological Survey 2005).

While there is a solid and growing body of research assessing disaster preparedness (Russel, Goltz, & Bourque 1995), there has been little focus solely on earthquake hazard mitigation among individuals. Extensive research assessing the importance of mitigation from a technical and financial perspective, particularly focusing on mitigation from an insurance and civil engineering aspect,

has been widely documented (Settle 1985; Multihazard Mitigation Council 2005).

Much of this research is focused on the public administration aspect of disaster preparedness or commercial risk management. Mitigation research has often revolved around what city planners and governments can do to reduce both property damage and the injury of residents in the event of various natural disasters (Bolt 1991; Lamarre 1998; Meltsner 1977; Nelson & French 2002; Palm and Hodgson 1992).

Numerous organizations, businesses and governments are exploring ways to ready communities against both the physical and financial effects of disasters. Yet, research has found that often homeowners themselves do not take the proper precautions against damage caused by disasters (Lindell and Perry 2000; U.S. Geological Survey 2005). In fact, Edwards (1993) shows that when asked about disaster preparedness in an area where earthquakes are a potential hazard, over 70 percent of individuals responded that they had taken actions toward personal preparedness. However, less than 4 percent of individuals had participated in actual mitigation practices (Edwards 1993).

Noted studies have shown that individuals tended to increase disaster preparedness and/or mitigation efforts either directly after a major disaster had occurred or following an awareness campaign which highlighted the threat of a disaster (Duval and Mulilis 1999; Kreps 1984; Lindell and Perry 2000). Turner, Niggs, Paz, and Young (1986), presented research based on individual and group responses of Southern California residents to earthquake prediction

announcements over the time period of three years. The threat of an earthquake was not a frequent worry of most respondents. However, when a potential threat was communicated to them, these individuals became very interested in obtaining more information and inquired about ways to be prepared. Since this study was conducted in Southern California only, it is difficult to assume that the same disaster threat campaign would have parallel results on a national level. However, in a study conducted by The Council for Excellence in Government (2008) it was found that 19 percent of over 1,000 national respondents claimed to have taken steps toward preparedness after observing disasters such as recent flooding in the Midwest and wildfires in California. These findings help efforts to understand motivations behind disaster preparedness on a national level. It may be that it is not only one particular type of disaster but also the actual occurrence of disasters in general that may encourage individuals to prepare. Still, while the above studies have shown that awareness of disasters may cause individuals to begin to prepare for the occurrence of a disaster in their area, the majority of the national population remains unprepared at all times (Council for Excellence in Government 2007; National Center for Disaster Preparedness 2007; Department of Homeland Security 2007).

Past studies have shown that often individuals do not participate in disaster preparedness or disaster mitigation for several reasons. It may be that the individual was unaware of the imposed risk of disaster or did not perceive the threat of a disaster to be imminent (Clarke 2008). A survey of 955 Californians

conducted by the Survey and Policy Research Institute (SPRI) at San José State University (2006) found that those respondents who understood the potential threat of an earthquake had higher preparedness ratings than those who did not. In fact, 63 percent of adults who reported that they did expect a large-scale earthquake to hit California claimed to be prepared for that earthquake (Survey and Policy Research Institute 2006). As, this study was conducted as part of the California Consumer Confidence Survey, and is representative of the general California population, the findings are significant and revealing. In fact, after assessing each region of California separately, it can be concluded that approximately 9.8 million individuals in California would report that they are not prepared for a major earthquake (Survey and Policy Research Institute 2006).

While these measurements are self-evaluations of preparedness on behalf of each individual, it seems that preparedness ratings are more subjective than defined. However, from a preparedness perspective, the extremely high rate of individuals who report that they are unprepared for a major earthquake is quite alarming. Additional research has found that not only do individuals not recognize the threat of a disaster but they also do not personalize that threat (Lindell and Perry 2000; Weber 2003). This means that individuals do not recognize that the damage caused by an earthquake or a disaster in general will directly affect them or their lives overall. This inability to personalize the threat of a disaster, may have led individuals to be less likely to participate in preparedness or mitigation activities.

A review of the literature has offered a composite inventory of other barriers to disaster preparedness. For example, studies have found that individuals are more preoccupied with daily life than they are concerned about preparing for a natural disaster (Lindell and Perry 2000; Clarke 2008). Other studies have found that many individuals do not mitigate because they do not feel mitigation is their responsibility (Garcia 1998; Lindell and Perry 2000; City of Roseville 2004). In fact, many individuals report that they believe the government to be responsible for disaster preparedness as it is the government's role to protect and care for the general public. Some individuals do not feel as though mitigation is financially viable (Lindell and Perry 2000; Weber 2003). In this case, individuals may feel that purchasing emergency goods is too costly or that house assessments or engineer evaluations are not a useful investment.

The conclusions about disaster preparedness as presented above are further verified by a study conducted by the San Diego County Department of Emergency Services. In this study, 55 percent of the 600 houses surveyed in San Diego County were most concerned with the threat of an Earthquake in their direct area (Rea & Parker Research 2006). Moreover, those who had children living in the home and those who had previously experienced a disaster were more likely to be prepared than those who had not. Approximately 50 percent of the total respondents were prepared for a disaster with a family emergency plan. However, 50 percent of those in households that were not prepared claimed the following as reasons for their neglect to prepare: they had not taken the time to

prepare (approximately 35 percent), they had planned to prepare sometime in the future (approximately 18 percent), they did not believe anything serious was going to happen (18 percent), and they felt that they were too busy to take steps toward preparedness (15 percent; Rea & Parker Research 2006). Among these responses, another 12 percent of households claimed that one of the following issues prevented them from being prepared: they simply had not thought about preparedness, they did not have enough space in their home for storage of preparedness items, they did not have children, they lived in an apartment, and/or they could not afford certain types of preparedness supplies (Rea & Parker Research 2006). As this study was conducted among San Diego residents only, it is not directly generalizable to the broader population on a national scale. Yet, the variety of disasters this sample has been exposed to gives researchers insight into individuals' perspectives on the various types of disasters that occur throughout the United States and not just in the San Diego area. For example, the study reported that respondents had experienced earthquakes, fires, floods, hurricanes, and tornadoes. Because San Diego County does not frequently experience disasters such as hurricanes and tornadoes, it might be assumed that many of the respondents had moved to the San Diego area from somewhere else. Therefore, to further this study, researchers may attempt to measure where the respondents had moved to San Diego from originally or where it was that the respondents had originally

experienced the disaster. Perhaps these additional factors had an effect on the preparedness levels of the individual.

Stemming from the understanding, as presented above, that there are barriers to disaster mitigation and disaster preparedness overall, it is in the interest of earthquake mitigation research to understand what incentives can be used to encourage individuals to participate in mitigation and preparedness. Considering that it has previously been found that individuals do not participate in disaster preparedness or mitigation due to the lack of feelings of personal responsibility, and other factors such as cost, time, and inconvenience as listed above, researchers must find incentives that will appeal effectively so that these particular barriers can be overcome.

Although incentive research is scarce, there have been some governmental and community based organizations that have conducted community and national surveys to better understand how to encourage disaster preparedness. For example, the Texas Colorado River Floodplain Coalition found that out of 39 respondents, only one individual mentioned that enforcing government mandates, such as building codes, would be useful as an encouragement toward disaster preparedness (H2O Partners, Inc 2004). In addition, the Council for Excellence in Government (2006) offered a unique insight to preparedness by citing reasons that individuals do prepare. Specifically, among the 1,000 respondents in this study, about 80 percent of the individuals who had taken at least one preparedness step did so due to the need

for self-sufficiency and to reduce their reliance on others during a disaster (Council for Excellence in Government 2006). Additionally, 49 percent of respondents who had taken preparedness steps claim to have done so because they were responsible for children. When focusing on specific areas of the country, it was found in this survey that 62 percent of individuals who lived in Miami and 61 percent of individuals who lived in San Francisco claimed to be prepared because they knew they lived in a high risk area (Council for Excellence in Government 2006).

In a nationwide survey conducted by the National Center for Disaster Preparedness in 2007, it was found that many individuals do not feel a disaster threat is imminent and over 60 percent would still have needed to gather items if a disaster were to happen (National Center for Disaster Preparedness 2007). This information may imply that an incentive to encourage preparedness and mitigation would be one that helped individuals understand the realistic urgency of a threat in their area. This same survey found that only 28 percent of 1,352 adult respondents felt that financial incentives such as a tax credit or other economic strategies would affect their decision to prepare (National Center for Disaster Preparedness 2007). It has been mentioned in previous studies that individuals feel that better education and more information about disasters and disaster preparedness would provide incentives (Lindell & Perry 2000). For example, a national survey revealed that 64 percent of 1,006 respondents claimed that they would be very or somewhat more likely to prepare if police and

fire officials offered information and preparedness recommendations to the general public (Council for Excellence in Government 2006). Encouragement from friends and family was also a compelling source of preparedness as 63 percent of respondents claimed this would increase their preparedness level significantly (Council for Excellence in Government 2006).

Still, information may not always encourage individuals to protect themselves from disasters. One study showed that when prospective homeowners in the Berkeley, California and Contra Costa County, California areas were provided with information on potential disasters in their region, they ranked the house's location to an earthquake fault line as one of the least important factors to consider when choosing which new home to purchase (Palm 1981). Moreover, only about 19 percent of homeowners who bought homes within a governmentally defined hazard zone said that the house's location in an earthquake hazard zone made any difference in their choice to purchase the home. The most important factors to these homeowners were the price of the house and the investment potential the house offered (Palm 1981). Researchers for this study did not offer any background on homebuyers concerning each individual's experience with earthquakes or whether the homeowner had moved to the area from another city. Both of these factors may have had an influence on the buyer's concern about a disaster. It may be likely that those individuals who have had no experience with earthquakes or other types of disasters would have less concern about fault lines and earthquakes overall than those who have

had experience. Also, it can be speculated that perhaps individuals who are from an earthquake or other hazard prone area may be more concerned about the proximity of their home to a fault line than those who are from an area where this would not traditionally have been an issue. This study begs researchers to consider that perhaps particular types of information concerning disasters are more important to some groups at certain times and are more preferred over others. The kind of information given to the public may be just as important to consider as other incentives.

Aside from general incentives for individuals to prepare, demographic characteristics have also been studied to reveal their relationship with disaster preparedness. Characteristics such as job status, age, race, education and the presence of children in the home all have affected preparedness levels. For example, individuals who have a full time job are more likely to participate in disaster preparedness than those who work part time or less (Council for Excellence in Government 2006). In terms of age, it has been found that individuals between the ages of 45 and 55 have the highest preparedness rating among all adult age categories, followed by the 55-64 and 35-44 categories ranked as the second and third most prepared. The 25-34 category is the fourth most prepared and the 18- 24 age category is the least prepared category (Department of Homeland Security 2007). In a general disaster preparedness study conducted in 2006, African Americans were rated the most prepared of all ethnic categories, and in a follow-up study in 2008, non-Hispanic whites were

ranked as the least prepared (Council for Excellence in Government 2008). In terms of education, individuals with less education, specifically those who had only a high school diploma or less are significantly less prepared than those who have obtained higher education (Council for Excellence in Government 2006; 2008). Additionally, having one or more school-aged child in the home has a positive effect on the household's preparedness levels (Council for Excellence in Government 2006).

Based on many of these findings stated here in the literature review, this study will look to better understand the various barriers to hazard mitigation as well as incentives. This study will measure the respondents' threat perceptions and overall mitigation activities. Additionally, this study will look at demographic characteristics and the influence of social networks on mitigation activities.

### **III. Theoretical Background**

Particular theories concerning an individual's lack of preparedness or minimal actions taken towards mitigation have been developed in both the psychological and sociological fields. One such theory is called the person-relative-to-event (PrE) approach that was developed by Duval and Mulilis (1999). Grounded in the concept of negative threat appeals, as well as the association of both personal attributes (i.e. self-efficacy) and actual event characteristics (e.g., probability, severity), this theory is focused on an individual's preparedness activities in direct response to threat perception (Duval & Mulilis 1999). The PrE approach hypothesizes that "problem focused coping" will be greater when resources are considered to be sufficient in relation to the size of the expected disaster (Duval & Mulilis 1999). Duval and Mulilis (1999) used the negative threat appeal of an impending disaster to study the response and disaster preparedness activity of a group of 328 homeowners in Long Beach, California. PrE theory was supported when the results of the study showed that those with high personal resources tend to increase their readiness activities as the potential magnitude of the disaster increases. However, for those with low personal resources, as the potential magnitude of the disaster increases, preparedness efforts decrease. The explanation for this finding is that when a disaster is anticipated as potentially more intense, and individuals have low coping resources, preparedness activities are perceived as more difficult and that actual preparation is impossible. Therefore, individuals with low personal

resources were not willing to commit to a level of disaster preparation that they did not feel they could attain (Duval & Mulilis 1999). Duval and Mulilis (1999) presented a thorough analysis of both the resources an individual has along with the individual's psychological perception of a disaster threat. Yet, this research did not discuss in detail the possible incentives that could be presented to encourage mitigation. Perhaps one way to encourage disaster preparedness or mitigation would be to help individuals understand how easy and how few resources are actually needed to practice preparedness or mitigation. If the anxiety around not having enough resources in comparison to the perceived threat of a disaster could be alleviated, perhaps individuals would be more likely to be prepared.

Expanding their previous work done on tornado preparedness, Duval, Mulilis, and Rombach (2001) discussed disaster preparedness in the social psychological terms of not only personal responsibility but also of personal choice and commitment. The extent to which individuals feel that they have a choice *to be involved* in a particular situation relates to how much control they feel that they have *in* that situation. This control in turn affects the amount of responsibility individuals feel that they have *over* that situation. Duval et al. (2001) stated that when individuals feel that they are responsible for a decision, the more commitment to that decision they will have. The findings of a study on tornado preparedness done on 52 undergraduate psychology students at Pennsylvania State University found that only under conditions of high choice

and high commitment do individuals feel highly responsible for tornado preparedness activity (Duval et al. 2001). While these finding are important to better understand the place that choice and commitment have in the preparedness process, future research is needed to understand if these trends are not just unique to this sample. For example, with a very small undergraduate sample taken from a single university, it may be assumed that the demographic characteristics of these individuals differ greatly from many of the demographic characteristics that have been proven to encourage mitigation and preparedness. For example, some such characteristics are owning a home or having a family or school aged children in the parent's home. Therefore, while it is important to understand the influence on disaster preparedness and mitigation that choice and commitment have, further research should be done on a variety of populations.

The concept of choice as related to personal responsibility in disaster preparedness is important. It may be concluded that when individuals understand that they have a choice to participate in mitigation activities they will take control of and follow through with those activities. In this same vein, if an individual has the power to choose to mitigate for disasters, if they believe that they are responsible for that decision, they will be more committed to following through on it. These conclusions are consistent with Duval and Mulilis' (1999) research on the PrE approach to disaster preparedness. Just as individuals need to feel as though they are in control of their choices and are in turn

committed to those choices, individuals need and use personal attributes and resources to react to and prepare for the threat of disaster.

Predating the social psychological approaches presented above, Bogard (1988) took a more sociologically rooted look at disaster preparedness. Appealing to rational action theory and Anthony Giddens' concept of structuration to explain the relationship between the action of mitigation and its unanticipated consequences, Bogard (1988) discussed the intentional, purposeful and feedback oriented nature of human action. Essentially, this theory maintains, as Giddens asserted, that humans are naturally able to monitor and reflect upon their actions based on stocks of knowledge shared by individuals in society. Bogard then compared the nature of human action as asserted by Giddens, to the perpetually uncertain threat and outcome of a disaster (Bogard 1988). Bogard concluded that mitigation must always operate against this perception of the unknown and therefore inhibits behavior that promotes disaster mitigation.

Bogard further discussed mitigation as a collection of strategic actions taken by individuals or society to reduce the impact of hazards. However, due to the fact that mitigation is not always guaranteed to work as perfectly as planned, some precautions can have negative effects. Bogard warned that the potential harms of hazard mitigation must also be considered. He pointed out that very rarely an increase toward vulnerability in a disaster has been connected to mitigation. Specifically, Bogard cites White (1974) who showed that flood hazard mitigation actually increased property loss and damage. This discussion is

important for understanding possible reasons why individuals may not participate in mitigation activities. For example, as Bogard illustrated, humans are constantly acting in relation to previous actions and shared social knowledge. If individuals do not conceptualize their actions directly in relation to the threat of a disaster, specifically in choosing to act in ways that support disaster mitigation, then individuals will continue to be unprepared for a disaster. Similarly, because individuals are able to reflect upon actions, if they perceive previous mitigation actions, whether their own or that of others, as unhelpful, ineffective, or dangerous, then they are not likely to mitigate, initially or repeatedly. While this is a more abstract and less tangible concept than other theories presented here, it is important to understand that preparedness and mitigation result from complex processes, as we have seen in both the social and psychological realms.

Lindell and Perry (2000) discussed another theoretical model called Protective Action Decision Model (PADM). This model stated that the awareness of a threat arises through the individuals' exposure to incidences of environmental observation, through communication with others and/or through official governmental and media campaigns. After this exposure, individuals attempt to find the appropriate response for protection without interrupting everyday activities. Often individuals will then appeal to friends and other sources for clarification of appropriate responses (Lindell & Perry 2000). This may lead to the conclusion that if those friends and family members are

responding to the situation by participating in disaster preparedness and mitigation, so too, will the individual respond with the same actions. The PADM model demonstrates that a widespread and direct social influence such as communication from governmental campaigns or reactions from friends and family may be largely responsible for why individuals do or do not participate in preparedness or mitigation activities. This theory can be linked to previously presented theories in that once individuals perceive threat internally, they will then turn outward toward society, friends, and the media to gather information to understand appropriate reactions. While this theory does not take into consideration the necessary resources or demographic background each individual has, it allows for more subjectivity. For example, if individuals are looking to those around them for appropriate reactions, they will likely respond according to their means, as they would be more likely to be surrounded by individuals in the same demographic territory as themselves.

In line with a sociological approach, Kreps (1984) discussed the need to assess disaster preparedness in terms of responses by social units. Kreps stated that while social units can range in size and organization, depending on location and the nature of the disaster, and that mitigation efforts vary, social units uniformly are more likely to increase mitigation efforts as the knowledge of a potential disaster increases. In fact, research has found that often individuals' preparedness activities are associated with the same preparedness activities that have been taken by others in their social networks (Mileti and Darlington 1997).

Clearly, there are several theoretical perspectives that have been asserted by researchers concerning human behavior and disaster preparedness. While some researchers claim that preparedness or mitigation activity is directly related to an individual's resources and threat perception or feelings of responsibility and personal commitment and others claim that preparedness and mitigation activity is reliant upon human nature, observation of others and the influence of the government or the media, this study will focus on the influence of social networks on the individual. This study will look to measure the direct influence that the experiences and actions of others has on the mitigation activity of the respondents themselves.

#### **IV. Review of the Pilot Study**

Prior to the present study, research by Lee, Paul, and Selvaduray (2009) was conducted among faculty and staff members at San José State University as a pilot for later research. Lee et al. (2009) focused solely on earthquake mitigation and the barriers to mitigation activities among individuals. This study measured the various types of mitigation activities homeowners participated in, factors that might have prompted individuals to take steps toward mitigation, and incentives that may lead homeowners to mitigate in the future. Lee et al. (2009) essentially found that homeowners most often mitigate for actions that were required by law. For example, 88 percent of respondents reported that their water heaters were strapped down; a mitigation step required by law (Lee et al. 2009). However, a lot of damage during an earthquake can occur due to unsecured items in the home that may fall during the shaking of an earthquake. This is where Lee et al. (2009) saw the least mitigation occurring. In fact, about 80 percent of respondents reported that they did not have large furniture items and appliances strapped or bolted into place and only 4 percent of respondents claimed to have protective glass film over their windows to prevent shattering.

Overall, lack of knowledge and perceived cost were the most frequently reported barriers to mitigation in reference to home structures (Lee et al. 2009). However, knowledge and cost were not reported as barriers to mitigation for smaller items such as securing home contents like strapping down furniture and fastening down tabletop items. Instead, respondents found the inconvenience of,

the time investment for, and the lack of necessity for these actions to be the largest barriers to mitigation. Therefore, it would seem that the largest barrier to mitigation is the lack of prioritization of mitigation activities. Clearly this is a call for researchers to investigate how to encourage individuals to highly prioritize earthquake mitigation.

For Lee et al. (2009), incentives such as tax breaks or insurance discounts as well as free advice, free information or free labor to assist with home mitigation were all received favorably by respondents. However, the portion of the study that will be focused on here concerns the incentive that personal relationships provided. In fact, more than half of the respondents claimed that knowing someone who experienced damage in their home or having experienced damage themselves was the factor that prompted them to mitigate. Moreover, the study found that “myself” and “neighbor” were the relationships most frequently reported to cause an individual to have mitigated. Therefore, physical proximity of a disaster and those affected by disasters may be a contributing factor in encouraging mitigation.

In an attempt to add to the small body of literature about earthquake mitigation as presented in the literature review above, and drawing upon the findings stated in the study conducted by Lee et al. (2009) the study presented here is predominantly focused on earthquake mitigation activities among individuals and the motivation for them to engage in those activities. Just as the literature review states that there are various barriers and incentives for

individuals to mitigate, this study will assess how one's social networks may encourage earthquake mitigation activities. Similar to the findings stated in Lee et al. (2009), this study looks to evaluate whether the personal experiences of property damage or bodily injury among individuals and their friends and family, help to better understand how social ties may influence mitigation activity. An additional objective of this research is to better understand how the actual mitigation activities of friends and families around the respondents may have affected the respondents' own mitigation activities.

As Bogard (1988) states, humans act in relation to actions that have previously been taken and those actions are based on shared communal knowledge. Therefore, if those around them mitigate, individuals will draw upon those actions to understand how they themselves should respond to the threat of an earthquake. Moreover, as individuals perceive mitigation acts as effective, especially within their social networks, they will be likely to continue to practice mitigation. Similarly, the Protective Action Decision Model presented by Lindell and Perry (2000) essentially states that individuals choose to react to or prepare for a particular situation based on the knowledge they gain from the media as well as the social influences around them. They make choices to act or react according to whatever solution affects everyday life the least (Lindell and Perry 2000). Therefore, appealing to these social theories and the study done by Lee et al. (2009), it is expected that the closer in personal relationship individuals previously affected by damage or injury during an earthquake are to the

respondent, the more likely the respondent will be to have mitigated. Moreover, as found in Lee et al. (2009) it is expected that the closer in physical proximity an individual who mitigated is to the respondent, the more likely the respondent is to also have mitigated.

Drawing from the findings presented in the pilot study and research findings from the literature review, the main results expected in this study are:

- Respondents who expect an earthquake to be more severe will be more likely to mitigate.
- Respondents who have themselves experienced or who know someone who has experienced injury due to an earthquake will be more likely to mitigate.
- Respondents who have themselves experienced or who know someone who has experienced damage in the home due to an earthquake will be more likely to mitigate.
- Respondents who know someone who has mitigated will be more likely to mitigate.

## **V. Methodology**

This study was conducted among a group of American Red Cross staff and volunteers in Santa Clara County, California. This group was targeted as an ideal group to survey because it can be assumed that these volunteers have adequate knowledge of disaster preparedness, recognize the importance of disaster mitigation and clearly understand the threat of an earthquake that could cause damage to their homes or injury to themselves and family members in the near future. Further, as members of the American Red Cross, these volunteers may already have a particular interest in disaster preparedness, and therefore may practice mitigation on their own without influence of social networks beyond the American Red Cross. Yet, if this is not the case, and social networks do prove to be encouraging of mitigation activities, it might indicate an even larger role played by social networks among the greater population. The literature review states that past barriers to mitigation have been cost, inconvenience, lack of knowledge, or lack of threat perception. Using American Red Cross staff and volunteers, we may better understand these barriers as it is assumed, and will be tested, that these volunteers should have more knowledge about earthquake preparedness and mitigation as well as higher levels of perceived threat than the general population.

The survey for this study was administered using an online platform. Respondents were sent an email request with the survey link provided. Those who did not respond within two weeks were then sent an email reminder to

encourage higher response rates. Out of approximately 1030 potential respondents who were sent the survey, a total of 235 participated in the survey. All data analysis beyond simple response summaries were conducted using the SPSS 17.0 program.

### ***Explanation of Survey Instrument***

The questionnaire is a slightly modified version of the questionnaire used in the pilot study conducted by Lee et al. (2009). Questions asked of the respondents were intended to measure the respondents' home characteristics, perceptions of earthquake risk, level of mitigation, and experience with earthquake injury or damage. Additional questions measured the social influence on mitigation levels as well as responses to potential incentives to encourage mitigation. Demographic characteristics were also measured. Questions were grouped together according to topic and descriptions of each group can be found below. The questionnaire can be found in the appendix.

***Home Characteristics*** This set of questions was used to measure the respondents' living arrangements (Questionnaire Sections 2 - 4). The answers to these questions will be used to better understand whether the respondent owns or rents a house or apartment and what type of house or apartment the respondent owns or rents. Different homes may provide different opportunities for hazard prevention and mitigation and may lead to varying barriers to hazard mitigation. Additionally, this set of questions was used to assess the length of

time the respondent has lived in the home as well as the age of the home. Zip codes are requested as well in order to measure the geographical location of the residence of each respondent.

***Perceptions of Earthquake Risk*** This set of questions was used to measure the effect of potential risk on the respondents' level of mitigation (Questionnaire Sections 5 - 8). It has been shown in the literature review that individuals who consider an earthquake to be a more likely occurrence will be more likely to mitigate. This set of questions measured the respondents' perception of the likelihood of an earthquake occurrence. Additional questions measured the potential damage or injury the respondent anticipated may occur. Questions that were not included in the pilot study have been added to this section to measure the severity of damage or injury, if any, the respondents anticipated would occur.

***Level of Mitigation*** This set of questions was used to measure the respondents' involvement in hazard prevention (Questionnaire Sections 9 - 28). Based on findings stated in the literature review, several different categories of hazard prevention and mitigation are measured here. Categories of hazard prevention measured in this questionnaire include: research done on earthquake damage prevention, home assessment by an engineer to measure earthquake resistance, secured home to its foundation, strapped down water heater, fitted gas and other appliances with flexible connections, bolted large furniture items into place, placed safety straps on large appliances, placed security latches on

cabinets, secured heavy wall hangings, secured table tops items into place, and braced or replaced masonry chimney into place.

It is assumed that those who responded with “done” to each question were more likely to have participated in or planned to participate in hazard mitigation. A “not done” response, however, does not necessarily imply that the respondent did not plan to take steps toward hazard mitigation. A response of “others did before I moved in” allows researchers to understand that respondents may not have taken this hazard prevention step themselves but that others previously have. A response of “don’t know” indicates that respondents did not know whether other individuals had taken this step or whether they themselves had taken this step. A response of “other” indicates that respondents did not feel that any of the other responses reflected their experience. Respondents then filled in the “other” space with their own words to explain additional answers.

For those who responded to questions in this section with a “not done” response additional questions were asked to qualify why they had not taken the cited step towards hazard mitigation. While there is an “other” space for respondents to explain themselves, a list of choices were provided for them to check why they had not participated in mitigation. Those choices included: not enough information, too expensive, unnecessary, requires too much time, not useful/effective, inconvenient, and not my responsibility. Answers provided by the respondents will help with understanding what barriers may have led the respondent to not take a more active role in a particular form of hazard

prevention. A response of “other” prompted respondents to directly qualify this answer by typing in an explanation of their answer using their own words.

***Experience with Earthquake Injury or Damage*** This set of questions was used to understand the personal experiences of the respondent (Questionnaire Sections 29 - 34). As is illustrated in the literature review, many individuals did not participate in hazard prevention or mitigation because they did not personalize the risk involved. Therefore questions were asked to measure the respondents' personal experience with damage or injury caused by an earthquake. A “Yes” response to such questions implies that the individual may have been more likely to personalize the risk of an earthquake. Further, if the respondent had experienced earthquake damage or injury, then the relationship to the person affected was measured. It is assumed that the closer in relationship the affected person is to the respondent, the more likely the respondent will have been to personalize the risk of damage or injury in the event of an earthquake and therefore the respondent will have been more likely to participate in hazard mitigation.

***Social influence on Hazard Mitigation*** This set of questions was used to measure the effect that social structure and social connections had on the respondents' hazard prevention efforts (Questionnaire Sections 35 - 37). It is assumed that respondents who had an immediate relationship with friends, family or community groups who had taken steps toward hazard mitigation would be more likely to participate in hazard mitigation. Additional questions that

measured the respondents' likelihood to participate in hazard mitigation based on mitigation activities of friends or family are found here.

***Incentives*** The questions here are used to measure financial and other incentives not found in other parts of the survey (Questionnaire Section 38). Each incentive listed, with the exception of "other," had been previously offered or suggested in similar studies as found in the literature review. Some examples of these incentives include: free mitigation literature, free supplies or engineer evaluation for the home, discount on home insurance or tax breaks, and encouragement from friends, family and neighborhood associations.

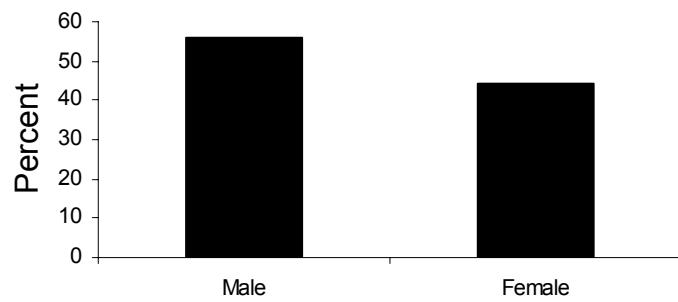
***Demographic characteristics*** This set of questions was used to measure the diversity of the respondents in such terms as gender, race or ethnicity, level of education, marital status, family size, immigrant status, age, income and disposable income (Questionnaire Section 39 - 48). As has been stated previously in this study, it is important to identify the demographic composition of the sample in order to better understand possible barriers to mitigation as well as possible demographic influences over those barriers.

## **VI. Findings**

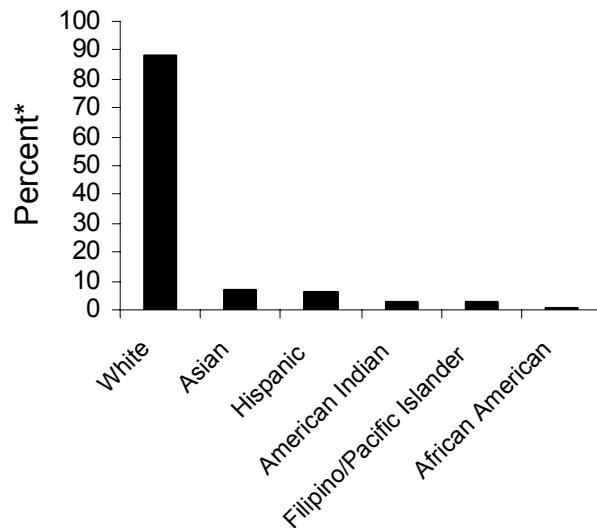
### ***Description of the Sample and Demographic Characteristics***

As mentioned above, the sample for this study was taken from a group of adults who volunteer or work for the American Red Cross, Silicon Valley Chapter. Recognizing that this particular sample of American Red Cross staff and volunteers is a specific and targeted population, the demographic characteristics of the sample will be compared against the demographics of the geographical area but not against the demographic characteristics of American Red Cross staff and volunteers, as there is no information available for this comparison.

The total number of respondents was 235. Some respondents chose to skip some questions; therefore, the total number of responses will be noted in each of the tables and figures. Among respondents, approximately 44 percent were male and 56 percent were female (Figure 1). This varies slightly from the San José population where approximately 48 percent of the population is female and 52 percent are male (U.S. Census Bureau 2007). The majority of respondents were white (88 percent) while about 7 percent were Asian, 6 percent Hispanic, 3 percent American Indian, 3 percent Filipino or Pacific Islander, and 1 percent African American (Figure 2). This sample has a much larger percentage of white persons and fewer Asians and Hispanics than the San José population where the population is 57 percent white, 30 percent Asian, and 32 percent Hispanic (U.S. Census Bureau 2007).



**Figure 1.** Gender of Respondents,  
N=211.



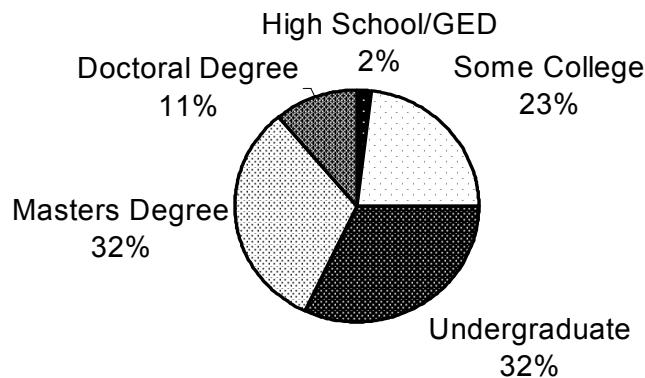
**Figure 2.** Ethnicity of Respondents,  
N=204.

\*Percent exceeds 100 because respondents could choose more than one ethnicity.

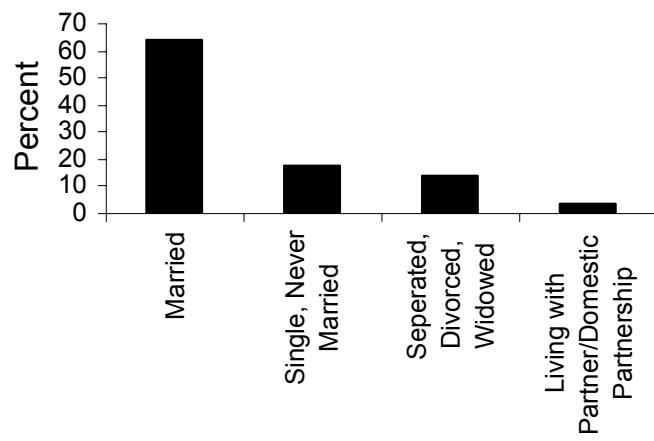
All respondents had at least a high school diploma or equivalent with 2 percent having a high school diploma or GED only (Figure 3). In terms of higher education, 23 percent of respondents had some college or trade school education, 32 percent had an undergraduate degree, 32 percent had a master's

degree and 11 percent had achieved a doctoral degree. This sample is more educated than the San José population where about 36 percent of the population has a college degree or more (U.S. Census Bureau 2007). Most respondents were married (64 percent) whereas 18 percent responded as single, never married, 14 percent reported being separated, divorced or widowed, and 4 percent either lived with their partner or claimed to have a domestic partnership (Figure 4).

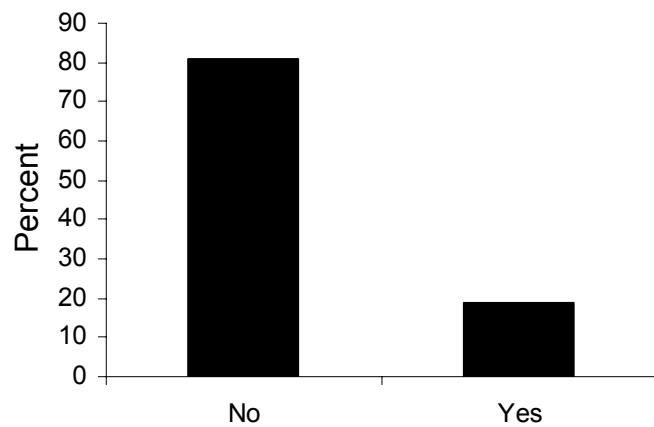
When asked about children living at home, 19 percent of respondents said they did have children under the age of 18 living in their home. Therefore the majority of respondents, 81 percent, did not have children in the home (Figure 5).



**Figure 3.** Education of Respondents, N=210.



**Figure 4.** Marital Status of Respondents, N=212.



**Figure 5.** Children Under 18 in the Home? N=212.

Concerning age, the majority of respondents were age 51 or older (67 percent) while only 33 percent were between the ages of 18 and 50 (Table 1). This varies considerably from the San José population where the median age is 34.6 (U.S. Census Bureau 2007). One reason for this variation is that the

median age of San José includes those who are 18 years and under whereas the population in this sample is 18 years and older only.

Approximately 15 percent of respondents claimed a household income of less than 50,000 dollars (Table 2). Thirty-nine percent had a household income between 50,000 and 109,999 dollars, 16 percent had a household income between 110,000 and 149,999 dollars and about 30 percent had a total household income of \$150,000 or more. This sample has a much higher income than the median income of the San José population, which is 70,000 dollars (U.S. Census Bureau 2007). Clearly the sample of American Red Cross staff and volunteers is more educated and much wealthier than the average citizen of the city of San José.

**Table 1.** Age of Respondents by Age Category, N=206.

<b>Category</b>	<b>Frequency</b>	<b>Percent</b>
18 to 25	4	2
26 to 30	13	6
31 to 35	11	5
36 to 40	7	3
41 to 45	15	7
46 to 50	19	9
51 to 55	29	14
56 to 60	28	14
61 to 65	34	17
66 to 70	26	13
71 or above	20	10
Total	206	100

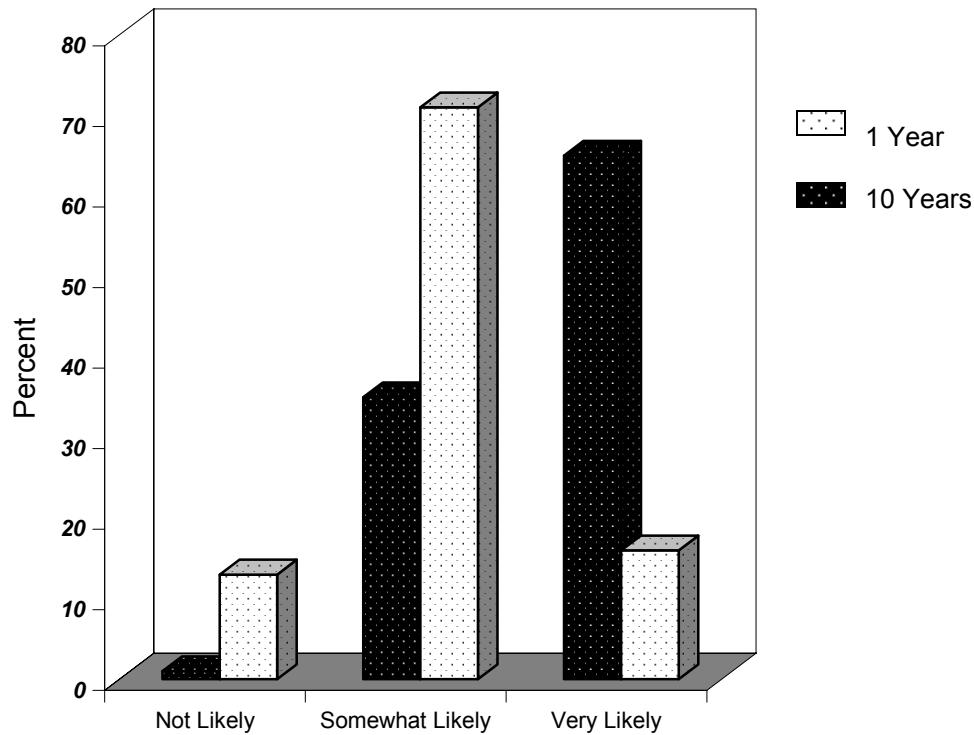
**Table 2.** Household Income of Respondents by Category, N=179.

Category	Frequency	Percent
Less than \$30,000	13	7
\$30,000 to \$49,999	14	8
\$50,000 to \$69,999	18	10
\$70,000 to \$89,999	23	13
\$90,000 to \$109,999	29	16
\$110,000 to \$129,999	15	8
\$130,000 to \$149,999	14	8
\$150,000 or more	53	30
Total	179	100

### ***Threat Perception***

Concerning threat perception, 100 percent of the 220 respondents answered “yes” when asked if they were aware that earthquakes could occur in the San José, CA area (figure not shown). Of that total, 71 percent of respondents thought that the likelihood of an earthquake occurring in the next year was “somewhat likely” with about 16 percent claiming that it was “very likely” (Figure 6). Moreover, 65 percent of respondents agreed that the likelihood of an earthquake occurring in the next 10 years was “very likely.” Those who think it was only “somewhat likely” fell to 35 percent in comparison. Clearly it can be seen that the threat of an earthquake is real and understood by this sample. However, respondents here do not seem to process the threat level of an earthquake to be imminent; instead, they view it as eventual. This may lead

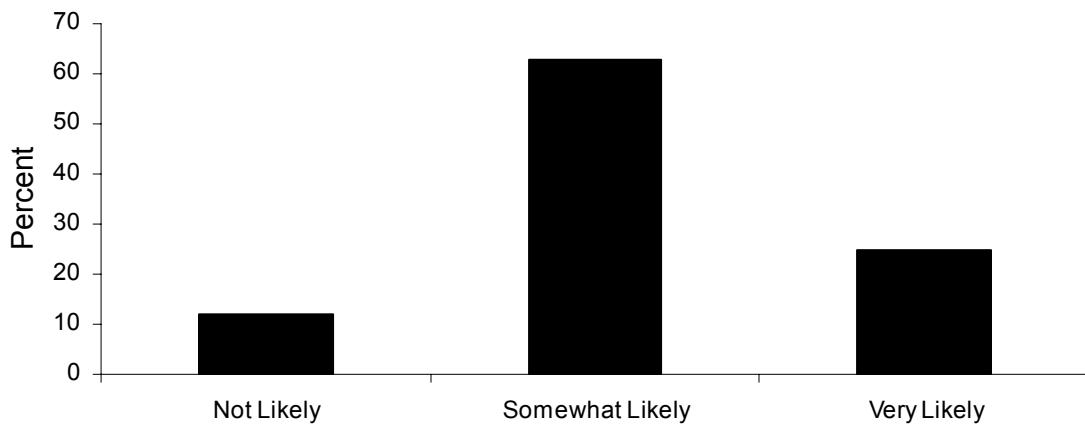
respondents to prioritize mitigation at a lower level than if they understood the threat to be more immediate.



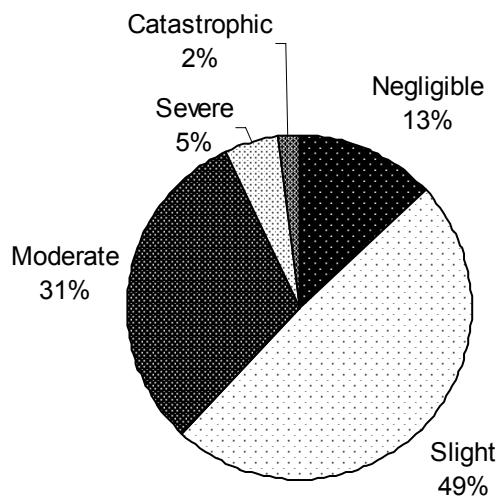
**Figure 6.** Reported Expected Likelihood that a Major Earthquake Will Occur in the San Jose Area in the Next 1 Year and the Next 10 Years, N=220.

Not only is it important to understand respondents' perceptions of how soon an earthquake may occur, but also important is to understand the severity of the earthquake they expect to happen. A total of 88 percent of respondents claimed that they believed an earthquake that could cause damage to their home or items in the home was either "somewhat likely" (63 percent) or "very likely" (25 percent) to occur in the near future (Figure 7). Among these respondents, about

5 percent claimed that they thought the damage would be negligible (small items displaced or broken, Figure 8). About 38 percent thought the damage would only be slight (windows, dishes, glassware broken, furniture moved or overturned, weak plaster and masonry cracked) and about 45 percent of respondents thought that damage would be moderate (furniture and weak chimneys would break, masonry would be damaged, loose bricks, tiles, plaster and stones would fall). In comparison, only a small amount of respondents (13 percent total) were concerned that an earthquake in the near future would cause either severe or catastrophic damage. Approximately 11 percent of respondents believed damage would be severe (structural damage considerable, particularly to poorly built structures, chimneys, monuments, towers, elevated tanks may fail, frame houses moved, trees damaged, cracks in wet ground and steep slopes, and general damage to foundations) and 2 percent thought the damage would be catastrophic (masonry and frame structures/foundations destroyed or damage more severe than previous listed categories). Based on these responses, it can be said that while respondents did perceive that the threat of an earthquake that will cause damage is near, they believed the damage that would be caused would only be slight to moderate. This fact may affect respondents' likelihood of mitigating their homes for a damaging earthquake. This finding is very informative because as has been seen previously in the literature review, when individuals do not perceive the threat of a disaster to be strong, they are less likely to prepare for that disaster.



**Figure 7.** Expected Likelihood that an Earthquake Will Cause Damage to or in Respondents' Home, N=219.

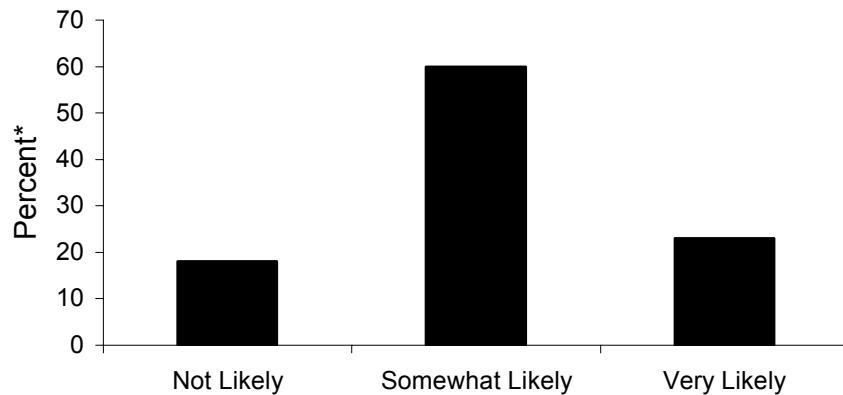


**Figure 8.** Expected Damage to Occur in or to Home During an Earthquake, N=189. \*

\* Percent exceeds 100 due to rounding.

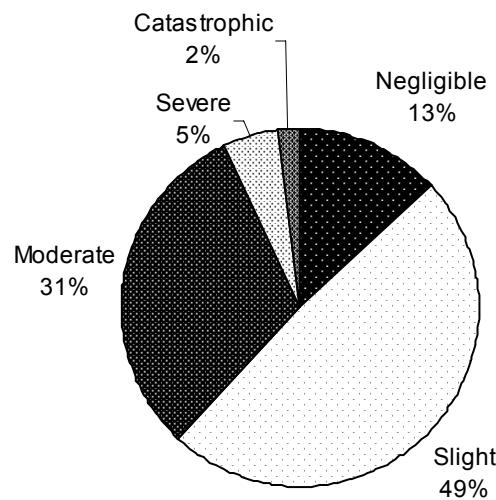
When asked how likely an earthquake with the potential to cause injury to individuals in the home was to occur in the near future, 60 percent of individuals responded that it was “somewhat likely” (Figure 9). About 18 percent of respondents claimed that it was “not likely” and 23 percent said that it was “very likely.” Among respondents, 13 percent reported that they thought injury would be negligible (small cuts or bruises, Figure 10). The majority of respondents, 49 percent, thought that the injury would be slight (individuals would sustain minor bleeding or serious bruising but nothing more). About 31 percent of individuals claimed that injury would be moderate (fractured or broken bones or severe bleeding) while 5 percent claimed that injury would be severe (life threatening injury such as internal organ damage, hemorrhaging, and/or unconsciousness). Still only 2 percent believe that an earthquake causing catastrophic injuries, or death, in the near future is likely. As with damage assessment above, respondents again agreed that it would be somewhat likely or very likely in the near future to have an earthquake that caused injury to individuals. Yet, similar to the above responses about damage, individuals believe that the level of injury that will occur will not be life threatening. While respondents seem to think that injury will be slightly higher than damage caused, in the slight to moderate range, clearly the perception of threat is not enough for them to fear for their lives, but only to anticipate moderate injury to themselves or family members. This perception may be due to the fact that individuals feel that they have already

mitigated for any severe damage or injury that could be caused during an earthquake.



**Figure 9.** Expected Injury to Occur in Home During an Earthquake, N=218.

\* Percent exceeds 100 due to rounding.



**Figure 10.** Expected Injury During an Earthquake, N=176.

In order to better understand the relationship between the severity of expected injury or damage during the next earthquake and mitigation activity, bivariate correlations were run. As can be seen in Table 3, only three types of mitigation activity (mitigation activity will be further discussed in the following section) significantly correlated with the severity of injury respondents expected to occur. “Research damage prevention,” “strapped down water heater,” and “bolted furniture” were all significantly correlated with severity of expected injury, although those correlations were very weak. Correlations for mitigation activity and damage expected were also run, however none of the correlations were significant (Table not shown). These weak or non-existent correlations may imply something about the importance of looking at severity in relation to mitigation activity as well as something about the perspective of the sample. These implications will be further discussed in the conclusion.

**Table 3.** Correlation Between Severity of Expected Injury and Mitigation Activity, N=220.

Research Damage Prevention	0.172*
Engineer Evaluation	-0.007
Secured Home to Foundation	0.034
Strapped Down Water Heater	0.154*
Fitted Flexible Connections	0.06
Bolted Furniture	0.114*
Strapped Appliances	-0.004
Safety Latches on Cabinets	0.039
Secured Wall Hangings	0.108
Braced Masonry Chimney	0.127

\*Indicates significant correlations.

### ***Mitigation Activity***

In addition to being asked questions about earthquake threat perception and amount of damage or injury expected, respondents were asked questions about their own mitigation activities in their homes (Table 4). As American Red Cross staff and volunteers who, it may be assumed, have extensive awareness about disaster mitigation and preparedness, it would be expected that the majority of respondents would claim to have done all of the mitigation activities listed, however this was not the case. The majority of respondents did participate in some mitigation activities such as research damage prevention (80 percent), strapped down water heater (77 percent), fitted gas and other appliances with flexible connectors (65 percent), secured heavy wall hangings into place (53 percent), bolted large furniture items into place (49 percent), and secured home to its foundation (44 percent). However, there were some mitigation tactics that many of the respondents did not participate in. For example, 75 percent of respondents did not place safety straps on large appliances. Additionally, 70 percent of respondents did not place safety latches on cabinets, 45 percent did not have an engineer evaluate their home, and 26 percent did not brace, repair or remove the masonry chimney.

**Table 4.** Percent Who Reported on Status of Mitigation Activity According to Category, \* N varies between 213 and 220.

Mitigation Item	Done	Not Done	Others Did Before I Moved In	Not Sure If This Was Done	No Masonry Chimney
Research	80	20	-	-	-
Engineer	23	45	12	19	-
Foundation	44	11	23	22	-
Water Heater	77	4	10	9	-
Flexible Connectors	65	5	10	20	-
Bolted Furniture	49	48	1	1	-
Strap Appliances	22	75	1	2	-
Latches on Cabinets	27	70	2	1	-
Wall Hangings	53	46	1	1	-
Chimney	19	26	5	15	35

\*Percent does not always add up to 100 due to rounding.

Besides “done” or “not done,” there were two other categories for respondents to choose from called “others did before I moved in” and “not sure if this has been done.” These two options may explain why some of the “done” categories are lower than may be expected. For example, securing one’s home to its foundation is a very important step in mitigation and as noted above, 44 percent of respondents claimed to have done this. Still, this number seems low and when all responses are considered, it can be seen that an additional 23 percent of individuals have their homes secured to its foundation because others

had done it before the respondent had moved in. It can also be seen that 22 percent of respondents did not know whether or not their home was secured to its foundation. This could be thought of as neglect to mitigate because it would be assumed that an individual interested in practicing mitigation would ensure that such things were done. This categorization may reduce the amount of “done” responses for all mitigation categories, however it is a more accurate understanding of respondents mitigation activities.

Respondents who reported not mitigating were asked to choose among reasons that they had not done so (Table 5). Among these reasons, “unnecessary” and “too expensive” were two of the most common barriers listed. “Not useful” and “not responsible” were the least reported as barriers to mitigation. Overall, each suggested barrier was used at some point as a reason for not practicing mitigation among respondents. For example, among those who had not strapped down their water heater, the most commonly reported mitigation activity, 20 percent claimed that it was “unnecessary,” 20 percent claimed it was “not useful/effective” and another 20 percent claimed that it was “inconvenient.” “Not enough information” and “not my responsibility” were also used as reasons at 10 percent each. For the least mitigated item, placing safety straps on large appliances, 30 percent of respondents claimed it was “unnecessary” to do so, 24 percent said it was “inconvenient,” 13 percent said it was “not useful/effective,” 11 percent said “not enough information” was given to

them, 7 percent said it “requires too much time,” 4 percent claimed it was “too expensive,” and 2 percent reported that it was “not [their] responsibility.”

**Table 5.** Percent Who Indicated Reason for Not Mitigating for Each Mitigation Item. \*

Mitigation Item	Not Enough Information	Too Expensive	Un-necessary	Too Much Time	Not Useful	Inconvenient	Not Responsible	Other	N
Research	36	12	5	17	2	17	14	33	42
Engineer	12	35	22	5	10	16	12	33	97
Foundation	16	32	16	12	12	16	24	40	25
Water Heater	10	0	20	0	20	20	10	20	10
Flexible Connectors	8	25	0	17	0	17	0	50	12
Bolted Furniture	8	3	16	11	7	26	1	50	102
Strap Appliances	11	4	30	7	13	24	2	30	161
Latches on Cabinets	7	1	24	9	12	40	3	24	149
Secured Wall Hangings	6	3	31	9	11	18	1	37	97
Chimney	15	31	14	6	11	16	6	31	55

\*Percents are higher than 100 due to rounding and the respondents' option to choose all that apply.

To better understand demographic characteristics and mitigation activity, chi-squared and logistic regression tests were conducted. In Tables 6 and 7, the responses to mitigation practices were collapsed into “done” (a combination of “done” and “others did before I moved in”) and “not done” (a combination of “not done” and “not sure if this has been done”) categories. The objective of this analysis was to determine factors that may be directly related to the certainty of mitigation activity. Among all demographic characteristics tested, “owns home,”

“know someone [who experienced] damage,” and “married” were the most common predictors of mitigation activity.

Owning a home was positively related to all mitigation activity with the exception of “latches on cabinets,” “secured chimney,” and “strapped appliances.” Owning a home was negatively related to “strapped appliances.” “Earthquake damage,” meaning those respondents, who expected an earthquake that would cause damage to their homes in the near future, was positively related to only one mitigation activity, which was “secured wall hangings.” Knowing someone who was injured in an earthquake was positively related to three mitigation activities: “research,” “bolted furniture,” and “strapped appliances.” Knowing someone who had experienced damage from an earthquake was positively related to five mitigation activities: “research,” “secured foundation,” “strapped water heater,” “flexible connections” and “bolted furniture.” Knowing someone who had practiced mitigation was positively related to three mitigation activities, which were “research,” “engineer evaluation,” and “bolted furniture.” Being male was negatively related to “strapped water heater” and “flexible connections” and was positively related to “secured chimney.” Being white was positively related to “flexible connections” only. Being married was related to six mitigation activities which included “engineer evaluation,” “secured foundation,” “strapped water heater,” “flexible connections,” “bolted furniture,” and “secured wall hangings.” Having children under the age of 18 in the home was negatively

related to “latches on cabinets.” Being born in California was negatively related to “engineer evaluation.”

**Table 6.** Relationship between Respondent Characteristics and Mitigation Items where Chi-Squared Tests Indicated Significant Relationships, N=235.

	Secured Chimney	Secured Wall Hangings	Latches on Cabinets	Strapped Appliances	Bolted Furniture	Flexible Connections	Strapped Water Heater	Secured Foundation	Engineer Evaluation	Research
Owns Home	+	+	+	+	+	+	-	-	+	+
Earthquake Damage										+
Knows Someone Injured	+						+	+		
Knows Someone Damage	+		+	+	+	+	+	+		
Knows Someone Mitigated	+	+					+			
Male					-	-				+
White							+		-	
Married	+	+	+	+	+	+	+	+	+	+
Children in Home										-
Born CA			-							
Age			*		*					
Income	*						*			
Disposable Income	*	*					*			

+ Indicates a positive relationship between variables.

- Indicates a negative relationship between variables.

\* Indicates that directionality in relationship between variables can not be determined.

“Age,” “income,” and “disposable income,” were measured as ordinal variables and produced curvilinear results, therefore positive and negative relationships could not be determined. However, we do see some significant

relationships. “Age” was related to both “secured foundation” and “flexible connections.” “Income” was related to “engineer evaluation” and “bolted furniture.” And “disposable income” was related to “engineer evaluation,” “secured foundation,” and “bolted furniture.”

The mitigation activities that were associated with more predicting factors than any others were “bolted furniture,” “flexible connections,” and “engineer evaluation.” A similar analysis was run in the pilot study by Lee et al. (2009) where knowing a person who had experienced damage was also found to be a determining factor in predicting mitigation activity. The consistency of these findings, specifically the relationship between the experience of others and mitigation activity, nods to the influence of social networks over mitigation.

After running chi-squared tests on all demographics, logistic regressions were run on the demographic factors that were related to three or more mitigation practices in order to verify significant relationships. The results in these regressions support the results found in the chi-squared analysis. Individuals who owned a home, who knew someone who had mitigated and who were married had participated in more mitigation activities remained significant when controlling for the other factors. “Owns home” changed from a negative relationship to a positive relationship with “strapped appliances.” Male had two more negative relationships with mitigation activity, which were “engineer evaluation” and “secured foundation.” (“Disposable income” was not included

because no linear relationship could be determined due to the ranked composition of the variable.)

**Table 7.** Relationship between Respondent Characteristics and Mitigation Items where Linear Regression Indicated Significant Relationships, N=235.

	Secured Chimney	Secured Wall Hangings	Latches on Cabinets	Strapped Appliances	Bolted Furniture	Flexible Connections	Strapped Water Heater	Secured Foundation	Engineer Evaluation	Research
Owns Home	+	+	+	+	+	+	+	+		+
Knows Someone Injured	+					+	+			
Knows Someone Damage	+		+	+	+	+				
Knows Someone Mitigated	+	+				+				
Married		+	+	+	+	+				+
Male	-	-	-	-						+

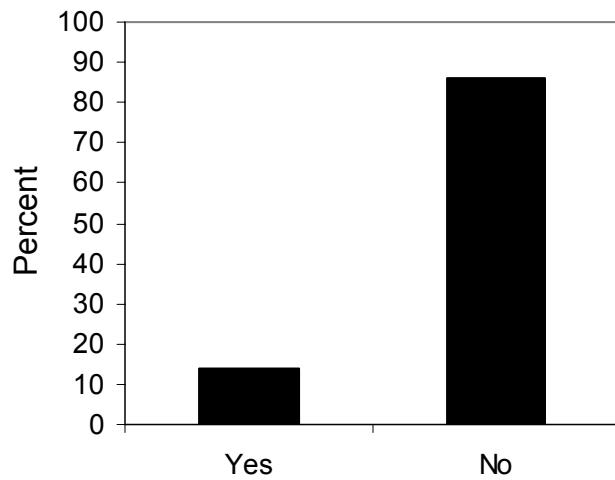
+ Indicates a positive relationship between variables.

- Indicates a negative relationship between variables.

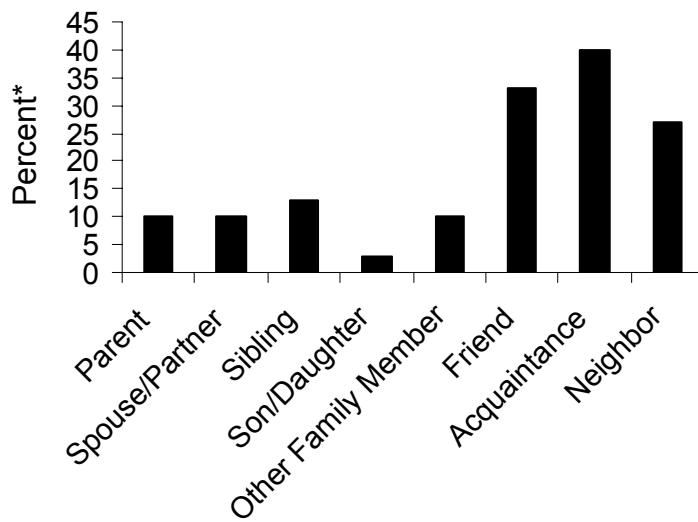
### **Predictors of Mitigation and the Influence of Social Networks**

Turning towards predictors of mitigation activities, it can be seen from the literature review that social networks and personal experiences of the individual may play a role in prompting individuals to mitigate. Therefore, questions were asked of the respondents to measure their personal experience with earthquakes and the experiences of the people in their lives. The majority of respondents (86 percent) reported that neither they nor anyone they knew had been injured in an

earthquake (Figure 11). Among the 14 percent of individuals who reported that they or someone they knew had experienced injury in an earthquake, the most common relationships reported were “acquaintance” at 40 percent, “friend” at 33 percent, and “neighbor” at 27 percent (Figure 12). Other reported relationships included: “myself” and “ sibling” at 13 percent, “parent,” “other family member” and “spouse or partner” all at 10 percent and “son or daughter” at 3 percent.



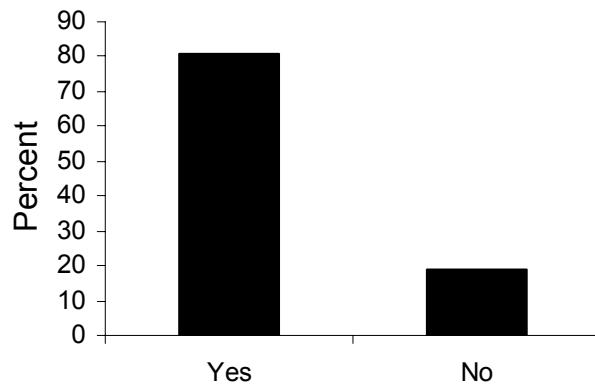
**Figure 11.** Respondents Who Have or Know Someone Who Has Been Injured in an Earthquake, N=213.



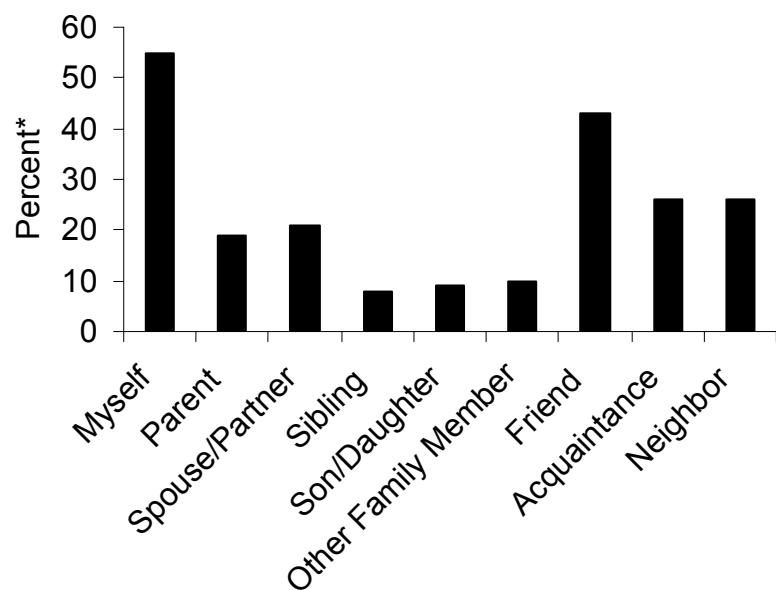
**Figure 12.** Relationship of Injured Person to Respondent, N=30.

\*Percent exceeds 100 due to the respondents' option to check all that apply.

When assessing damage experienced by an earthquake, the majority of individuals (81 percent) claimed that they or someone they knew had indeed experienced damage to their home or items within their home (Figure 13). Among the respondents who experienced damage from an earthquake, the most common relationship to the respondent was “myself” (55 percent) and “friend” at 43 percent (Figure 14). “Acquaintance” (26 percent), “neighbor” (26 percent), and “spouse or partner” (21 percent) were also commonly reported as having experienced damage. Other relationships where damage was experienced included: “parent” at 19 percent, “other family member” at 10 percent, “son or daughter” at 9 percent and “sibling” at 8 percent.



**Figure 13.** Respondents Who Have or Know Someone Who Has Had Damage to Home, N=213.

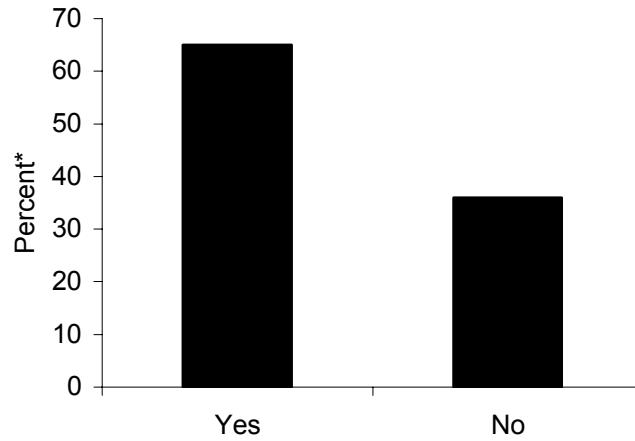


**Figure 14.** Relationship of Respondent to Person Who Experienced Damage, N=174.

\*Percents exceed 100 due to the respondent's option to check all that apply.

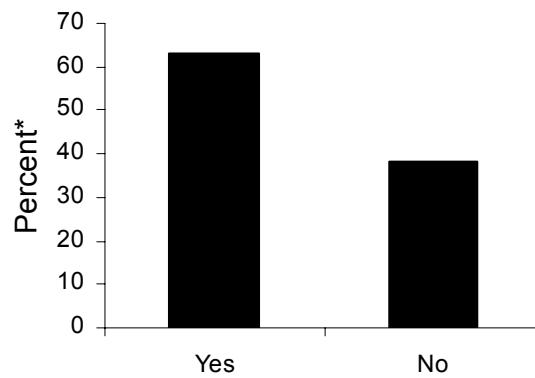
In order to understand whether these experiences with earthquakes, injury to persons, or damage in the home, encouraged individuals to mitigate,

questions assessing this topic were asked. Among those respondents who experienced injury or damage, the majority in both categories (injury 65 percent, damage 63 percent) claimed that that experience did cause them to take steps toward mitigation in the home (Figure 15, Figure 16).



**Figure 15.** Did Injury Experience Cause Respondent to Mitigate? N=31.

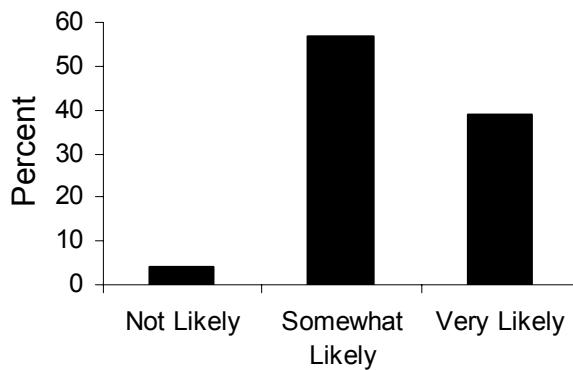
\*Percent exceeds 100 due to rounding.



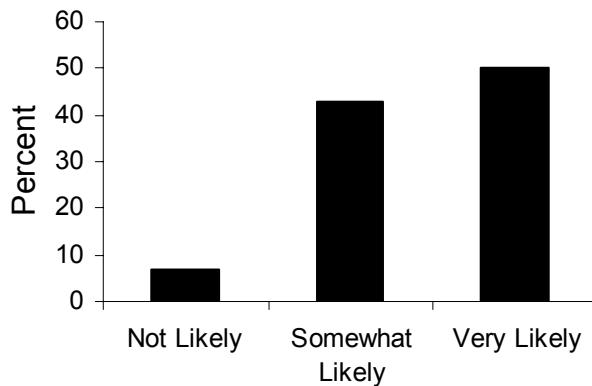
**Figure 16.** Did Damage Experience Cause Respondent to Mitigate? N=168.

\*Percent exceeds 100 due to rounding.

Moreover, when asked how likely they would be to take steps toward preventing injury or damage in the home if they or someone they knew were to experience injury or damage from an earthquake in the future, the majority of respondents said that they would either be “somewhat” or “very” likely to do so. Among individuals who said that injury would cause them to be more likely to mitigate, 43 percent said that they would be “somewhat” more likely to mitigate and 50 percent said that they would be “very” likely to do so (Figure 17). Among individuals who said that damage experience would cause them to mitigate, 57 percent said that they would be “somewhat” more likely and 39 percent said that they would be “very” likely to do so (Figure 18). This finding is useful because it suggests that there is a relationship between experience and mitigation activity. Further, it suggests that there is a social component that strongly affects mitigation. Yet, it is interesting to see how action and opinion differ below.

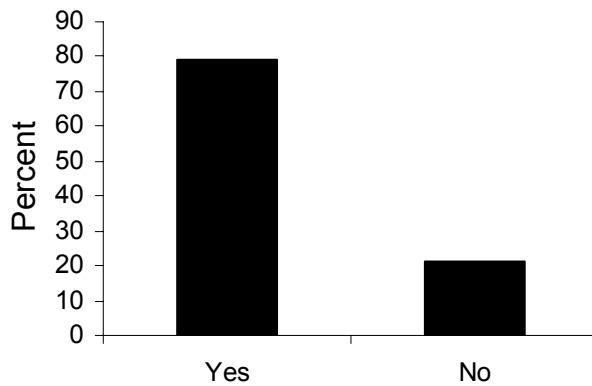


**Figure 17. Likelihood of Respondent to Mitigate if Damage Occurred in Future, N=45.**

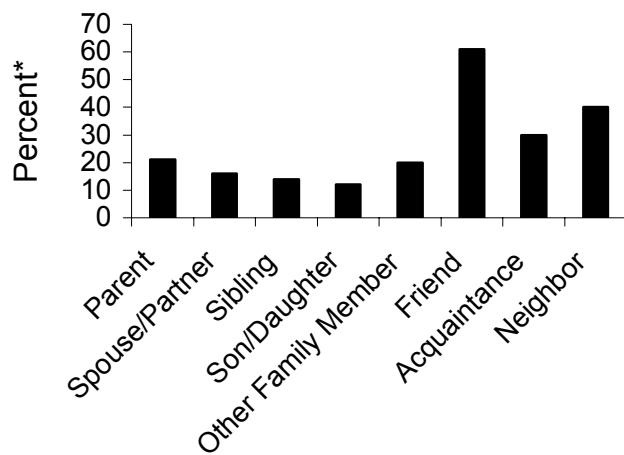


**Figure 18.** Likelihood of Respondent to Mitigate if Injury Occured in Future, N=182.

In order to better understand the mitigation activities of individuals in their social networks, respondents were asked about those individuals they knew who had participated in some mitigation activity. Approximately 79 percent of respondents said that they did know someone who had taken steps to prevent earthquake damage or injury in the home (Figure 19). The most common relationships reported between the respondent and the person who had taken preventative steps were: “friend” (61 percent), “neighbor” (40 percent) and “acquaintance” (30 percent, Figure 20). Interestingly, 68 percent of respondents claimed that the actions of those around them who they know to have mitigated their homes did not influence respondents themselves to mitigate (Figure 21). Further, most respondents claimed that they would be only “somewhat likely” (55 percent) to take steps toward mitigation if they had known friends or family who had already done so (Figure 22).

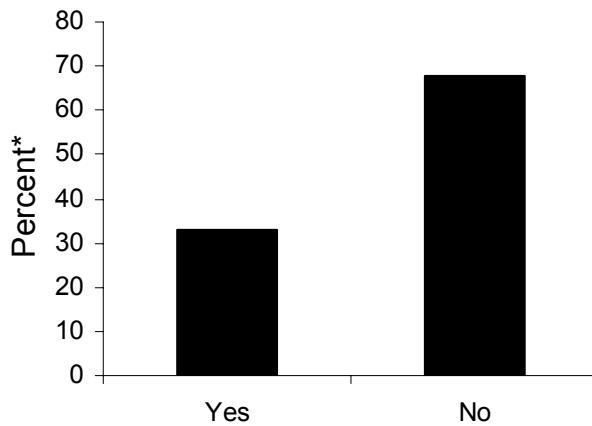


**Figure 19.** Respondents Who Have Friends, Family, or Neighbors Who Have Mitigated, N=207.



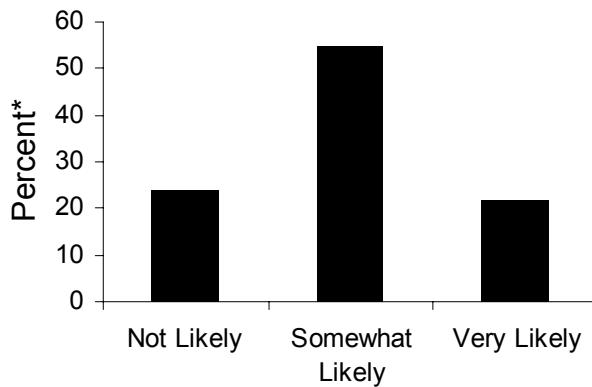
**Figure 20.** Respondent's Relationship to Person Who Mitigated, N=163.

\*Percent exceed 100 due to Respondent's option to check all that apply.



**Figure 21.** Did Mitigation of Others Cause Mitigation? N=160

\*Percent exceeds 100 due to rounding.



**Figure 22.** Likelihood of Mitigation if Friends and Family Were to Mitigate, N=51

\*Percent exceeds 100 due to rounding.

In order to better understand the influence that friends and family had on the mitigation activities of respondents, chi-squared tests were conducted to

reveal whether certain relationships were more likely to cause mitigation over others (Table 8).

**Table 8.** Relationship to Respondents Who have Mitigated against Damage or Injury Compared with those Reporting that Knowing a Person Who Mitigated Caused them to Mitigate.

<b>Relationship</b>	<b>Percent this Relationship</b>	<b>Persons Who Mitigated</b>		<b>Comparing Mitigation with those Not Reporting the Relationship</b>		
		<b>N</b>	<b>Percent</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>
Parent	21.3	34	29.4	0.188	1	0.665
Spouse/Partner	15.6	25	48.0	3.245	1	0.072
Sibling	13.8	22	40.9	0.822	1	0.365
Son/Daughter	11.9	19	63.2	9.237	1	0.002
Other Family Member	19.4	31	35.5	0.156	1	0.693
Friend	60.0	96	32.3	0.005	1	0.945
Acquaintance	30.0	48	25.0	1.758	1	0.185
Neighbor	40.0	64	34.4	0.171	1	0.679

Among these comparisons, the relationship that was more likely to cause mitigation over others was “son/daughter.” In contrast, the pilot study by Lee et al. (2009) found that respondents were more influenced by relationships that were in close physical proximity. The finding here is helpful in that it may also be the interpersonal relationship that influences mitigation. While an individual’s son or daughter may or may not be within close living distance of the respondent, it may be assumed that the son or daughter has a close social bond with the respondent and that this closeness between parent and child may have influenced mitigation.

An important point to make here is that although many of the relationships do not provide significant chi-squared statistics, this does not mean that those

relationships are not important to consider. This concept will be addressed further in the discussion, however an example can be seen in Table 8 where it is reported that 25 respondents claimed to know that a spouse or partner had mitigated and in turn, 48 percent of those respondents were prompted to also mitigate. If the chi-squared test were significant, this would simply mean that having a spouse or partner mitigate would cause respondents to be more or less likely to mitigate than expected by chance. So, persons' whose spouse or partner mitigated were no more or less likely to mitigate because of knowing that the person specifically had mitigated.

To further analyze the importance of social networks on mitigation activity, other data were analyzed. Table 9 and Table 10 below outline individuals that respondents knew who had suffered damage or injury from an earthquake. This relationship between the respondent and the individual who suffered damage or injury was then compared with those respondents who claimed that the experience of knowing someone who had suffered damage or injury caused them to practice earthquake mitigation.

Among those respondents who knew individuals who have experienced damage due to an earthquake as presented in Table 9, it can be seen that four different relationships encouraged mitigation more or less than others. Those relationships included: "myself," "spouse/partner," "son/daughter," and "other family member." In terms of analyzing the importance of geographical location of social networks, at least two of these relationships, "myself" and

“spouse/partner,” can be directly related to geographical location and influence on mitigation activities. As individuals have experienced damage in their own homes, whether they themselves or their spouses, the likelihood of mitigation is more prevalent. This finding echoes what Lee et al. (2009) found in the pilot study. Using the same comparisons, the pilot study found that among those who knew individuals who had experienced damage, the relationships that caused mitigation as a result of this experience were “myself” and “neighbor.” This finding allowed the pilot researchers to conclude that it is the physical proximity of the relationship that is important in encouraging mitigation. As individuals experience damage in their own homes or in the homes around them, it may prompt mitigation on a higher level than other relationships that are not as physically close. Still, “myself” and “spouse/partner” are also relationships that are close to the respondent in terms of social bonds. Therefore, no real conclusions using these findings can be drawn around whether it is geographical location or familial bond that influences mitigation more than the other.

Other relationships to consider are “parent,” “sibling,” “friend,” and “neighbor.” Although these relationships do not have significant chi-squared statistics, they do show that more than 60 percent of respondents in each of these categories were prompted to mitigate. For example, 43 respondents claimed that they had a neighbor who had experienced earthquake damage. Of those 43 respondents, 67.4 percent reported that it was that experience that had encouraged them to mitigate their homes against earthquake damage.

Therefore, although this relationship may not prompt individuals to mitigate more than others, it is still an important relationship to consider.

**Table 9.** Relationship to Respondent of Person Reported to Have Had Earthquake Caused Damage in Their Home Compared with Those Reporting that the Experience Caused Them to Mitigate for Future Damage.

<b>Relationship</b>	<b>Percent this Relationship</b>	<b>Persons Who Mitigated</b>		<b>Comparing Mitigation with those Not Reporting the Relationship</b>		
		<b>N</b>	<b>Percent</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>
Myself	56.0	94	77.7	20.925	1	.000
Parent	19.6	33	60.6	0.063	1	.802
Spouse/Partner	21.4	36	77.8	4.563	1	.033
Sibling	7.7	13	61.5	0.006	1	.941
Son/Daughter	7.7	13	92.3	5.342	1	.021
Other Family Member	9.5	16	37.5	4.716	1	.030
Friend	42.3	71	64.8	0.275	1	.600
Acquaintance	25.6	43	55.8	1.102	1	.294
Neighbor	25.6	43	67.4	0.602	1	.438

**Table 10.** Relationship to Respondent of Person Reported to Have Had Earthquake Caused Injury in Their Home Compared with Those Reporting that the Experience Caused Them to Mitigate for Future Injury.

<b>Relationship</b>	<b>Percent this Relationship</b>	<b>Persons Who Mitigated</b>		<b>Comparing Mitigation with those Not Reporting the Relationship</b>		
		<b>N</b>	<b>Percent</b>	<b><math>\chi^2</math></b>	<b>df</b>	<b>p-value</b>
Myself	12.9	4	75.0	*		
Parent	9.7	3	100.0	*		
Spouse/Partner	9.7	3	66.7	*		
Sibling	12.9	2	50.0	*		
Son/Daughter	3.2	1	100.0	*		
Other Family Member	9.7	1	33.3	*		
Friend	32.3	9	90.0	4.188	1	.041
Acquaintance	38.7	5	41.7	*		
Neighbor	25.8	5	62.5	*		

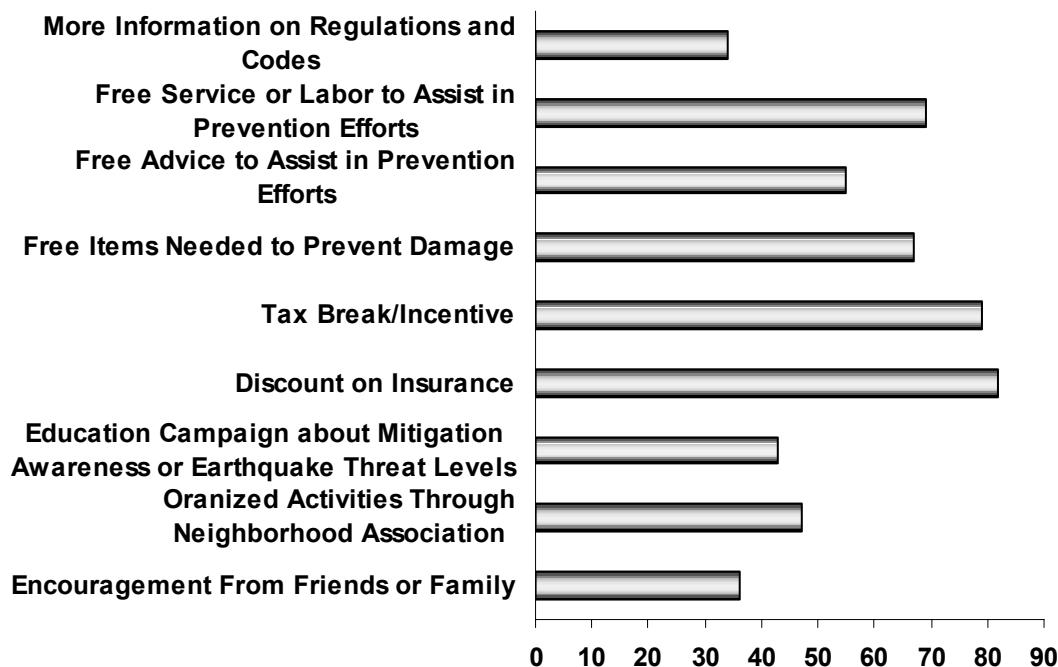
\*Number is too small to produce a valid Chi-squared Statistic.

With the exception of one relationship, all comparisons in Table 10 are not valid. Still, some conclusions can be drawn. The one relationship that had enough cases for use was “friend.” This demonstrates that the experience of friends among these respondents did encourage mitigation over other relationships. Although no conclusions about physical location in relation to the respondent can be made about these friends, this finding does imply that looking at the experience of injury among respondents may be worth exploration in future studies. Observing the numbers of respondents found in Table 10, it can also be said that responses are too small to make conclusions about other relationships that do not have a valid chi-squared statistic. For example, 100 percent of individuals who claimed that their parent had experienced injury, also claimed that they had mitigated. Yet, since there were only three respondents in this category, it is difficult to make a solid claim that this relationship would be important overall.

### ***Incentives***

Looking toward incentives to encourage mitigation, respondents preferred incentives that were related directly to the cost of mitigation over incentives that were related to social networks and education (Figure 23). Overall, respondents ranked “encouragement from friends and family” (34 percent), “education campaign about mitigation awareness or earthquake threat levels” (43 percent), and “organized activities through neighborhood association” (47 percent) rather

low. Among the most popular incentives were “discount on insurance (e.g., homeowners or renters)” (89 percent), “tax break, tax incentive” (79 percent), and “free service or labor to assist in prevention efforts” (69 percent). Further discussion about the implications of these incentives and suggestions for future research are found in the sections to follow.



**Figure 23.** Incentives Measured in Percent,\* N=204.

## **VII. Discussion**

The study presented here has looked to measure barriers and incentives to mitigation and to better understand the threat perceptions and mitigation activity of respondents. Further, this study has focused particularly on the influence social networks have on mitigation activity among respondents. Appealing to the review of the literature and the pilot study, a discussion of the findings is found here.

Directly concerning the hypothetical conclusions previously outlined in this paper, it was expected to find that as the perceived severity of an earthquake threat increased, respondents would be more likely to practice mitigation. The finding here was that while most respondents recognized that there was the threat of an earthquake in the near future, they did not expect the damage or injury from that earthquake to be severe. Weak correlations between mitigation activity and the expected severity of a threat were found, however this does not mean that individuals were not mitigating due to a lack of perceived threat, but rather, it may be that individuals have already mitigated for damage or injury and therefore reduced the expected severity of damage or injury they expect. It was also expected that individuals who had experienced or knew someone who had experienced injury due to an earthquake would be more likely to mitigate. Although most respondents had no experience with injury in an earthquake, the majority of respondents who had, did report that this experience prompted them to mitigate. Similarly, it was expected that those respondents who had

experienced or knew someone who had experienced damage in the home due to an earthquake would be more likely to mitigate. Indeed, among those respondents who claimed to have had earthquake damage in their homes or knew someone who had, the majority practiced mitigation as a result of this experience. However, it was also expected that respondents who knew someone who had practiced mitigation would be more likely to practice mitigation in their own homes. Yet, while the majority of respondents reported that they did know someone who had practiced mitigation, the majority of those respondents claimed that knowing someone who had mitigated did not prompt them to also mitigate. Further discussion on each of these assertions can be found in the discussion below.

It is evident that this sample perceives the risk of an earthquake that will cause damage or injury to occur to be somewhat likely in the near future and very likely within the next 10 years. In this vein, this study measured the severity of the damage or injury respondents expected to occur in the next earthquake. Most respondents acknowledged that an earthquake in the near future would cause homes to be damaged and individuals to be hurt. However in both cases, respondents thought that the severity of damage or injury would only be slight or moderate. Very few respondents felt that an earthquake that would cause severe or catastrophic damage or injury would occur in the near future. Likewise, few respondents believed that no injury or damage would occur either.

Moreover, when correlations were run to determine the relationship between expected severity of injury or damage and mitigation activity, most correlations were insignificant. The three variables that were correlated with expected injury exhibited very weak correlations. This finding is important for future research in that it may imply one of two things. The first is that perhaps the severity of expected injury or damage did not directly relate to the types of mitigation activities respondents participated in. This may imply that because respondents generally perceive the damage or injury caused by an earthquake to be slight or moderate, the severity of perceived threat is not an indicator of mitigation activity. The second and more probable implication is that correlations were weak because respondents did not expect severe damage or injury due to the fact that they had already participated in mitigation activity. In other words, respondents may expect a major earthquake to occur, but may not expect very severe injury or damage to occur because they had already mitigated for that damage or injury in their homes. Therefore a correlation between expected severity and mitigation activity would not be found.

This sample has participated in larger scale mitigation activities such as strapping down water heaters, securing homes to their foundation and replacing connectors with flexible connectors in the home. It could be assumed that American Red Cross staff and volunteers, whom it would be assumed would have a higher awareness of the damage caused by earthquakes and would know the importance of mitigating for that damage, would also have participated in

smaller scale mitigation tactics such as securing furniture items into place and strapping large appliances down. However this was not the case. Many respondents did not participate in several mitigation activities. The barriers to practicing mitigation reported were in line with both the findings stated in the literature review and those found in the pilot study. Overall, individuals did not mitigate because of the cost, the time it would take, the inconvenience it would cause, the lack of information they had or their belief that it was not necessary. Each barrier was reported at some point as a reason for not mitigating. It seems as though what may be needed is better education about the simplicity and cost effectiveness of mitigation. The same barriers have shown up through the literature review, the pilot study and this study. Exploration for future research may revolve around how to address each of these barriers and dispel the perception that mitigation is, for example, too costly or time consuming.

As was suggested by the literature reviewed in preparation for this study, many demographic characteristics were measured to understand their influence on mitigation activities. It should be noted here that the demographics in this sample varied considerably from the San José population, therefore the conclusions drawn here can not be generalized to the San José population overall. In comparing these characteristics to actual mitigation activity, few factors proved to be predictors of mitigation. That is, there was little evidence that having one particular demographic characteristic over another would directly relate to mitigation activity. However, characteristics such as being married and

owning a home are both factors that theoretically couple nicely with mitigation activity. As seen in the literature review, individuals with school aged children and families overall tend to more often report being prepared for a disaster. Considering the age composition of this sample of American Red Cross staff and volunteers (the majority over age 50), reporting that one is married and having that characteristic relate to mitigation activity makes sense. It is very likely that these individuals at one time had school aged children and a family under their roof and perhaps their focus on preparedness began there. Additionally, owning a home along with being married are both factors that often cause an individual to feel responsible for protecting their homes and their families. Aside from legal requirements such as strapping down a water heater, individuals may feel an increased sense of responsibility in relation to these factors and that may have lead to mitigation.

Three other factors of interest that were related to mitigation activity were knowing someone who had been injured in an earthquake, knowing someone who had experienced damage from an earthquake and knowing someone who had mitigated for earthquake damage already. Knowing someone who had been injured in an earthquake was only associated with 3 of the 10 mitigation activities. Still, the fact that there were significant relationships between this variable and some mitigation activities is proof that the experience of others did influence mitigation. Furthermore, Table 10 shows that while very few respondents reported knowing someone who had been injured, those respondents who had

friends who were injured were likely to participate in mitigation as a result of that experience.

Interestingly, knowing someone who had experienced damage was a predictor for 5 of the 10 mitigation activities. This is a direct demonstration of the influence of social networks. As individuals internalize the experiences of others, in this case damage done by an earthquake, they personalize the threat and therefore work toward preventing damage to themselves and their homes. This conclusion is further supported by the results found in Table 9. Those respondents who claimed to either have experienced damage themselves or had a spouse or partner, or son or daughter who experienced damage, were more likely to participate in earthquake mitigation.

Similarly, as was seen in Table 8, if a respondent had a son or daughter who had practiced mitigation, that respondent was influenced by that experience and in turn mitigated for earthquake damage as well. As mentioned above, Table 8 shows that knowing someone who had mitigated was a predicting factor for 3 of the 10 mitigation items measured. These findings are direct illustrations to the influence of social networks on mitigation activity and are comparable to the results stated in the pilot study by Lee et al. (2009) where it was concluded that those respondents who knew someone who had mitigated caused them to also mitigate.

Beyond these results, perhaps more relevant is the finding that among those respondents who answered a question inquiring about their likelihood of

mitigating for disaster if they knew someone else who had already done so, 77 percent claimed that they would be either somewhat or very likely to also mitigate. It is possible that individuals do have relationships with others who have mitigated but mitigation has never been discussed in conversation and therefore the individual did not realize that their friends or family had practiced mitigation. According to these findings, that knowledge would increase the individual's likelihood of mitigation. This means that if researchers can better understand how to open the lines of communications between those who have mitigated and those who have not, perhaps more individuals will be affected by the experiences of others and also practice mitigation activity themselves.

Within the context of social networks, this study was looking to better understand the types of relationships that influenced mitigation among respondents. In other words, this study looked to understand whether it was the geographical location or the closeness in familial relationship between the respondent and the person who influenced them to mitigate that was important. Lee et al. (2009) found that those respondents who reported having a spouse or another family member (excluding parents, siblings, and children) who practiced mitigation actually encouraged respondents to mitigate as well. In this case, it may be that the familial relationship is what was more influential. Additionally, there is some evidence from the pilot study to claim that geographical location between the respondent and the person who mitigated may be a factor in influencing mitigation. Lee et al. (2009) found that respondents who had

experienced earthquake damage themselves, or who had a neighbor who did, were likely to practice earthquake mitigation. Considering the evidence presented for these two types of relationships that influence respondents' mitigation activities has been found in the pilot study, the study presented here was interested in exploring these relationships further.

As it has been seen in this study, 65 percent of those respondents who reported knowing someone who had been injured in an earthquake said that this experience had caused them to mitigate. Further, 63 percent of respondents who said they knew someone who had experienced damage from an earthquake reported that this experience had caused them to mitigate as well. Of those experiences, data analysis does not lead to sound conclusions about geographical proximity of the relationship nor familial relationship as a direct influence over mitigation activities. The evidence stated above illustrates that there are a variety of relationships that have made respondents more likely to mitigate over others: having a son or daughter who has mitigated, having themselves, a spouse, or a son or daughter experience damage, and having a friend experience injury. Comparing these findings to the two categories of relationships, geographical location and familial relationship between the respondent and person who mitigated or whose experience caused the respondent to mitigate, there is not much evidence to support that one category of relationship is more likely to influence mitigation over the other. For example, the relationship between respondent and son or daughter does have influence in

two of the three variables that may be a predictor that familial relationships do have some influence, however there is not enough evidence to conclusively assert this claim. Therefore, It can be said as proof in both the pilot study as well as the study presented here that further research must be done in order to better understand the nature of the relationship between social networks of the respondent and respondent's mitigation activity.

Addressing the other relationships in Table 8, Table 9, and Table 10, simply because they did not have a significant chi-squared statistic, does not mean that the numbers around the relationships are not important. Valuable information is also found among such relationships. The relationships here may still have encouraged individuals to mitigate. In fact, this is evident in Table 9 where a high percentage of respondents who had parents, siblings, friends, and neighbors who had experienced earthquake damage reported that this experience caused them to mitigate. Similar results are found in Table 8 and Table 10. Therefore, while it is difficult to draw conclusions around the types of relationships that may influence mitigation activity over other relationships here, it can be said that the experience of others does encourage individuals to mitigate and this study provides a solid beginning for future research.

Additionally, there is something to be said about the sample of this study and the relationship of respondent to mitigation. As 79 percent of respondents claimed that they did know someone who had mitigated, 68 percent reported that the actions of others did not influence them to mitigate. It could be speculated

that this lack of influence could be related to the respondents' position as American Red Cross staff and volunteers. As an American Red Cross staff or volunteer member, the respondent may have been the person who influenced another individual to mitigate. Or it may be likely that respondents participated in mitigation as a result of working or volunteering for the American Red Cross, but did not make that direct connection as having known someone who mitigated which in turn influenced their mitigation activity. Moreover, perhaps American Red Cross staff and volunteers feel as though they are already experts in the field and would not be influenced by those around them outside of the American Red Cross. Yet, if this is so, it would be further evidence to prove the importance of social networks. The American Red Cross as a social network in itself works to prepare the community through its volunteers.

Mark Granovetter's work around the strength of weak ties (1973) is a sociological concept that should also be considered here. Granovetter (1973) stated that weak ties are characterized by the fact that the individuals who share the tie spend a small amount of time together, have less emotional intensity and intimacy and fewer reciprocated services between them than strong ties would have. While the study presented here has no real way to measure the strength or weakness of the ties found between respondents and individuals they knew who had participated in mitigation or experienced damage or injury from an earthquake, it could be assumed that categories like "acquaintance," "neighbor," and "other family member" may fall in the weak tie category. As there was little

evidence to prove that familial association or geographical location of the relationship was important, future researchers may look into the association of strong or weak ties. In fact, there is some evidence that weak ties may be important here. For example, as previously stated, the categories of “acquaintance” and “neighbor” both show that more than half of the respondents who knew someone in these categories who had experienced damage from an earthquake said that they participated in mitigation activity.

Moreover, this concept of weak ties may be important in encouraging individuals to mitigate. Incentives will be further discussed below, however, two incentives, educational campaigns and awareness activities, can be linked to the importance of weak ties. Granovetter (1973) claimed that often weak ties are the bonds that link two separate groups and act to transmit information between the two. Therefore, when looking at the dissemination of information around the benefits of mitigation, it may be said that the strong ties, like having a parent or spouse who encourages mitigation, are important, but the weak ties can also assist. If individuals in one group who are practicing mitigation discuss the importance of mitigation and their personal experiences around earthquake damage, injury, or mitigation, with those outside their concentrated groups through weak ties, the information will spread and in turn encourage others to practice mitigation.

Granovetter (1973) continued on to state that mass-media campaigns are often ineffective in encouraging individuals to act, unless those campaigns are

reinforced through personal ties. This may mean that educational and awareness campaigns supported by governmental and non-profit organizations may prove useless unless the information is also transmitted through personal ties. Weak ties may be the key here. This may alter the way that educational and awareness campaigns are presented. For example, if groups are interested in having an American Red Cross volunteer come do a presentation on disaster mitigation, it would make the best sense for the American Red Cross to send an individual who may have even a weak tie with that group. Therefore, once the general presentation has been completed the American Red Cross volunteer may approach the individual with whom a weak tie has been formed and discuss mitigation on a more personal level. This person, with which the volunteer has a weak tie, may either introduce the volunteer to others thus transmitting more personal experience to others, or may themselves go off into their group disseminating information based on the personal conversation with the volunteer. As such information would be spreading between groups, and would be transmitted through and reinforced by personal relationships, initially through a weak tie. This approach may improve the effectiveness of educational and awareness campaigns altogether.

Looking at incentives overall, responses for what respondents claimed would encourage them to mitigate are consistent with what has previously been found in the review of the literature and the pilot study by Lee et al. (2009). Respondents were interested in the financial incentives over other incentives like

education campaigns and encouragement from friends and family. Yet financial barriers were not the only barriers reported by respondents as prohibiting them from mitigating. Therefore, perhaps future researches should focus on a different approach to the measurement of incentives. Researchers interested in understanding the true incentives to mitigation may have to actually offer particular incentives and measure the success of each incentive to draw indisputable conclusions. This would mean that researchers would provide whatever incentive they wished to measure, whether it be financial incentives or educational campaigns, to the community and measure the actual levels of mitigation that individuals who accepted that incentive exhibited. Using this tactic, researchers would not simply be relying on what respondents claim would be an incentive, but would actually be measuring the outcome and effectiveness of that incentive.

Additional observations concerning incentives and the sample used here should be made. The first concerns the incentive of educational and awareness campaigns. Perhaps one reason that the respondents did not react as favorably to educational campaigns or awareness activities is due to the fact they are American Red Cross staff and volunteers. The majority of American Red Cross staff and volunteers participate in disaster preparedness training and perhaps they believed that since they had already been through training, additional training around disaster mitigation would not be an incentive for them to mitigate. A better question in this situation would have been to ask if the respondent

thought the general public would be encouraged to mitigate based on the listed incentives rather than the respondent only.

The second observation deals with both barriers and incentives. It has been found in the literature review, the pilot study and the present study that a reported barrier to many mitigation activities, such as securing the home to its foundation and having an engineer out to evaluate the home, was cost. Moreover, incentives such as tax breaks and free or low cost supplies and labor were reported as highly favorable among respondents. Yet, this sample seems to have little excuse for lack of mitigation when it comes to cost. Recognizing that this sample is rather elite with about 50 percent of respondents having between 1,000 and 4,999 dollars in disposable income each month, it would seem that the cost of mitigation should not be prohibitive to this group. Yet they still rank financial incentives as the most attractive incentives. Perhaps this says something about the kind of education that these respondents need: education to dispel the concept that mitigation is too expensive and reinforce the idea that it is generally affordable. In fact, this idea may prove helpful for individuals overall. If educational campaigns focused on dispelling the perceived barriers to mitigation and informing the public that mitigation is in fact not as costly and time consuming as they think, it may reduce the amount of perceived barriers and encourage mitigation overall.

## **VIII. Suggestions for Future Research**

Several suggestions can be made for future research. First is the question of sample size. As this study was restricted to a particular portion of a localized population, having the case size for solid analysis was at times difficult. For example, this study presents a promising start for future research on social networks and the experience of damage and injury among respondents and the individuals around them, however due to a small sample size, statistics could not be employed to test some relationships. Additionally, a sample that is more representative of the general population would be advised. The sample here of American Red Cross staff and volunteers was more highly educated and had higher incomes than the general San José population. This difference may have influenced some barriers or reported incentives to mitigation.

Second, in terms of the survey instrument, researchers may consider including a question that assesses whether or not the respondents feel that they have influenced the mitigation of others. Much of the questionnaire for this study was focused on the influence of others on the respondent, however it is likely that if the respondent is practicing mitigation, perhaps that respondent is knowingly influencing those around them.

Third, an additional suggested change to the survey instrument concerns questions around expected severity of damage or injury during an earthquake on the behalf of the respondent. The weak correlations around expected severity and mitigation activity provides evidence that perhaps respondents do not

personally expect severe damage or injury to occur during an earthquake because they, themselves, have already mitigated their homes to prevent damage or injury. However, a question that may help researchers better understand the correlation between expected severity of injury or damage and mitigation activity is one that asks respondents to rate how severe they would expect the damage or injury would be that others, individuals outside of their household, would sustain. Moreover, an excellent addition to this questionnaire would be a question specifically asking respondents to rank how severe they would expect damage or injury to be for those individuals who had not mitigated.

Fourth, concerning incentives, a better way to assess incentives that would actually encourage mitigation should be assessed. More detailed questions about whether or not listed incentives have already influenced the respondent toward mitigation could be offered. Or, an open ended answer choice where the respondent could explain why each incentive would or would not provide encouragement may be helpful. Additionally, measuring whether or not a listed incentive would actually influence mitigation should be considered. It is simple for a respondent to claim that the incentive would or would not influence mitigation, however it would be difficult to know whether that incentive actually worked unless that incentive was implemented. Therefore, researchers should explore a way to actually offer incentives to respondents and track whether or not these incentives really encouraged mitigation.

Fifth, researchers may want to explore the concept of migration and its role in mitigation activity. This study did ask questions about the respondents' birth origins and movement to or within California. Although, not much evidence supporting migration as an indicator of mitigation activity was found, this idea may help researchers understand why individuals perceive particular barriers to mitigation or would be encouraged by specific incentives based on cultural background. Further, additional insight into the role social networks play concerning mitigation activity may be discovered.

## **IX. Conclusion**

The study presented here was intended to add to the body of literature on earthquake mitigation by looking at threat perception, barriers to mitigation, incentives for mitigation and influences over mitigation activity on behalf of social networks. The findings of this study are in keeping with that of previous research on the barriers of hazard mitigation and incentives to mitigate. However, this research does add new findings to previous research by both developing a measurement of severity of threat perception as well as focusing on social networks.

By asking a variety of questions around the severity of threat perceptions, this study helps researchers better understand how respondents conceptualize and personalize the threat of a disaster. Not only are questions asked about the likelihood of a disaster occurring in the near future, but additional questions are asked to explore the severity of the disaster that respondents expect. Including a graduated scale of severity for both potential injury and damage caused by an earthquake allows the respondent to clearly articulate the level of disaster they perceive will occur and how far in the future they expect it to happen. Personalization of a disaster threat is an important influence in disaster mitigation and may influence a better understanding of both the barriers to and the encouragement of mitigation.

Through an analysis of several different forms of social influence, this study was intended to better understand the role social networks play in disaster

mitigation. Measuring different aspects of the respondents' personal experiences and the experiences of those around them, conclusions can be made about the impact these experiences had on the respondents' mitigation activities. Certainly it can be stated that respondents who knew individuals, of varying relationships, who practiced mitigation were also more likely to practice mitigation. Two categories of relationships between the respondent and the individual who experienced damage or injury from an earthquake or whose mitigation activity influenced the respondent to mitigate were assessed. The first was the geographical location of the person whose experience or actions caused the respondent to mitigate and the second was the familial relationship between that individual and the respondent. While significant relationships for both of these categories were found, no conclusions about the reasons these relationships were important can be asserted. Ultimately, this study has provided a solid basis for future research to explore these concepts further.

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## Appendix

### Survey Instrument

#### **1. Instructions**

**\* Research on Barriers to Earthquake Damage Prevention**

**Crystal Paul, MA Sociology Candidate**

**James Lee, Ph.D., Co-Investigator**

**Welcome! This is a survey for a research project under the direction of the Department of Sociology at San Jose State University.**

**Red Cross volunteers are being asked to participate in this study. The purpose is to evaluate why people do or do not take measures to prevent earthquake-caused injuries and damage to their homes and its contents. Your participation will help to improve the ways by which residents can be assisted in preventing injury or damage.**

**To participate, you will complete a questionnaire which involves answering a variety of questions about yourself and your home. This will take approximately 15 minutes or less.**

**There are no anticipated risks for your participation. We will not collect personally identifying information and the questions are not sensitive in nature. However, if a question makes you uncomfortable, you may simply skip it. After collection, the data will be stored in a locked office. Research team members are the only persons who will ever see the data file this website generates. The results of this study may be published.**

**Your consent is being given voluntarily. No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose to not participate in the study in whole or part. You may refuse to participate in the entire study or to answer particular questions, and you may withdraw from the study at any time. No one will receive compensation from the researcher for this study.**

**Questions about this research may be addressed to James Lee, Ph.D., at (408) 924-5866 or [james.lee@sjtu.edu](mailto:james.lee@sjtu.edu). Complaints about the research may be directed to Yoko Baba, Ph.D., Sociology Department Chair, at (408) 924-5320. Questions about a research subjects' rights, or research-related**

**injury may be presented to Pamela Stacks, Ph.D., Associate Vice President, Graduate Studies and Research, at (408) 924-2480.**

**Thank you very much for your participation.**

**To begin the survey, please check "I agree" below and then click the "next" button.**

I agree

## **2. Home Ownership**

**When answering the questions about your "home" below, please refer to your current primary residence.**

**Do you own your home?**

Yes  
 No

## **3. Home Rental**

**Do you rent your current home?**

Yes  
 No

## **4. Home Type**

**Please mark below the type of home you live in:**

- Single family home
- Townhouse
- Condominium
- Apartment
- Mobile home
- Room
- Other (please describe)

**Please tell us how long have you lived in your current home (in years and months):**

**Please enter the zip code for your home:**

**In what year was your home built? (please approximate if you are not sure)**

## **5. Earthquake Liklihood**

**Are you aware that earthquakes may occur in the San José area?**

- Yes
- No

**In your opinion, how likely is it that a major earthquake will occur in the San José area within the next year?**

- Not Likely
- Somewhat Likely
- Very Likely

**In your opinion, how likely is it that a major earthquake will occur in the San José area within the next 10 years?**

- Not Likely
- Somewhat Likely
- Very Likely

**In your opinion, how likely is it that an earthquake with the potential to cause injuries to people within your home will occur in the near future?**

- Not Likely
- Somewhat Likely
- Very Likely

## **6. Earthquake Injury Likelihood**

**If an earthquake were to cause injury to people within your home, how severe do you think that injury would be?**

- Negligible (small cuts or bruises)
- Slight (minor bleeding, serious bruising)
- Moderate (fractured or broken bones or severe bleeding)
- Severe (life threatening injury such as internal organ damage, hemorrhaging, and/or unconsciousness)
- Catastrophic (death)

## **7. Damage to home**

**In your opinion, how likely is it that an earthquake with the potential to cause damage to your home or items within your home will occur in the near future?**

- Not Likely
- Somewhat Likely
- Very Likely

## **8. Damage to home likelihood**

**If an earthquake were to cause damage to your home or items within your home, how severe do you think that damage would be?**

- Negligible (small items displaced or broken)
- Slight (windows, dishes, glassware broken, furniture moved or overturned, weak plaster and masonry cracked)
- Moderate (furniture and weak chimneys broken, masonry damaged, loose bricks, tiles, plaster and stones will fall)
- Severe (structure damage considerable, particularly to poorly built structures, chimneys, monuments, towers, elevated tanks may fall, frame houses moved, trees damaged, cracks in wet ground and steep slopes, general damage to foundations)
- Catastrophic (most masonry and frame structures/foundations destroyed or damage more severe than listed above)

## **9. Group 1: Research, engineer 1a**

The questions on the following pages will be in reference to steps you have taken since moving into your home toward preventing earthquake damage or injuries in your home (including to structure, items, people, etc.).

**Have you researched earthquake damage prevention?**

- Done
- Not Done

**10. Group 1: Research, engineer 1b**

**You indicated that you have not researched earthquake damage prevention to prevent earthquake damage.**

**Please indicate your reasons for not doing so (check all that apply):**

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)

[REDACTED]

**11. Group 1: Research, engineer 2a**

**Have you had an engineer evaluate your home for resistance to earthquake damage?**

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

**12. Group 1: Research, engineer 2b**

**You indicated that you have not had an engineer evaluate your home for resistance to earthquake damage.**

**Please indicate your reasons for not doing so (check all that apply):**

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain) \_\_\_\_\_

### **13. Group 2: Foundation, braced 1a**

**Have you secured your home to its foundation?**

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

### **14. Group 2: Foundation, braced 1b**

You indicated that you have not secured your home to its foundation.

Please indicate your reasons for not doing so (check all that apply):

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)

### 15. Group 3: Safety straps - Water heater 1a

Have you strapped down your water heater?

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

### 16. Group 3: Safety straps, bolted furniture, flexible connections, Water heate...

**You indicated that you have not strapped down your water heater.**

**Please indicate your reasons for not doing so (check all that apply):**

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain) \_\_\_\_\_

### **17. Group 3: Safety straps - Water heater, etc. 2a**

**Have you fitted gas and other appliances with flexible connections?**

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

### **18. Group 3: Safety straps, bolted furniture, flexible connections, Water heate...**

You indicated that you have not fitted gas and other appliances with flexible connections.

Please indicate your reasons for not doing so (check all that apply):

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)  

---

#### 19. Group 3: Safety straps - Water heater, etc. 3a

Have you bolted large furniture items into place (e.g., bookshelves/entertainment centers)?

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

#### 20. Group 3: Safety straps, bolted furniture, flexible connections, Water heate...

You indicated that you have not bolted large furniture items into place (e.g., bookshelves/entertainment centers).

Please indicate your reasons for not doing so (check all that apply):

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)  

---

**21. Group 3: Safety straps, bolted furniture, flexible connections, Water heate...**

Have you placed safety straps on large appliances (e.g., televisions or refrigerators)?

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

**22. Group 3: Safety straps, bolted furniture, flexible connections, Water heate...**

You indicated that you have not placed safety straps on large appliances (e.g., televisions or refrigerators).

Please indicate your reasons for not doing so (check all that apply):

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)

### 23. Group 4: Secured, Secured, Safety latches, Glass 1a

Have you placed safety latches on cabinets?

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

### 24. Group 4: Secured, Secured, Safety latches, Glass 1b

You indicated that you have not placed safety latches on cabinets.  
Please indicate your reasons for not doing so (check all that apply):

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)

#### 25. Group 4: Secured, Secured, Safety latches, Glass 2a

Have you secured heavy wall hangings, art/paintings, or mirrors?

- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

#### 26. Group 4: Secured, Secured, Safety latches, Glass 2b

You indicated that you have not secured heavy wall hangings, art/paintings, or mirrors.

Please indicate your reasons for not doing so (check all that apply):

- Not enough information
  - Too expensive
  - Unnecessary
  - Requires too much time
  - Not useful/effective
  - Inconvenient
  - Not my responsibility
  - Other (please explain)
- 

### 27. Group 5: Foundation, braced 1a

Have you braced, reinforced, replaced, or removed your masonry chimney?

- Home has never had a masonry chimney
- Done
- Not Done
- Others did before I moved in
- Not sure if this has been done

### 28. Group 5: Foundation, braced 1b

**You indicated that you have not braced, reinforced, replaced, or removed your masonry chimney.**

**Please indicate your reasons for not doing so (check all that apply):**

- Not enough information
- Too expensive
- Unnecessary
- Requires too much time
- Not useful/effective
- Inconvenient
- Not my responsibility
- Other (please explain)  

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## **29. Earthquake Injury Experience**

**Have you, or anyone you know, ever been injured in an earthquake?**

- Yes
- No

## **30. Earthquake Injury Experiencers**

**What relationship to you was the person(s) who was injured in an earthquake? (check all that apply)**

- Myself
- Parent
- Spouse or partner
- Sibling
- Son or daughter
- Other family member
- Friend
- Acquaintance
- Neighbor

**Did this event lead you to take steps to prevent future earthquake injuries in your home?**

- Yes
- No

### **31. No Earthquake Injury Experience**

**If you or someone you know were injured in an earthquake, how likely would you be to take steps to prevent future earthquake injuries in your home?**

- Not likely
- Somewhat likely
- Very likely

### **32. Earthquake Damage Experience**

**Have you, or anyone you know, experienced an earthquake that caused damage to their home or items within their home?**

- Yes
- No

### **33. Earthquake Damage Experiencers**

**What relationship to you was the person(s) who experienced home damage in an earthquake? (check all that apply)**

- Myself
- Parent
- Spouse or partner
- Sibling
- Son or daughter
- Other family member
- Friend
- Acquaintance
- Neighbor

**Did this event lead you to take steps to prevent future earthquake damage to your home?**

- Yes
- No

#### **34. No Earthquake Damage Experience**

**If you or someone you know had home damage in an earthquake, how likely would you be to take steps to prevent future earthquake damage in your home?**

- Not likely
- Somewhat likely
- Very likely

#### **35. Other People's Earthquake Preparation**

**Do you have friends, family, or neighbors who have taken steps to prevent earthquake damage or injuries in their homes?**

- Yes
- No

#### **36. Other Earthquake Preparers**

**What is your relationship to those who took steps to prevent damage or injury from an earthquake? (check all that apply)**

- Parent
- Spouse or partner
- Sibling
- Son or daughter
- Other family member
- Friend
- Acquaintance
- Neighbor

**Did the actions of your friends, family, or neighbors to prevent earthquake damage or injuries lead you to take earthquake damage or injury prevention measures in your home?**

- Yes
- No

### **37. No Other Experimental Preparers**

**If your friends, family, or neighbors were to take steps to prevent earthquake damage or injuries in their homes, how likely would you be to take similar action in your home?**

- Not likely
- Somewhat likely
- Very likely

### **38. Incentives to Prepare**

**Suppose your local community were to take steps to encourage you to modify your home to prevent earthquake damage or injuries.**

**Which of the following would cause you to participate in preventing earthquake damage or injuries? (Check all that apply)**

- Encouragement from friends or family
- Organized activities through neighborhood association
- Education campaign about mitigation awareness or earthquake threat levels
- Discount on your insurance (e.g., homeowners or renters)
- Tax break / tax incentive
- Free items needed to prevent damage (such as straps, bolts, maintenance costs)
- Free advice to assist in prevention efforts
- Free service or labor to assist in prevention efforts
- More information on regulations and codes

**Please describe other things that would make you more likely to take steps to prevent damage or injury from an earthquake in your home (if there are any):**

## **39. Demographics 1**

Now we are almost finished with the survey! We just need to gather a little more information about you to help us understand earthquake damage and injury prevention efforts.

### **What gender are you?**

- Male
- Female
- I identify as another gender

### **What race or ethnicity are you? (check all that apply)**

- White
- American Indian
- African American
- Asian
- Filipino
- Pacific Islander
- Hispanic

## **40. Demographics 2**

### **What is the highest level of education you have achieved?**

- less than a high school diploma
- High school diploma/GED
- some college/Associates Degree/Trade school
- Undergraduate Degree
- Masters Degree
- Doctoral Degree

**What is your marital status?**

- Single, never married
- Married
- Domestic partners
- Living with partner
- Separated, divorced, or widowed

**Do you have children under the age of 18 currently living in your home?**

- Yes
- No

#### **41. Born in USA**

**Were you born in the United States?**

- Yes
- No

#### **42. Not Born in USA 1**

**What is your country of origin?**

#### **43. Not Born in USA 2**

**At what age did you migrate to the US?**

- Under 10
- 10 to 17
- 18 to 25
- 26 to 30
- 31 to 35
- 36 to 40
- 41 to 45
- 46 to 50
- 51 to 55
- 56 to 60
- 61 to 65
- 66 to 70
- 71 or above

**44. Born in CA**

**Were you born in California?**

- Yes
- No

**45. Not born in CA 1**

**From what state or country did you move to California?**

**46. Not born in CA 2**

**At what age did you move to California?**

- Under 10
- 10 to 17
- 18 to 25
- 26 to 30
- 31 to 35
- 36 to 40
- 41 to 45
- 46 to 50
- 51 to 55
- 56 to 60
- 61 to 65
- 66 to 70
- 71 or above

**47. Demographics 3**

**What is your current age?**

- 18 to 25
- 26 to 30
- 31 to 35
- 36 to 40
- 41 to 45
- 46 to 50
- 51 to 55
- 56 to 60
- 61 to 65
- 66 to 70
- 71 or above

**48. Demographics 4**

**What was your total household income (income from all those in your home) for 2008?**

- less than \$30,000
- \$30,000 - \$49,999
- \$50,000 - \$69,999
- \$70,000 - \$89,999
- \$90,000 - \$109,999
- \$110,000 - \$129,999
- \$130,000 - \$149,999
- \$150,000 or more

**After accounting for all your expenses (such as mortgage or rent, taxes, utilities, food, and so forth), approximately how much income do you have each month?**

- less than \$1,000
- \$1,000 - \$4,999
- \$5,000 or more

#### **49. Thank You**

**THANK YOU VERY MUCH FOR COMPLETING THIS SURVEY!**

If you are interested in learning about the results of this survey, please email Crystal Paul, [PaulCry@usa.redcross.org](mailto:PaulCry@usa.redcross.org) or Dr. James Lee in the San Jose State University Sociology Department, [james.lee@sjsu.edu](mailto:james.lee@sjsu.edu).