

International Journal of Mass Emergencies and Disasters
November 1993, Vol. 11, No. 3, pp. 293-303.

**Social Location and Self-Protective Behavior:
Implications for Earthquake Preparedness***

Margie L. Edwards
State of Delaware
Department of Services to Children, Youth, and Families
1825 Faulkland Road
Wilmington, DE 19805

Participation in household preparedness activities is examined in light of the first highly publicized earthquake prediction issued for the Central United States. Drawing on earlier research conducted in California, this paper examines the adoption of self-protective measures in Memphis, Tennessee. Survey data show that while people in this city are generally aware of and concerned about the earthquake hazard in their community, few have adopted the necessary precautions to reduce the negative effects of a damaging earthquake. However, those respondents who were most likely to engage in self-protective behavior are situated in structurally advantageous locations. Thus, future community-wide planning and preparedness efforts must be more attentive to limitations on household resources when advocating individual responsibility for safety.

Although some attention has been given to the New Madrid Fault as a site where a damaging earthquake may occur within the next decade, earthquake prediction efforts have been heavily concentrated in California. Near the community of Parkfield, for example, scientists from the United States Geological Survey (USGS) are conducting studies that aim to improve earthquake prediction techniques. Likewise, social scientists have focused on west coast communities in most of their research on public knowledge of and response to earthquake risk. As a result of widespread public education efforts by the state and recent experiences with earthquakes, California residents are generally aware that an earthquake hazard exists (Mileti et al. 1989).

Unlike California, states in the central region of the nation lack recent experience with serious earthquakes. Furthermore, prior to October of 1989,

* Research for this paper was conducted while the author was a Research Assistant at the Disaster Research Center (DRC), University of Delaware. Research was undertaken with support from the National Science Foundation, Grant No. BCS-8912287 (E.L. Quarantelli, Principal Investigator). The ideas expressed here are those of the author; they do not necessarily reflect the views of the National Science Foundation or the other researchers mentioned here.

there was relatively little public discussion about the possibility of a serious earthquake or about preparedness and mitigation activities related to the hazard. In communities such as Memphis, Tennessee, where earthquakes are not common events, raising residents' awareness and concern about the hazard is a difficult task for emergency management officials. The inability to provide the public with exact information about the probability of a damaging earthquake in this area further complicates efforts to increase public concern and preparedness.

In the fall of 1989, public attention was drawn to the earthquake hazard by the release of a highly publicized earthquake prediction by Iben Browning, a business consultant and self-proclaimed climatologist. Browning's controversial earthquake prediction, first issued at a private conference, was reported by the media within one month of the Loma Prieta, California earthquake. Beginning in the early spring of 1990, the media devoted unprecedented attention to the possibility of a major earthquake in the Central United States. Most earthquake experts denounced the prediction and ridiculed Browning, yet the prediction became an event in itself.

This paper provides one of the first overviews of public responses to earthquake prediction in the Central United States. Using data from a mail survey distributed to residents of Memphis, Tennessee, this paper provides insight into how social structural location influences participation in earthquake preparedness activities in the midwest.

Previous Research on Preparedness

Preparedness entails "almost any predisaster action which is assured to improve the safety or effectiveness of disaster response" (Gillespie and Streeter 1987, p. 157). Simply stated, preparedness consists of those activities that have the potential to save lives, lessen property damage, and increase individual and community control over the subsequent disaster response.

Despite an extensive body of research concerning how to improve individual preparedness for natural disasters, attempts to mitigate the losses of disaster victims through individual precautions often meet with limited success (Weinstein 1987). Public officials in the hazards arena who place the responsibility for safety on individual members of society often become frustrated when individuals do not take the appropriate actions to protect themselves from the potential damage an event may cause.

Several conclusions have been offered to explain why individuals often neglect to engage in preparedness activities. Individuals may inaccurately

perceive the risk associated with hazards in their environment and consequently fail to take appropriate self-protective action against these hazards (Slovic et al. 1974; Tversky and Kahneman 1974). Individuals faced with risk may engage in a process of denial, since most people discount the possibility that they personally will suffer harm from an event even if they are aware of a hazard in their environment (Burton and Kates 1964; Kunreuther et al. 1978).

Although individual cognitive processes are important in shaping responses to environmental hazards, more attention to the social processes involved in evaluation and decision making is required. A sociological perspective brings the social context of decision making into the analysis as a central element of the process. Every individual is a member of a social system, and members are connected through communication—formal and informal; sustained or intermittent; one-way or interactive. The individual's location in the social structure helps determine patterns of information exchange. Through social exchange with relevant others in a person's network of social relationships, the individual interprets scientific "facts" and formulates beliefs about such information by integrating the information into their own frame(s) of reference in order to make it meaningful (Nigg 1982, pp. 30-31). Since frame of reference varies according to one's location in the social structure and cultural perspective, scientific information will not be interpreted or responded to in a consistent manner across diverse populations.

In order for people to respond to a hazard, they must first become aware of and concerned about the potential threat. The success of the emergency planning process for disaster events depends largely on potential victims being informed about the nature of the hazard and appropriate responses to it (Regulska 1982, p. 37). Educational efforts have been shown to elicit attitude and behavior change that can reduce the chance of property damage, injury, and loss of life due to disaster (Saarinen 1982). Educational campaigns directed at improving preparedness assume that the learning of new information through persuasive communication efforts will change individual beliefs and, subsequently, alter attitudes and behavior. The release of Browning's prediction and the subsequent flurry of media and academic attention to it provided a context in which Memphis residents could have developed heightened awareness of and concern about the earthquake hazard.

However, it is important to remember that if an individual lacks access to hazard and preparedness information, or if the information is inconsistent or too complicated for the individual to understand, the information may

lack utility for its intended users. If the information is not provided repeatedly over time, people often forget receiving it or do not remember the useful details of the communication (Waterstone 1978).

Thus, increasing an individual's knowledge of preparations that can be taken to reduce damage and injury from earthquakes should encourage the individual to adopt a positive attitude toward preparedness and, consequently, adopt self-protective measures. However, other factors enter into the complex decision-making process that guides individual action.

Tierney (1981) criticizes the assumption that the mere provision of information will lead to the adoption of preparedness measures because this assumption neglects the social context of individual behavior. Social norms, personal goals, individual habits, situational pressures, and economic realities are among the other factors that can constrain or facilitate a change in individual behavior (Tarter 1970). Moreover, in addition to having knowledge about appropriate behavior, individuals must have the ability to engage in it (Brannon 1976). The failure to engage in self-protective behavior even though awareness and concern are present, an example of attitude-behavior inconsistency, may actually reflect differences in an individual's opportunity and competence to behave in a manner that is consistent with his or her attitude (Erllich 1969).

In explaining the adoption of self-protective measures, Palm (1981) takes into account both individual thought processes and social structural factors, such as economic constraints. She suggests that individuals may fail to take precautionary measures because other factors that enter complex decision-making processes, such as financial cost, are more salient than, and therefore outweigh, the risk associated with potential earthquakes. Without assuming that individuals are completely rational and calculating, we can presume that some form of cost/benefit assessment precedes the adoption of precautions (Mileti and Sorensen 1987; Sorensen and White 1980). Assuming both knowledge and assessment of precautionary measures, the individual's willingness and capacity to implement measures also influences the adoption of preparedness and mitigation activities (Mileti and Sorensen 1987).

Capacity to engage in self-protective behavior is primarily determined by the individual's place in the social structure and the resources he or she has available for such activities (Dynes and Wenger 1971; Hutton and Mileti 1979; Sorensen and White 1980). Previous research documents that earthquake preparedness is correlated with sociodemographic indicators such as ethnicity, age, education level, income, occupation, place of residence, and the presence of children in the household (Bourque et al. 1973; Turner et

al. 1986). For example, low-income families may not have the financial resources to purchase earthquake insurance or structurally reinforce their homes; the elderly may lack the physical ability to secure heavy furniture; and apartment dwellers are constrained by decisions made by the building owner.

H₁—Whites are more likely than Blacks to participate in earthquake preparedness activities.

H₂—Younger people are more likely than older people to participate in earthquake preparedness activities.

H₃—People with higher levels of education are more likely than people with lower levels of education to participate in earthquake preparedness activities.

H₄—People in households with higher annual incomes are more likely than people in households with lower incomes to participate in earthquake preparedness activities.

H₅—People with children present in the household are more likely than people without children present in the household to participate in earthquake preparedness activities.

Data and Methods

Researchers at the Disaster Research Center took advantage of this unique opportunity to explore public response to earthquake prediction in the Central United States using a self-administered mail survey. Information on individual attitudes and on household preparedness was gathered over a four month period. The questionnaire was distributed to a random, stratified sample of households in Memphis, Tennessee, a city expected to suffer serious damage in the event of a major earthquake along the New Madrid Fault.

The data collection strategy is a modified version of Palm's (1990) adaptation of Dillman's (1978) "total design method," a widely adopted strategy in mail research. Out of a total 279,258 households located in Memphis, TN, 1158 were randomly selected. The mail survey was administered during fall of 1990. The response rate for the project was 47%.

The central focus of this paper is the relationship between social structural location and the adoption of household preparedness measures. The crosstabulation analysis employs race, age, education level, household income, and the presence of children in the home as independent variables that indicate social structural location.

The dependent variable, *household preparedness*, is measured by an index based on 14 hazard reduction measures commonly recommended to the public by emergency management officials. The variable is measured as a ratio of actions taken to actions that are possible for the respondent. For example, individuals without children cannot give their children safety instructions; therefore the base number of possible actions taken is 13 for households where there are no children present.

Respondent Profile

Memphis is the largest city in Tennessee, with 652,640 people. Of the total population, 52% are White while 48% are Black, with other ethnic groups making up less than 1% of the population. Sixty-seven percent of the survey respondents are White, 30% are Black, and less than 2% of respondents belong to all other ethnic groups. Although it appears that Blacks are underrepresented in the survey, this is not necessarily the case considering that the sample was drawn by household, not by individual. White households in Memphis contain an average of 2.5 people while the average Black household has 3.27 people.

The median age of the respondents is 46 years, somewhat higher than the median age of the total population at 31 years. However, the census statistics rely on the total population to determine median age, while survey respondents had to be 18 years of age or older.

The respondents as a group are more highly educated and have higher household incomes than the general population of Memphis. Most respondents had some college education (63%) and one-third held a college degree or higher, while only 15% of the city population has a college degree or higher and 63% have completed high school. The median household income across Shelby County, where Memphis is located, is \$26,950, slightly lower than the \$30,000 median household income of the respondents.

This profile suggests that the results of the survey may be more reflective of White, better-educated, higher income residents and caution must be used in generalizing the results to the Memphis population. However, for hypothesis testing, which is the focus of this analysis, no significant impact is expected.

Results

Bivariate tests of significance were conducted for each of the independent variables in relation to the adoption of preparedness measures at the household level. The results of these tests are shown in Table 1. With

the exception of age, support was found for the proposition "Social structural location will be positively correlated with participation in earthquake preparedness activities."

White respondents, respondents with higher levels of education and higher household incomes, and respondents with children present in the household were more likely than Black respondents, respondents with lower levels of education and lower household incomes, and respondents who did not have children at home to adopt commonly recommended preparedness measures.

It is possible that the lack of correlation between age and preparedness is a result of limitations imposed by the analysis. This analysis sought an increasing likelihood of preparing one's household as age increased, and support was not found for this hypothesis. Turner and colleagues (1986) found that both young and elderly people are least likely to take the recommended precautions, with middle-aged people most likely to adopt household preparedness measures.

However, the remaining findings are consistent with Turner's (1986) findings from research done in southern California. Higher education and household income increased the likelihood of engaging in preparedness activities. These households are more likely to have the financial resources to invest in increasing the safety of their homes. Furthermore, we can assume that lower educated respondents may experience greater limitations on their abilities to understand the sometimes complex nature of information about earthquakes and preparedness than do higher educated respondents.

The presence of children in the household appears to increase participation in preparedness activities for several reasons. First, adults may be more attentive to the safety of their children than they are to their own safety. They may take precautions to protect their children that they would not otherwise invest in for themselves. Second, children are likely to bring

Table 1: Social Structural Location and Household Preparedness

Sociodemographic Characteristic	Tau C	Significance
Age	.0363	ns
Children	.1165	.05
Education	.1501	.001
HH Income	.1700	.001
Race	.2576	.001

safety information from school into the household that might not otherwise be familiar to adults. Children can act as a motivational tool for adults, making preparedness a family event.

Racial differences serve as the final variable on which respondents differed in their levels of preparedness. Since the analysis controlled for race when examining education and income levels, additional factors must be influencing disparate levels of household preparedness between black and white respondents. Several considerations should be made in future examinations of race and preparedness, including: faith in science; trust in authority figures from the political, scientific, and media arenas; and the types of information sources each group accesses in their attempts to understand and respond to earthquake threats. Finally, we must take into consideration the cultural frameworks through which people interpret information. Since frame of reference varies according to one's location in the social structure, scientific information will not be interpreted or responded to in a consistent manner across ethnically diverse populations (cf. Nelkin 1986).

Despite the higher level of preparedness found among people in structurally advantageous locations, over half of the respondents still perceive that their households are "not very" or "not at all" prepared for an earthquake. The proportions of respondents who had taken various actions to prepare for an earthquake are shown in Table 2. The preparedness activities most prevalent in this community are those usually taken for reasons other than natural hazard safety, such as having a working flashlight (84%) and having a battery operated radio (70%). These measures involve relatively little investment of money, time, and effort.

We are unable to determine whether people who did take action will maintain their preparedness levels in the absence of another prediction or actual earthquake. It appears that "the adoption of adjustments becomes habitual and cumulative" (Schiff 1977) because once adopted, old habits die hard. This is especially true concerning insurance. Once an earthquake rider is added to an insurance policy, individuals are likely to routinize payment every year. On the other hand, activities such as storing water (37%) and keeping first aid supplies on hand (37%) require a greater degree of sustained commitment. While having a flashlight and battery operated radio on hand should prove to be helpful in the event of a serious earthquake, few households have taken the necessary precautions to significantly reduce their potential for injury, death, and damage or to lessen the hardship of recovery.

Conclusions

By focusing attention on this region as a potential site of a **damaging** earthquake, Browning's prediction may have generated discussion **about** the hazard and contributed to an increased awareness of and concern **about** earthquakes. Over time, with a sufficient commitment of effort and **financial** resources, improvements in household preparedness can be achieved. **These** efforts, in order to be successful, must address the wide variations in economic, social, and cultural conditions that shape people's lives. **Local** officials should continue to stress public education and preparedness and engage people in ongoing self-protective activities.

However, even if more households choose to adopt recommended self-protective measures, the hazard still may not be effectively reduced, since arguably the most effective precautions against earthquakes "are not ones taken by individuals but those legislated or adopted by communities and by nations" (Mileti and Sorensen 1987, p. 191). As long as preparedness efforts continue to emphasize individual responsibility for safety, and disaster preparedness must compete with other more immediate social

Table 2: Hazard Reduction Measures Taken by Respondents

Action	Frequency	Percent
Store food/water	168	37
Learn first aid	240	54
Have first aid kit	165	37
Devise family plan	135	31
Have working flashlight	394	84
Have battery radio	321	70
Protect glasses/dishes	48	11
Secure water heater	40	9
Ask about EQ insurance	250	56
Buy EQ insurance	233	53
Give children instructions	179	44
Secure furniture	13	3
Have engineer assessment	15	4
Make structural changes	16	4

concerns, the damage from a future earthquake in the Central United States is likely to be significant. Furthermore, those groups that are most economically disadvantaged and socially disenfranchised during non-emergency periods will disproportionately suffer from the loss and disruption that a serious quake can inflict on a community.

References

- Brannon, R. 1976. "Attitudes and the Prediction of Behavior." Pp. 145-198 in *Social Psychology: An Introduction*, edited by B. Seidenberg and A. Snadowsky. New York: The Free Press.
- Bourque, L.B., L.G. Reeder, A. Cherlin, B.H. Raven, and D.M. Walton. 1973. *The Unpredictable Disaster in a Metropolis: Public Response to the Los Angeles Earthquake of February, 1971*. Los Angeles, California: Survey Research Center, University of California, Los Angeles.
- Burton, I. and R. Kates. 1964. "The Perception of Natural Hazards in Resource Management." *Natural Resources Journal* 3:412-41.
- Dillman, D. 1978. *Mail and Telephone Surveys: The Total Design Method*. New York: John Wiley and Sons.
- Dynes, R. and D. Wenger. 1971. "Factors in the Community Perception of Water Resources." *Water Resources Bulletin* 7:644-51.
- Erlich, H.J. 1969. "Attitudes, Behavior and the Intervening Variables." *The American Sociologist* 4:29-34.
- Gillespie, D.F. and C.L. Streeter. 1987. "Conceptualizing and Measuring Disaster Preparedness." *International Journal of Mass Emergencies and Disasters* 5 (2):155-176.
- Hutton, J. and D. Mileti. 1979. *Analysis of Adoption and Implementation of Community Land Use Regulations for Floodplains*. San Francisco, California: Woodward-Clyde.
- Kunreuther, H., R. Ginsberg, L. Miller, P. Sagi, P. Slovic, P. Borkan, and N. Katz. 1978. *Disaster Insurance Protection: Public Policy Lessons*. New York: Wiley.
- Mileti, D.S., C. Fitzpatrick and B.C. Farhar. 1989. *Risk Communication and Public Response to the Parkfield Earthquake Prediction Experiment*. Boulder, Colorado: Hazards Assessment Laboratory, Colorado State University.
- Mileti, D.S. and J.H. Sorensen. 1987. "Natural Hazards and Precautionary Behavior." Pp. 191-207 in *Taking Care: Understanding and Encouraging Self-Protective Behavior*, edited by N.D. Weinstein. New York: Cambridge University Press.
- Nelkin, D. 1986. *The Language of Risk*. Beverly Hills, California: Sage.
- Nigg, J.M. 1982. "Communication Under Conditions of Uncertainty: Understanding Earthquake Forecasting." *Journal of Communication* 32 (1):27-36.
- Palm, R.I. 1981. "Public Response to Earthquake Hazard Information." *Annals of the Association of American Geographers* 71 (3):389-399.

- Palm, R.I., M. Hodgson, R.D. Blanchard, and D. Lyons. 1990. *Earthquake Insurance in California*. Boulder, Colorado: Westview Press.
- Regulska, J. 1982. "Public Awareness Programs for Natural Hazards." Pp. 36-70 in *Perspectives On Increasing Hazard Awareness*, edited by T.F. Saarinen. Monograph #35. Program on Environment and Behavior. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.
- Saarinen, T.F. 1982. "The Relation of Hazard Awareness to Adoption of Approved Mitigation Measures." Pp. 1-35 in *Perspectives On Increasing Hazard Awareness*, edited by T.F. Saarinen. Monograph #35. Program on Environment and Behavior. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.
- Slovic, P., H. Kunreuther, and G. White. 1974. "Decision Processes, Rationality, and Adjustment to Natural Hazards." Pp. 187-204 in *Natural Hazards: Local, National, Global*, edited by G. White. New York: Oxford University Press.
- Sorensen, J.H. and G.F. White. 1980. "Natural Hazards: A Cross-cultural Perspective." Pp. 279-318 in *Human Behavior and the Environment*, edited by I. Altman, A. Rapaport, and J. Wolwill. New York: Plenum.
- Tarter, D.E. 1970. "Attitude: The Mental Myth." *American Sociologist* 5:276-278.
- Tierney, K. 1981. "Community and Organizational Awareness Of and Preparedness for Acute Chemical Emergencies." *Journal of Hazardous Materials* X:331-342.
- Turner, R.H., J.M. Nigg, and D. Heller-Paz. 1986. *Waiting for Disaster: Earthquake Watch in California*. Los Angeles, California: University of California Press.
- Tversky, A. and D. Kahneman. 1974. "Judgement Under Uncertainty." *Science* 185:1124-1131.
- Waterstone, M. 1978. *Hazard Mitigation Behavior of Urban Flood Plain Residents*. Natural Hazard Research Working Paper #35. Boulder, Colorado: Institute of Behavioral Science, University of Colorado.
- Weinstein, N.D. (ed.) 1987. *Taking Care: Understanding and Encouraging Self-Protective Behavior*. New York: Cambridge University Press.