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A STUDY OF PUBLIC AWARENESS AND PERCEPTION OF EARTHQUAKE HAZARDS IN THE MEMPHIS METROPOLITAN AREA

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ABSTRACT

The purpose of this research was to study public awareness and perception of earthquake hazards in the Memphis Metropolitan Area. One hundred Neighborhood Association presidents were selected to participate in the survey. Each of the Neighborhood Association presidents received a twenty-three item questionnaire designed to assess their knowledge and attitudes toward the regional earthquake risk, as well as their knowledge of earthquake safety/survival procedures. The results of the survey indicated that a high percentage of the Memphians interviewed were aware of the regional earthquake risk. However, 92% of the respondents felt that more information concerning earthquake preparedness is needed in order to help minimize the damage in the event of a future New Madrid earthquake.

INTRODUCTION

Throughout the course of history natural hazards such as hurricanes, tornadoes, volcanoes, and earthquakes have endangered human life and property. Damage caused by these natural disasters has been dependent on the magnitude, frequency, and duration of the hazard and the degree to which the area has been urbanized. As the population of the United States has increased, more and more people have settled in the natural hazard zones.

Although few residents of the Mississippi Valley region realize it, they reside in a natural hazard zone for earthquakes. Jackson defines earthquake hazards as those ground movements that may cause buildings to collapse, fires, and floods (Jackson and Mukerjee, 1974). The damage that may occur includes physical and psychological damage, loss of life, loss of property, economic disruption, as well as damage to local flora and fauna. In recent years, geographers have become increasingly concerned with how people perceive local natural hazards. Public awareness and perception studies are needed to determine how people would respond during and after the occurrence of a natural hazard event (White, 1974). The results of these studies can be used to prepare information that will enable people to act intelligently during a natural hazard event, to help government agencies design and implement emergency plans, and to assist individuals in the event of a natural disaster. Most earthquake hazard research in the United States has been focused on California, but the threat of earthquake hazards to the residents of the Mississippi Valley region is a growing concern of scientists. Hamilton (1980) states that the importance of understanding the cause of the New Madrid earthquakes is directly related to the realization that great earthquakes will recur eventually in this region. Since Memphis is only thirty-five miles south of the fault line, it has been predicted that in the event of another great New Madrid earthquake (magnitude of Richter scale greater than 6) residents of Memphis would sustain severe life loss and property damage (Groh, 1984). Expected effects from the ground shaking include landslides, fissuring, liquefaction, and abrupt changes in land level (Stearns and Miller, 1977). These effects could devastate Memphis. Nuttli (1981) states that the funds that would be required for post-earthquake reconstruction would cause a major drain on the economy. In light of these predictions concerning the effects of future earthquakes in the Memphis region, residents need to be aware of the hazards implicit in their proximity to the fault.

STATEMENT OF THE PROBLEM

This project studied Memphians' awareness and perception of earthquake hazards in the Memphis Metropolitan Area. The study may be used to help assess the need for public earthquake awareness and education programs.

The study was limited to residents of Memphis, Tennessee. In an attempt to obtain a representative sample, this study was further limited to Neighborhood Association presidents from the ten city-wide planning districts in Memphis. Ten Neighborhood

Association presidents were randomly selected from each planning district. The survey was conducted for a period of ten days in December, 1984.

METHODS AND PROCEDURES

This study was a descriptive analytical survey. A questionnaire was designed to study public awareness and perception of earthquake hazards in Memphis, Tennessee. The questionnaire consists of twenty-three multiple choice questions and sentence completions that emphasize knowledge and opinions of regional earthquake history, future occurrences of earthquakes in this region, and earthquake safety and survival procedures. The questionnaire also emphasizes respondents' interest in the subject of regional earthquake hazards. Questionnaire items were primarily based on earthquake safety/survival tips listed in the American Red Cross (1983) and the U.S. Geological Survey (1982) earthquake safety pamphlets.

A list of the questions to be covered during a telephone interview was mailed to each of the 100 Neighborhood Association presidents. A cover letter stated the purpose of the research and indicated that they would be telephoned about their responses. During the telephone interview, the respondents were asked to refer to their questionnaire and state the most appropriate answer for each questionnaire item. The responses were recorded according to planning districts in order to assess the representativeness of the survey.

A frequency distribution was computed for each questionnaire item. The frequencies were then converted to percentages of responses for further analyses.

The following three limitations of the survey results should be taken into consideration for analyses: (1) The questionnaire was mailed before the phone survey was taken, the respondents had the opportunity to obtain the correct responses to certain questionnaire items and/or discuss their answers with other people. (2) The study involved a mail/telephone survey; the results were limited by the number of people unwilling to respond and unable to be contacted. (3) The respondents were Neighborhood Association presidents; their responses may not reflect the average citizen's response.

DISCUSSION AND ANALYSIS OF SURVEY RESULTS

Since Memphis has not been struck by a major earthquake within living memory, the perception of earthquake hazards in the city may be influenced by variables such as frequency and magnitude of earthquakes in this area, lack of personal experience with earthquakes in this area, and limited media coverage of earthquake hazards in this area. The following discussion of the results of this study is intended to report the results as they were recorded. No attempt is made to analyze these results in terms of variables such as socioeconomic background, literacy, sex, race, or personality factors.

The survey revealed that a high percentage (72%) of the respondents have lived in Memphis at least sixteen years. Surprisingly, an even higher percentage of the respondents (89%) were aware of the potential earthquake hazard. A somewhat smaller percentage were able to name the New Madrid fault (64%) and Reelfoot Lake (72%). Just under half of the respondents (48%) felt that their actual experiences with earthquakes made up the most important part of their earthquake hazard perception.

Another interesting aspect of the survey was the respondents' perception of the recurrence of future major New Madrid earthquakes. Although a relatively small percentage (17%) of the respondents felt that another major earthquake would occur within the next fifteen years, a much large percentage (62%) believed that there was a high probability (between 40–100% chance) of a smaller, and less damaging earthquake occurring within the same period. These beliefs are somewhat "on target" since the expected probability that a major destructive earthquake will occur within the next fifteen years is estimated by Johnston of the Earthquake Information Center as less than 2% (Johnston, 1982). However, the probability that a smaller, but still damaging, earthquake will occur is between 40–60%.

When asked if they would be affected by a future great New Madrid earthquake, 64% of the respondents felt that they would experience major property damage, personal injury, or both. The remaining respondents perceived the danger from a future major New Madrid earthquake as slight. It is interesting to note, that although a high percentage of people believed earthquake damage would be high, only 31% of the respondents stated that they were covered by earthquake insurance.

A daytime earthquake is predicted to be more of a risk since so many children and teachers would be vulnerable to earthquake hazards. Only a small percentage of the respondents (25%) perceived daytime earthquakes to be more hazardous. The general feeling of the respondents was that "anytime was the worst time" for an earthquake to occur, and many respondents did not want to classify their answer as "daytime" or "nighttime".

Most of the respondents were correct in their perception of what to do during and after an earth-

quake. The most frequent response to what one should do if caught inside during an earthquake was to get under a sturdy piece of furniture. However, a small percentage of the respondents (25%) believed that the bathtub was the best place to be. This response (a correct adjustment in the event of a tornado) may be reflected in the fact that tornado safety procedures are widely publicized in this area. A high percentage of the respondents (72%) also knew that those outside during an earthquake should get into an open area away from trees and buildings. The majority of respondents (67%) were also cognizant of the fact that if one is in a public facility (such as a store or building) during an earthquake, the best course of action would be to crouch under something that would provide protection from falling debris.

Following an earthquake occurrence, 91% of the respondents stated that they would administer first aid as needed and check for fire hazards in and around their homes. The majority of respondents (61%) said that they would handle ruptures in utility lines by turning off all electrical, gas, and water; however, many respondents indicated that they were not familiar with how to accomplish this action. A few respondents (25%) said that they would telephone MLG&W for advice. This indicates that some residents do not believe that an earthquake would really change their lifestyle, since there is a possibility that communication lines would be out of service throughout most of Memphis.

The respondents concern for earthquake hazards in the Memphis Metropolitan Area is evidenced in the fact that 92% of the respondents stated that they would like to know more about the regional earthquake risk. More than half of the respondents (56%) stated that the best place to obtain information about earthquakes is the Tennessee Earthquake Information Center. Only 14% of the respondents said that they did not care to obtain earthquake hazard information.

CONCLUSION

The results of the study indicate that although the public is aware of the earthquake hazard in the Memphis Metropolitan Area, they want and need more information concerning earthquake preparedness. Since earthquakes cannot be predicted, last minute efforts to mitigate earthquake hazards are not effective. Residents need to be familiar with earthquake hazards and safety/survival procedures in order to help reduce panic, fear, injury, and loss of life in the event of a future New Madrid earthquake. Earthquake awareness and education programs can help accomplish this goal.

Since California is a seismically active state, many surveys have been conducted in order to assess Californians' perceptions of earthquake hazards. Based on the data gathered from these surveys, several earthquake awareness programs have been established to help better prepare Californians for potential earthquake hazards. Three such programs are the Earthquake Educational Institute, Project "Quake-Safe," and a traveling earthquake exhibit.

In 1978, the Earthquake Educational Institute was established at San Francisco State University in California (Sullivan, et al., 1980). The purpose of the Institute is to provide curricula for use in elementary and secondary schools to better prepare students in the event of an earthquake. The earthquake curriculum, multidisciplinary in nature, emphasizes geology, geography, mathematics, literature, history, and chemistry in order to help students understand earthquakes. It is believed that this program will reduce children's fear during an earthquake (Sullivan, et al., 1980).

Project "Quake-Safe," a combined effort of the U.S. Geological Survey, the American Red Cross, and Girl Scout Troop leaders, is an earthquake awareness program that emphasizes skills that can be practiced at home to help minimize hazards in the event of an earthquake. The program requires Girl Scouts to actively involve their parents and friends; therefore, Project "Quake-Safe" reaches over 50,000 residents in Southern California (Campbell, 1980). Due to the enthusiastic reception for this program, the "Neighborhood Plan" was developed to help communities "be prepared" for future earthquakes.

California's innovative traveling earthquake exhibit has also enabled communities to become more involved in earthquake education and awareness programs (Hall and Glare, 1980). The exhibit, aimed at elementary and secondary level students, exposes children to the concept of plate tectonics, effects of earthquakes on soils, identification of earthquake hazards, and earthquake waves and their measurement. Since the exhibit is mobile, the information presented in the exhibit is able to reach communities throughout the state of California.

Memphis has recently become active in the area of earthquake awareness and education programs. The Tennessee Earthquake Information Center, in cooperation with the Department of Curriculum and Instruction in the College of Education at Memphis State University, has developed the Earthquake Education Project. The coordinators of the project hope to work with local school systems, neighborhood organizations, and civic groups in order to help increase knowledge of earthquake safety/survival procedures throughout Memphis. The Department of

Curriculum and Instruction also offers a three credit hour course designed for educators concerning earthquake awareness. The goal of this course is to help teachers develop and implement earthquake curricula related to the New Madrid seismic zone, as well as to provide background knowledge of the earthquake hazards and safety procedures.

Not to be outdone by their California counterparts, Girl Scouts in Tennessee, Arkansas, and Mississippi are also involved in earthquake education. The Girl Scout Council's "Natural Hazard Preparedness Patch Program" helps prepare Girl Scouts for earthquakes (and tornadoes) by providing them with background information on earthquakes, earthquake hazards, and earthquake safety and survival tips.

Although these programs are limited in their scope, it is encouraging to know that efforts are being made to inform Memphians about the regional earthquake hazard. However, the success of these programs, and future programs, lies in the interest and cooperation of the citizens of Memphis. Are Memphians willing to become actively involved in earthquake awareness programs? Do they believe that such programs are worthwhile? Let's hope that the answers to these questions are "yes."

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