EARTHQUAKE THREAT

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THE HUMAN RESPONSE IN SOUTHERN CALIFORNIA

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ASRA INFORMATION RESOURCES
NATIONAL SCIENCE FOUNDATION

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This report is concerned with the community's ability to deal constructively with the uncertain prospect of a severe earthquake. It describes the public state of mind one year after announcement of the southern California Uplift. Using information from a survey conducted in 1977, of 1450 adult residents of Los Angeles County, the sample was designed to be representative of the entire country. The extent to which people are aware of the Uplift and of the various predictions, forecasts, and cautions concerning possible earthquakes in the near future is addressed. Public expectations are examined and an attempt is made to see whether they are related to events of the preceding year. Questions concerning preoccupation with, and concern and fear of earthquakes are explored. One chapter is devoted to whether people wish to be informed or sheltered from anxiety-provoking communications. Other chapters are concerned with whether and how action should be taken. Several aspects of response to earthquake hazard are dealt with including attempts to seek earthquake threat information; degree of confidence placed in scientific earthquake prediction; and general attitudes toward science.

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FORWARD

It is our hope that this interim report will be interesting and helpful to those who are concerned with enabling the community to deal constructively with the uncertain prospect of a severe earthquake. The report is largely factual and describes the public state of mind one year after announcement of the southern California Uplift. Recommendations for action have been left for a later report, when more sophisticated analyses of data have been completed.

The variety and subtlety of human attitudes revealed by our research belie all glib generalizations. Only a statistical account that records diversity can supply an accurate picture of the human response in Los Angeles County. But we have limited the report to only the simplest statistics and attempted to explain them fully in the text.

We invite comment on the report. Suggestions concerning the practical applications of these findings will be especially welcomed.

The investigation would never been possible without the strong support and wise counsel of Charles Thiel and William Anderson of the National Science Foundation, Robert Hamilton and Peter Ward of the U.S. Geological Survey, the research staff of the Survey Research Center at U.C.L.A. under the direction of Eve Fielder, the administrative staff of the Institute for Social Science Research under Ann Cinderella, and the dedicated service of the project secretary, Anita Anderson.

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INTRODUCTION

The Developing Prospect of Earthquake Prediction

As recently as 1973, a report of public response to the 1971 San Fernando-Sylmar earthquake was issued under the title The Unpredictable Disaster in a Metropolis. Forecasting earthquakes was commonly relegated to seers and fiction writers like those who warned that much of California would fall into the Pacific Ocean in June of 1969. But as early as 1968 a working group of the Federal Council for Science and Technology, impressed by progress in Japan, had recommended earthquake prediction as a valuable tool for saving lives in case of an earthquake. And in late 1973 and 1974 a spate of articles by leading seismologists optimistically recounted progress toward the practical realization of a scientific prediction capability. In May, 1975, a popular article by Frank Press bore the headline: "With adequate funding several countries, including the U.S., could achieve reliable long-term and short-term forecasts in a decade."

Some of the optimism was stimulated by the report from an American scientific delegation to the People's Republic of China in 1974 that their hosts might have successfully predicted as many as eleven substantial earthquakes. The most impressive, and certainly the most extensively verified Chinese success came the following year when a magnitude 7.3 earthquake in the vicinity of Haicheng, on February 4, 1975, was predicted with almost pinpoint accuracy just a few hours before it happened.

Early optimism was also based on the conviction that seismologists were close to finding a theoretical model which would adequately account for the various signs often observed before an earthquake. The model would permit quantitative analysis so as to specify the place, time, and magnitude of the expected quake. Building especially on Soviet findings, American seismologists

formulated the dilatancy theory, which promised a framework in which all the pieces of the puzzle could be fitted neatly together. In the meantime, American scientists were having some encouraging practical success. Peter Ward reported five small earthquakes that were predicted with varying degress of accuracy in the United States between 1974 and 1977. In a definitive analysis of the state of the art released in 1976, the National Academy of Sciences Panel on Earthquake Prediction was appropriately cautious about current progress. But the Panel reiterated the conclusion that "With appropriate commitment, the routine announcement of reliable predictions may be possible within ten years in well instrumented areas, although large earthquakes may present a particularly difficult problem."

Enthusiasm for earthquake prediction was occasionally muted by anxiety over potentially unsettling social and economic effects from warning the public about a coming earthquake. Especially if the warning involved weeks, months, or years of advance notice, might not disruption in the social and economic fabric of community life exceed whatever benefit could be anticipated from knowing when to expect an earthquake? Garrett Hardin imagined all of the worst possibilities in a witty and polemical essay that attracted wide attention. More serious efforts to estimate possible effects began with a working paper by J. Eugene Haas entitled "Forecasting the Consequences of Earthquake Forecasting," prepared for the University of Colorado Institute of Behavioral Science in 1974. Haas and Dennis S. Mileti then launched the first empirical study in which key decision makers in commercial and noncommercial sectors of the community tried to anticipate what steps they would take in the event of a prediction, taking into account the decisions that were being contemplated in other community sectors. Their conclusions were that lives would indeed be saved, but very likely at the cost of a crippling economic recession.

With a mandate to review the full range of social, economic, and legal

aspects of prediction, the Panel on Public Policy Implications of Earthquake Prediction was established in the National Academy of Sciences as a counterpart to the Panel on Earthquake Prediction. Drawing widely on experience with warnings of other types of disaster, the Panel offered recommendations for both action and research. Central to several of the research recommendations was the need to study response to actual instances of earthquake prediction and warning as they occur. At the same time studies by Martin V. Jones and Richard M. Jones and by Leo W. Weisbecker and Ward C. Stoneman also explored potential social and economic consequences of prediction, while emphasizing the need for more focused research. In 1978 a report from the National Research Council Committee on Socio-economic Effects of Earthquake Prediction presented a more fully elaborated outline for research. The Committee underlined the importance of studying response to near predictions as well as predictions, reminding investigators that people may not distinguish between near predictions and scientifically adequate predictions. In the same year Arnold J. Meltzner cited California statewide opinion polls to document the low level of apparent public interest in earthquake safety.

Earthquake Harbingers in Southern California

On February 4, news of the tragic Guatemalan earthquake in which more than 20,000 people were killed and 200,000 left homeless heightened local awareness of earthquake hazard. Whatever meaning this disaster may have had for southern Californians, it did not directly stimulate increased attention to problems of earthquake preparation and survival in Los Angeles area newspapers. But on February 13, before the Guatemala disaster ceased to be news, a front-page story in the Los Angeles Times announced the discovery that the earth's surface was uplifted over a vast area centered near Palmdale. The precise meaning of the Uplift remained a puzzle to seismologists, and scientists

admitted that alternating uplift and subsidence can occur without accompanying earthquakes. However, four circumstances could not be ignored, namely: (1) an uplift of this nature is one important hypothetical precursor to an earthquake; (2) if the uplift were a precursor, its extent--covering approximately 100 miles along the fault--could indicate an earthquake in the magnitude 8 range on the Richter scale; (3) the NOAA study published in 1973 had estimated that a quake of similar magnitude centered in approximately the same location could cost as many as 12,000 lives in the greater Los Angeles area, with astronomical injuries and property loss; (4) seismologists had long warned that a serious earthquake was overdue in the southern portion of the San Andreas fault. While acknowledging the uncertain meaning of the Uplift, the California Seismic Safety Commission on April 8 officially declared that "the uplift should be considered a threat to public safety and welfare in the Los Angeles metropolitan area."

Although nothing approaching a true prediction had yet been issued, the southern California Uplift might well serve as a prototype for the first stage leading toward eventual prediction of a highly destructive earthquake affecting a major metropolitan area. The U.S. Geological Survey rapidly increased instrumentation and observation in the uplifted area. A succession of further developments might well occur, culminating either in a positive prediction, a reinterpretation of the Uplift as benign, or an actual earthquake that struck while scientists and responsible community leaders were still debating the significance of the anomaly. Accordingly it was decided to launch an investigation into public interpretation and response to announcement of the Uplift and whatever subsequent developments might occur. This report is a summary of some early findings from that investigation.

Subsequent events have justified the assumption of a developing scenario, though not yet the anticipation of a true earthquake prediction. On April 21

1976, another front-page story in the Los Angeles Times reported that Professor James Whitcomb of the California Institute of Technology's Seismology Laboratory had "predicted" a quake between the magnitudes of 5.5 and 6.5 to occur any time from that date until April, 1977. The quake might occur on any of several faults in the area, and anywhere within an irregularly shaped circle some eighty-seven miles in diameter. It could not be determined at once whether this qualified prediction referred to the same phenomenon as the southern California Uplift, or whether Los Angeles now faced the prospect of two earthquakes. In subsequent discussion, Professor Whitcomb made it clear that he was merely engaged in testing a controversial hypothesis rather than issuing a confident prediction.

On May 28 the Los Angeles Times again carried a front-page story with the headline "Palmdale 'Bulge' Higher, Wider Than First Thought." This latest story suggested that the Uplift might relate to a fault on the Los Angeles side of the San Gabriel Mountains, rather than the San Andreas fault, and reported a growing conviction at the U.S. Geological Survey that the Uplift indeed presaged an earthquake.

The year following the first announcement of the Uplift was marked by an abundance of earthquake-related news. There were more destructive earthquakes around the world than usual, with the July 28 Tangshan quake in the People's Republic of China and the May 6 quake in northern Italy receiving most attention. Issues such as what to do about old and unsafe buildings, existing and projected dams, and the safety of nuclear reactors kept earthquakes in the public attention. Just about the time that Professor Whitcomb was cancelling his near prediction, a forecast from outside of the established scientific community attracted nationwide attention. Henry Minturn, a self-styled geophysicist unknown to the scientific community, was given a hearing by the local NBC radio affiliate on November 22, 1976. He claimed to have predicted many earthquakes successfully

in the past, including a small one that occurred while he was in the studio. On the air he forecast an earthquake for the Solomon Islands on December 7, to be followed by a quake in Los Angeles on December 20. Although recognized earthquake scientists consistently disparaged Minturn's methods and his predictions, interest in the forecast mushroomed. Media coverage was extensive, though it ranged from positive to inquiring to devastatingly critical. After December 20 had passed without an earthquake, most of the media simply dropped further mention of Minturn, without so much as a recapitulation and assessment.

The Nature of the Investigation and the Current Report

This report deals primarily with descriptive findings from a sample survey of 1450 adult residents of Los Angeles County, conducted from approximately mid-January to mid-March of 1977. The sample was designed to be representative of the population of the entire county, and to approximate a probability sample. Respondents were interviewed in their homes by trained interviewers from UCLA's Survey Research Center. The findings describe the public state of mind approximately one year after the first announcement of the southern California Uplift, and from one to three months after the period of public concern with the Minturn forecast.

In addition to the basic survey, the investigation included four subsequent waves of telephone interviews at five to six month intervals for the purpose of detecting changes, and a small study of public response to the magnitude 4.6 earthquake felt throughout Los Angeles County on New Year's Day, 1979. These data are under analysis and are not included in this report, with two exceptions. Some new questions included in subsequent telephone interviews were designed to clarify answer to questions in the basic survey. Replies to two of these sets of questions have been incorporated in the relevant portions of this report. At the same time as the basic survey, additional interviews

were secured in neighborhoods that suffered major damage or evacuation during the San Fernando-Sylmar earthquake of 1971, and in neighborhoods with predominantly minority residents. These data allow us to conduct a more intensive study of the effect of recent earthquake experience, current earthquake vulnerability, and minority racial and ethnic status on awareness and attitude toward the earthquake hazard. The results of this analysis are also being reserved for a later report.

In this report we begin by asking the simple question, to what extent are people aware of the southern California Uplift and of the various predictions, near predictions, forecasts, and cautions concerning possible earthquakes in the near future? Chapters One and Two deal with this question. Regardless of what announcements people remember, we then ask whether most people are convinced that a serious earthquake is on its way. In Chapter Three we examine public expectations and attempt to see whether they are related to events of the preceding year.

An appreciation of the public state of mind requires that we also know how people feel about earthquake hazard. To what extent are people preoccupied with the earthquake prospect and to what extent are they concerned and fearful of earthquakes? These questions are explored in Chapter Four. An important indicator of the public state of mind, and of great practical importance to those who communicate with the public, is public receptiveness toward information about the earthquake hazard. Do people want to be kept informed, or would they prefer to be sheltered from anxiety-provoking communications? Chapter Five is devoted to these questions.

In Chapters Six, Seven, and Eight we turn to the subject of action. Ultimately awareness and concern are significant if they are converted into some kind of action to deal with the earthquake threat. In Chapter Six we ask first whether people believe that anything can be done, for whom something

should be done, and whose responsibility it is to act. An important theme is whether earthquake hazard is seen as calling for cooperative community action and altruistic concern over people in exceptional danger, or whether individuals and families should look out for themselves. Chapter Seven is devoted to what people expect from government and government officials. And Chapter Eight asks what people are doing for themselves.

Chapters Nine and Ten deal with two special aspects of the response to earthquake hazard. In Chapter Nine we ask where people look for information about the earthquake threat, and how they make up their minds about the danger and about the actions to be taken. In Chapter Ten we ask what confidence people place in scientific earthquake prediction and in less scientific forms of earthquake forecasting, and what are their more general attitudes toward science.

At a later stage in this investigation we hope to translate many of the practical implications of these findings into concrete recommendations for action by earthquake scientists, government officials, media personnel, and others concerned with earthquake prediction and hazard mitigation. But the current report is intended primarily to enable interested personnel to replace speculation with facts as they devise and implement hazard mitigation programs. We believe that the many practical implications of the questions explored in this report will be obvious to people who have thought constructively about how best to prepare the public for a severe earthquake.

Chapter One

Are Southern Californians Aware of the Uplift?

Salience.

Public attention shifted constantly throughout the year 1976 between earthquake predictions and near predictions, reports of devastating earthquakes such as those in Guatemala, the north of Italy, and the People's Republic of China, and controversial issues such as nuclear power plant safety, dam safety, and the safety of unreinforced masonry buildings. But the existence of the great Uplift along the San Andreas fault, near to California's largest metropolis, was the constant that gave meaning and urgency to all of the discussion. After a year of exposure to reports and debate, how aware and concerned were people about the Uplift?

We first approached this question indirectly, in order to see how often the Uplift came to mind when people were asked about earthquake predictions and warnings. We use the term salience as distinguished from mere awareness to indicate that people think immediately of the Uplift when the topic of earthquake predictions and warnings is broached. Respondents were asked the following question:

> In the past year or so, have you heard any predictions, statements, or warnings about earthquakes in the southern California area? That is, about specific locations, specific time, or from specific people?

If the answer was positive, the respondent was then asked:

> I'd like you to tell me about the predictions, statements, or warnings. Any specific ones, anything at all that you remember.

Respondents were encouraged to give more than one answer, and up to five different answers were recorded and coded for each respondent.

The range of answers to these questions will be discussed in the next chapter of the report. But only 110 people, or 7.6 percent of the sample,

mentioned the Uplift by one of its names or in vaguer but recognizable terms. The existence of the Uplift plainly has little salience for most of the residents of Los Angeles County. When we compare other responses in the next section, it may be possible to speculate on why this should be.

Awareness.

In order to measure awareness of the Uplift, we later asked the following question of everyone who had not volunteered a reference to the Uplift:

> Do you remember hearing about a bulge in the earth near Palmdale in the Mojave Desert?

Combining respondents who answered "yes" to this question with respondents who mentioned the Uplift in answer to the prior questions, we find that 857 people, or 59.1 percent of the sample, were aware of the Uplift. Depending upon how one chooses to interpret these figures, we can be pleased that three out of five residents have heard of the Uplift, or disturbed that two out of five have not even heard of the Uplift after a year of public attention.

Merely having heard about a bulge in the desert may not signify any real awareness of the Uplift and its significance. Hence we asked people if they remembered what scientists were saying that the bulge signified. The objective of this question was to ascertain whether people understood that the bulge might be the precursor to an earthquake. The actual wording of the question is given in the accompanying table. The 157 respondents who believe that scientists make a definite connection between the Uplift and a coming quake have overestimated scientific confidence in the meaning of the Uplift, but at least have the right idea about the Uplift. The 466 who believe scientists interpret the Uplift as probably or possibly an earthquake precursor have most adequately grasped the view presented in the responsible media. But the 234 persons who don't know, or who believe scientists are saying the Uplift is not an earthquake precursor lack something in awareness of the Uplift and its

significance. If we eliminate these 234 persons, we find that 72.7 percent of the people who have heard of the Uplift understand that it may be an earthquake precursor. This constitutes 43.0 percent of the entire sample, down from the 59.1 percent who have heard of the Uplift.

Significance of the Uplift

Answer to the question: Do you happen to remember what scientists are saying the bulge signifies? Does it signify that:	Percent
There is definitely an earthquake coming,	10.8
There is probably an earthquake coming,	15.8
There might be an earthquake coming, or	16.3
The bulge doesn't signify that an earthquake is coming?	6.1
DON'T KNOW AND NOT ANSWERED	10.1
Total who heard of the Bulge	59.1
All others	40.9
Total percent	100.0
Total number	1450

Relevance

Awareness of the Uplift and of its possible significance as an earthquake precursor still does not insure that the earthquake threat has a personal meaning for the individual. Some people may think of Palmdale as a long way off and any associated earthquake as equally remote. Some may view the earthquake threat with interest and curiosity but not seriously examine whether it might affect them. Still others may be aware of scientific discussions but not take them seriously. We asked two questions in order to judge whether the earthquake threat associated with the Uplift was personally meaningful to our respondents.

First, we asked all of the respondents who had heard of the Uplift, except for the 88 people who said the Uplift didn't signify a coming quake, whether they expected damage where they lived in case of an Uplift-connected earthquake. The precise wording of the question appears in the table. Only 82 people expected a great deal of damage where they lived, but a total of 426 or 29.4 percent of the entire sample expected either some damage or a great deal of damage where they lived. Only 5.5 percent were prepared to say there would be no damage where they lived. If we eliminate people who don't know whether scientists are saying the Uplift might signify an earthquake, 25.3 percent have heard of the Uplift, understand that it may be an earthquake precursor, and expect some damage where they live in case of an Uplift-connected earthquake. From our total sample, 29.7 percent have heard of the Uplift but either don't see it as an earthquake precursor or don't anticipate much damage where they live.

Expected Damage Where Respondent Lives

Answer to the question: If the bulge should signify a coming earthquake, in your opinion, do you think there will be damage where you live? Would you say:	Percent
A great deal,	5.7
Some,	23.7
Not very much, or	13.6
None at all?	5.5
DON'T KNOW AND NOT ANSWERED	4.5
Total asked (see text)	53.0
All others	47.0
Total sample	100.0
Total number	1450

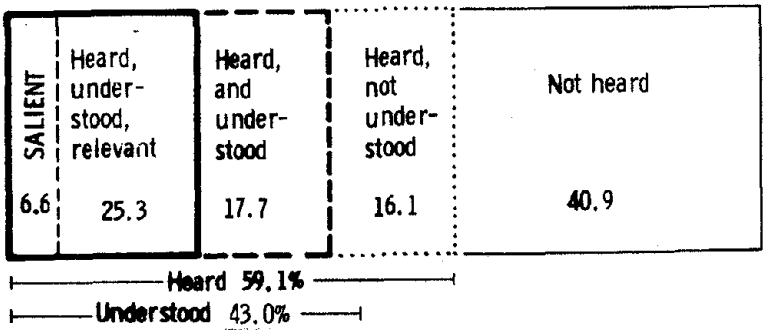
We also asked the same set of respondents how seriously they took the Uplift as a sign of a coming earthquake. More than half these respondents said they took the Uplift seriously (fairly and quite seriously). More than one in five said they took it quite seriously. However, a substantial 39.0 percent of persons who had heard of the bulge said they did not take it seriously. As parts of the total sample (see the table), 11.4 percent had heard of the Uplift and took it quite seriously, and 29.3 percent had heard and took the Uplift either fairly seriously or quite seriously. From 25 to 29 percent find the Uplift personally relevant, depending on which of these last two questions we use.

How Seriously Respondents Take the Uplift

Answer to the question: How seriously do you take the Palmdale bulge as the sign of a coming earthquake?	Percent
Quite seriously,	11.4
Fairly seriously,	17.9
Not very seriously, or	14.3
Not seriously at all?	6.4
DON'T KNOW AND NOT ANSWERED	3.0
Total asked (see text)	53.0
All others	47.0
Total sample	100.0
Total number	1450

The findings on awareness, understanding, relevance, and salience can be summarized in the simple accompanying graph. From left to right the graph identifies groups to whom the Uplift is decreasingly significant. The solid block on the left includes those who have heard, understood, and seen the

relevance of the Uplift. The next segment includes those who have heard and understood, but don't see the Uplift as personally relevant. Next come those who have heard of the Uplift but missed its significance as a possible earthquake precursor. And on the extreme right are those who have not even heard of a "bulge in the earth near Palmdale in the Mojave Desert," or have forgotten about it. The small segment to whom the earthquake threat is salient is included in the graph for comparison, although it does not necessarily correspond with knowledge and understanding of the Uplift.



AWARENESS OF THE SOUTHERN CALIFORNIA UPLIFT

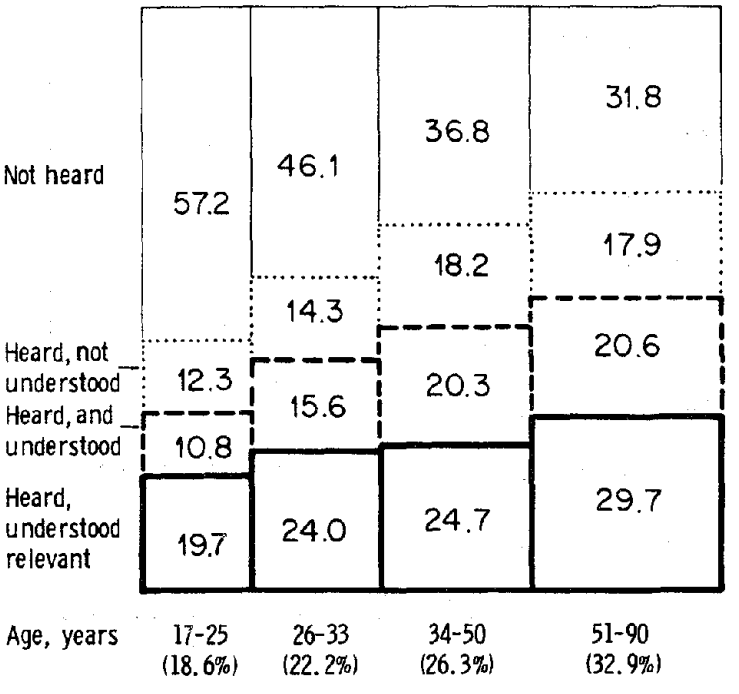
Correlates of Awareness

It has long been recognized that news spreads unevenly through any population, that some groups of people hear and grasp the significance of important information quickly and others frequently fail to hear the news or grasp its significance when they hear it. An important task in preparing the community to cope successfully with an earthquake and respond constructively to an earthquake prediction is to identify groups of people who are out of the mainstream of public communication. Public officials and leaders in the private sector can then devise ways to see that these people have the same opportunity to protect themselves from danger as others do. Comparing awareness of the Uplift among different population segments is one way to identify groups in

need of special attention.

We have selected a few important ways of dividing the general population for examination. Those that show interesting differences in awareness of the Uplift are presented graphically.

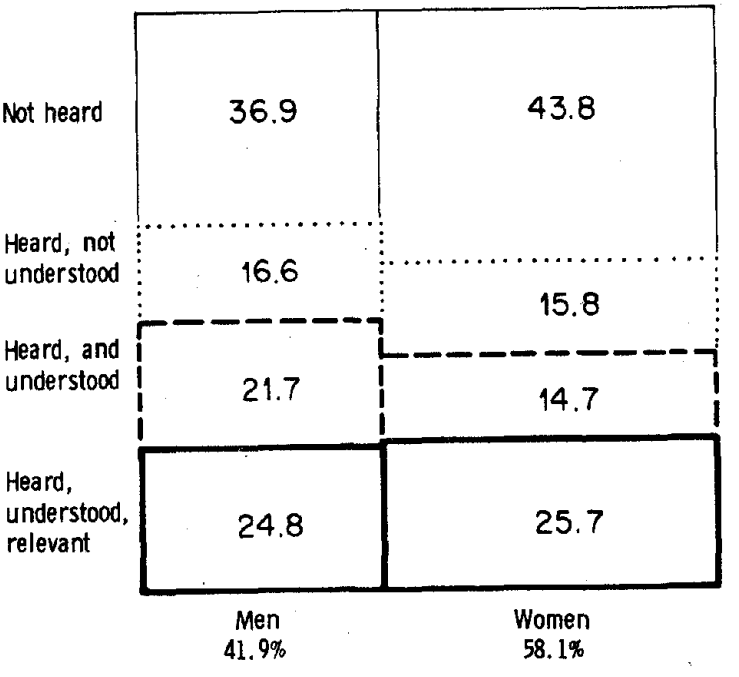
Studies of communication in disaster situations and knowledge of public issues often show that the elderly are not in the communication mainstream. Various explanations are offered--that they are more often isolated socially, that they lack the benefit of the more relevant and extended education received by later generations, that they are less future-oriented and thus less concerned or hopeful about the future. Although we do not separate the very old from the rest of the population, we find a consistent relationship between age and awareness of the Uplift that is precisely the opposite. There is a steady increase in awareness, understanding, and sense of relevance with age (see graph).



AWARENESS OF UPLIFT BY AGE

In a metropolitan environment with extensive television, radio, and newspaper coverage, the elderly may be at no significant disadvantage. The alienation of a generation or more of young people, many of whom responded by taking no interest in public affairs, may have made youth rather than the elderly the communication problem. The preoccupation with schooling, becoming established in a vocation, or establishing a family may translate hypothetical future events like a possible earthquake into low priority concerns. Whatever the correct explanation or combination of explanations, it must be a matter of concern that fully 57 percent of adults under 26 years of age do not even remember hearing of the Uplift.

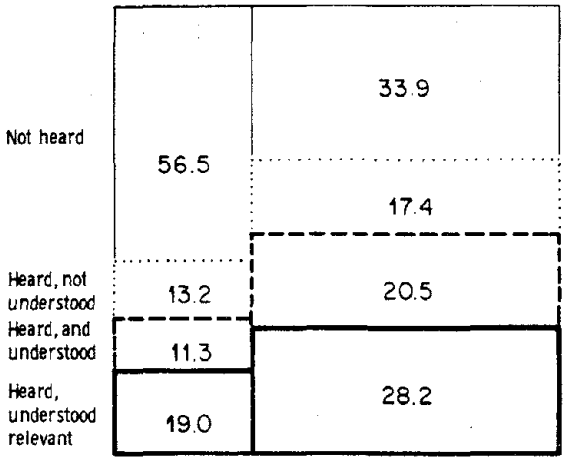
There is a difference between the awareness patterns for men and women, but it is more complex than the relationship with age. Women are less likely to say they have heard of the Uplift than men, but those who have heard are more likely to expect damage where they live in case of an Uplift-connected



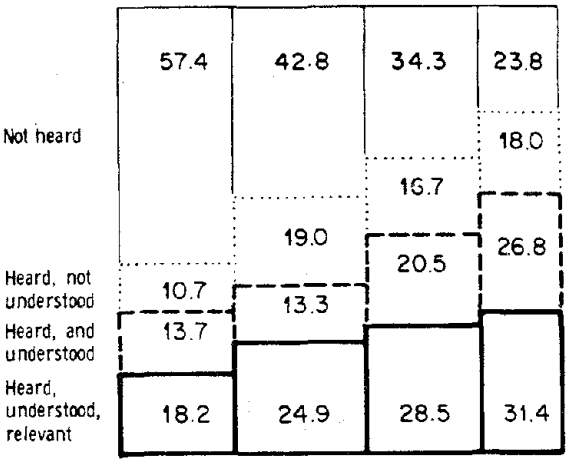
AWARENESS OF SOUTHERN CALIFORNIA UPLIFT BY SEX

earthquake. As research into other kinds of information has revealed, men are superficially better informed on public matters, but women are more likely to make what they hear relevant.

We examined two relationships that seem rather obvious, more as a check on the validity of our own procedures than to demonstrate the obvious. Clearly, those who expose themselves systematically to information sources and those who have more background for appreciating information should be more aware of the Uplift. As expected, we find that people who say they read a newspaper regularly have more often heard, understood, and seen the relevance of the Uplift than those who do not read a newspaper regularly. And the more formal education people have had, the more likely they are to have heard, understood, and seen the relevance of the Uplift.



AWARENESS OF THE UPLIFT BY NEWSPAPER READERSHIP



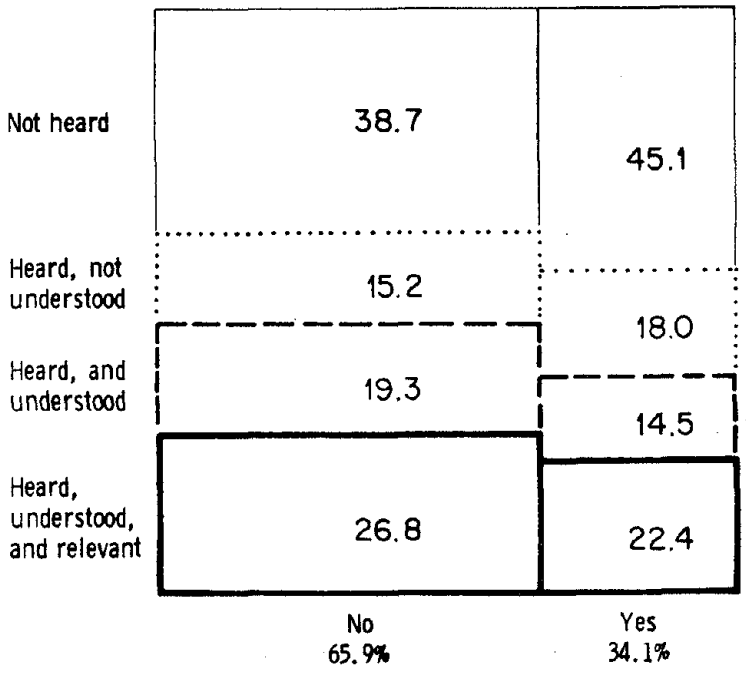
AWARENESS OF THE SOUTHERN CALIFORNIA UPLIFT BY EDUCATIONAL ATTAINMENT

From what we know about the spread of other kinds of information, there is good reason to suppose that people who have social ties and commitments in the local community should be more aware of whatever affects community welfare than people without ties. Being married, living in a household with school-aged children, and being personally attached to the local community all indicate

the presence of social ties. The greater the number of adults in the household, the more opportunities there should be to hear whatever news is locally important.

To our surprise we found no association between marital status and awareness of the Uplift. Likewise, number of adults in the household is unrelated to awareness of the Uplift.

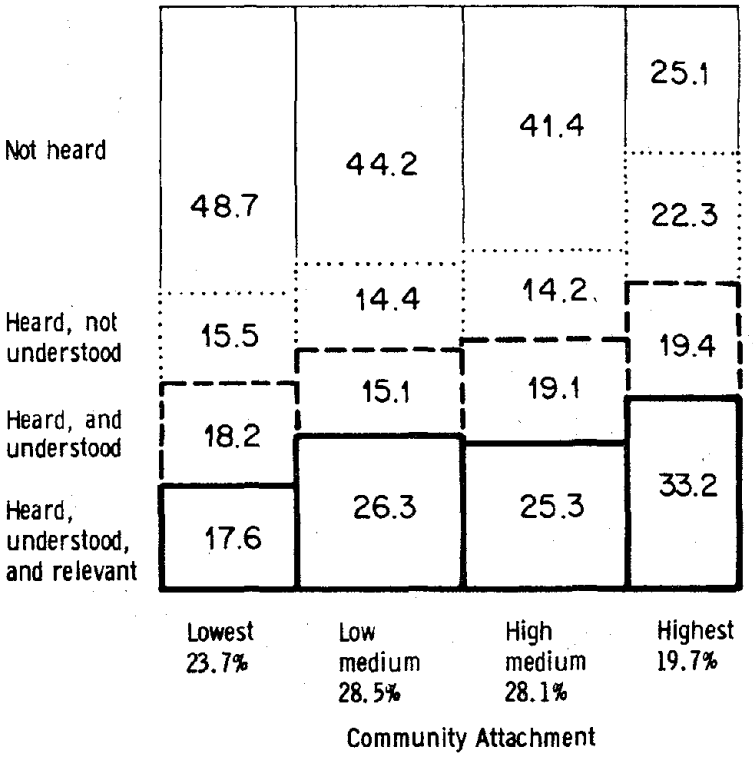
The presence of school-aged children in the home should be doubly significant because the schools often educate adults indirectly through their children. School children are often taught safety procedures, hygiene, and similar matters, and then relay their knowledge to parents and others at home. Often they are given study materials to bring home. Since there have been some efforts in the public and private schools to alert children to earthquake safety, children may have stimulated parental awareness of the currently important concern with earthquakes. In addition, adults should feel a special respon-



AWARENESS OF THE UPLIFT BY PRESENCE OR ABSENCE OF SCHOOL-AGED CHILDREN IN THE HOME

sibility for the safety of their minor children, and might therefore be more alert to earthquake news than adults without responsibility for children. The graph, however, shows that just the opposite is true. Adults who live in households with school-aged children are less often aware of the Uplift than others. Perhaps some of the same explanations apply here as were suggested to explain the low awareness on the part of younger people. Whatever the merits of these explanations, the school-to-child-to-parent communication linkage is not being used effectively to stimulate interest in the current earthquake threat.

In order to measure community attachment we combined answers to several questions on length of residence in the local community, thinking of the local community as one's real home, having relatives and friends in the immediate area, participating in local groups and organizations, and considering it unlikely that one will move from the immediate area in the next five years. The relationship between the index of community attachment and awareness of

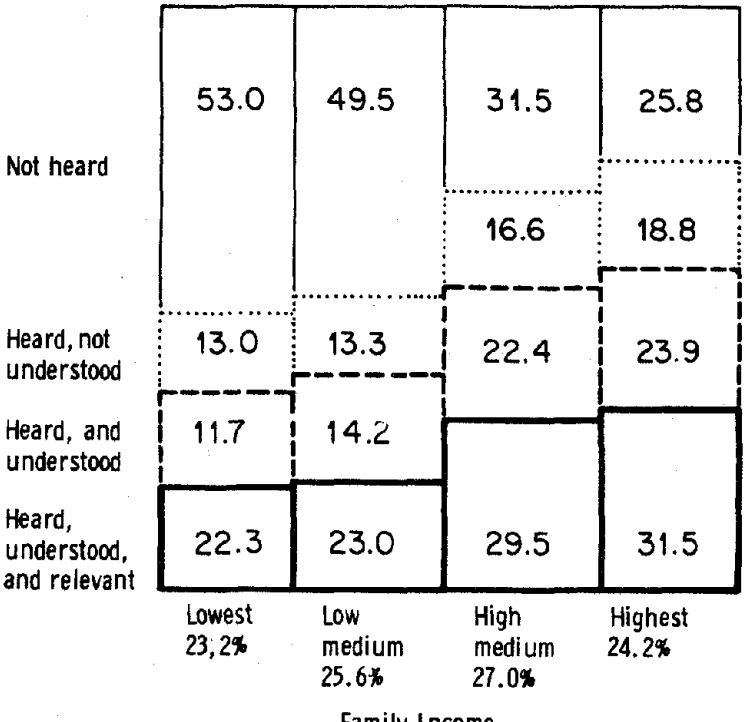


AWARENESS OF UPLIFT BY COMMUNITY ATTACHMENT

the Uplift, as graphed, is in the expected direction. Although the relationship is not perfectly consistent, people with strong attachment to the local community are strikingly more often aware of the Uplift and its relevancy than people with low attachment.

From the evidence on marital status, living with school-aged children, and number of adults in the household, we need to rethink any simple theory that having social ties enhances the likelihood of hearing and appreciating news of possible future disaster in the local area. Attachment to the community is more important than simply having ties.

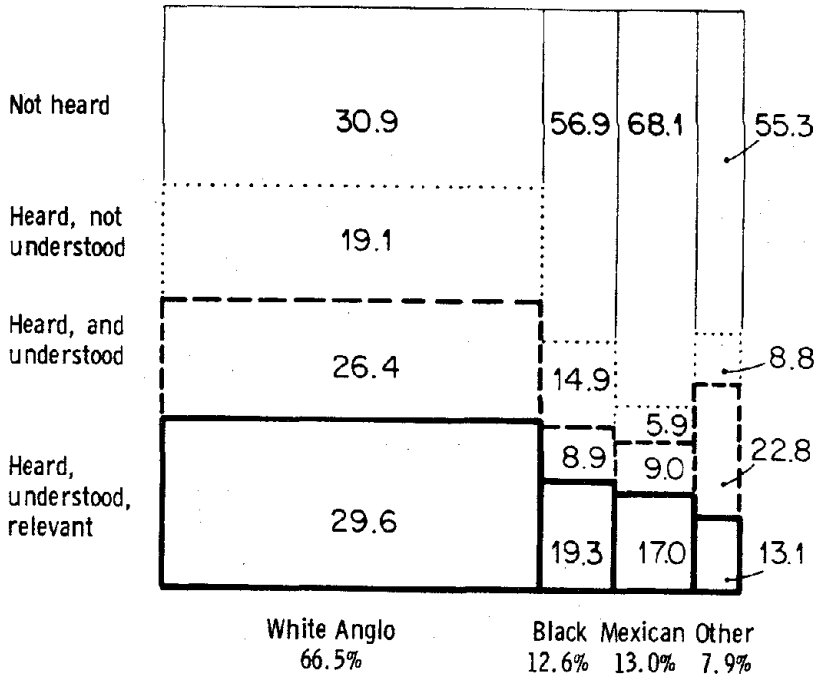
Most kinds of significant information get to the wealthy and middle classes before they reach the working and poorer classes, and to the white majority before they reach ethnic and racial minorities. The graph of family income shows the expected relationship. However, there is little difference



AWARENESS OF SOUTHERN CALIFORNIA UPLIFT BY FAMILY INCOME

between high and high medium income households, and there is also little difference between low and low medium income households. Only between the upper and lower income halves of the income distribution is there a difference. And this difference applies more to hearing of the Uplift than it does to experiencing it as personally relevant. Indeed, a larger share of upper income respondents who heard of the Uplift thought there would not be damage where they lived, than among lower income respondents.

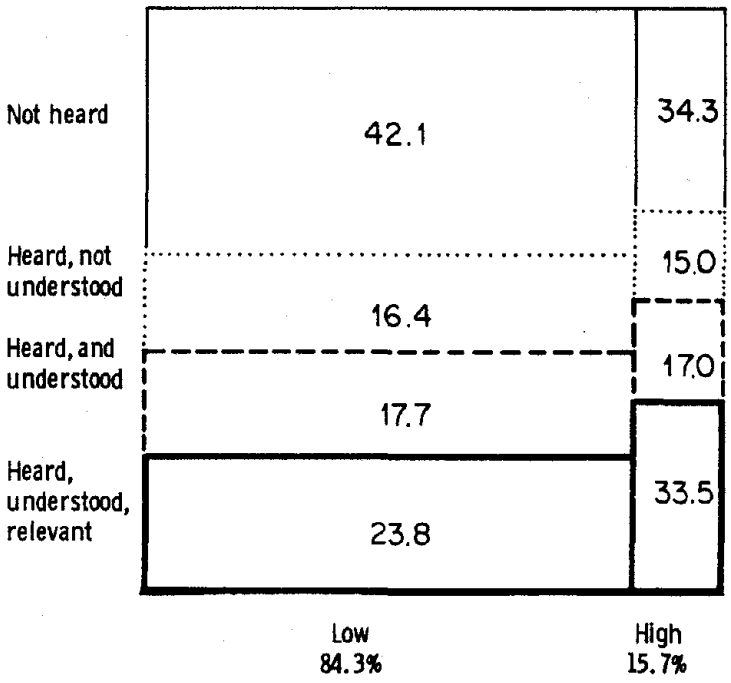
Blacks and Mexican Americans are much less likely to have heard than whites. Mexican Americans are least likely to have heard. Contributing to this finding may be the fact that the principal Spanish-language paper in the Los Angeles metropolitan area almost completely ignored the southern California Uplift. By featuring extensive coverage of the Guatemalan earthquake of February 3, 1976, in the same period, the paper may have reflected a tendency for attention to be turned away from local concerns and problems and toward concerns of the international Latin community throughout the Western Hemisphere.



AWARENESS OF SOUTHERN CALIFORNIA UPLIFT BY ETHNIC GROUP

But those Mexican Americans who have heard of the Uplift are more likely than whites, blacks, or other ethnic groups to feel it will mean damage where they live.

A final question is whether the news gets to those who need it most. Based on the very limited information at our disposal we prepared an index to identify the residences that were potentially more vulnerable to earthquake damage. The index counted constructions before 1934 of brick, stone, or concrete block, height of three or more stories, location in a canyon or on a steep incline or very close to a freeway bridge or overpass, and mobile home construction as contributing to vulnerability. Most residences were not distinctively vulnerable. But the small group of people who live in especially vulnerable residences were indeed more often aware of the Uplift and more likely to appreciate its personal relevance.



AWARENESS OF UPLIFT
BY RESIDENTIAL EARTHQUAKE VULNERABILITY

From this brief sampling of group differences in awareness of the Uplift, we note that special efforts may be required to insure that young adults, those who live in households with school-aged children, the less educated and members of lower income strata, and non-white and non-Anglo groups are made aware of any future earthquake prediction. Among the higher social and economic strata of the community, however, the benefits of being more aware may be offset by a sense of immunity which leads them to discount the possibility of considerable damage where they live. People over 50 years of age, people with especially strong attachment to their local communities, and those who live in especially vulnerable circumstances are most likely to be informed and also to appreciate the personal relevance of the news.

Chapter Two

What Earthquake Predictions, Forecasts, and Cautions Do People Remember?

While the southern California Uplift is the most scientifically credible and timely reason for increased attention to the prospect of a serious earthquake in the near future, the message of impending disaster comes from many quarters. Messages from scientists have ranged from the perennial reminders that a great earthquake is overdue in southern California to the relatively specific near prediction issued by James Whitcomb. From outside of the scientific establishment but wearing the mantle of science have been the forecasters of a "Jupiter effect" epidemic of great earthquakes in 1982 and Henry Minturn with his December 20, 1976, prediction for Los Angeles. Annual forecasts by an assortment of seers and psychics often include earthquakes. The forecast that much of California would break off and slide into the Pacific Ocean as a result of great earthquakes in 1969, proclaimed in a best-selling work of fiction, has been preserved as an enduring element in California earthquake lore. The original date has generally been forgotten. A television evangelist devoted an hour-long special and a paperback book to the forecast of an earthquake in 1982, claiming converging evidence from the Uplift, the Jupiter effect, and the biblical Book of Relevations. Thus forebodings of earthquake disaster are in the air in southern California.

The question for this chapter is how aware people are of these many forecasts and forebodings. If there is considerable awareness, how seriously do they take these messages? To what extent do they discriminate among them, keeping them separate, or merge them into one multifaceted prediction? Do people pay more serious attention to those with a credible scientific basis than they do to other forecasts?

Announcements People Remember

The basic source of information is the series of questions already presented in the preceding chapter, beginning with the query:

> In the past year or so, have you heard any predictions, statements, or warnings about earthquakes in the southern California area? That is, about specific locations, specific times, or from specific people?

If the answer was positive, the respondent was then asked:

> I'd like you to tell me about the predictions, statements, or warnings. Any specific ones, anything at all that you remember.

Up to five answers were recorded. The interviewer then took up each answer in turn, asking a series of questions about the particular announcement.

As the accompanying table indicates, most southern Californians have heard some prediction or announcement about a coming earthquake. From the column of cumulative percentages we find that 86.6 percent said they had heard one or more announcements. However, the majority of the people were only able to give one answer to the follow-up question. Only 29.2 percent were able or willing to identify two or more announcements. Only a meager 6 percent could name three or more.

Number of Earthquake Predictions, Forecasts, and Cautions Heard

Number of announcements heard	Percent	Cumulative percent
None	13.4	
One	57.4	86.6
Two	23.2	29.2
Three	4.9	6.0
Four	.7	1.1
Five	.4	.4
Total percent	100.0	
Total number of persons	1450	

The many forecasts and cautions to which southern Californians have been exposed are not kept separate in memory by most of our respondents. Either people lump together the many announcements into a generalized forecast of disaster, or they allow one specific announcement to speak for all. Our subsequent analysis will help us decide which pattern prevails.

Interviewers tried to get enough detail from respondents about each of the announcements they mentioned so we could tell whether they had some specific forecast or forecaster in mind. We hardly expected people to remember exact names and details of an announcement. But we looked for clues; for example, if someone mentioned a Caltech professor's prediction, or spoke of an earthquake predicted to occur by April, 1977, we assumed they were referring to the James Whitcomb announcement. In order to allow for possible confusion between different announcements, we provided that each answer could be coded under from one to three headings. For example, a reference to "the Caltech professor who predicted an earthquake for December" was coded under Whitcomb/Minturn, since the respondent had apparently mixed the two in his mind.

The announcements that people mentioned are summarized in the table. They have been grouped under four general headings and under "mixed" types. For clarity of communication we shall distinguish between "combined" and "mixed" types. If an answer confuses two or more announcements that fall within the same general category, such as scientific announcements, we call it a "combined" answer. For example, reference to "a Caltech professor who predicted an earthquake by April, 1977, based on a bulge in the desert" confuses two announcements. But since both sources are scientific, we place this under the <u>combined</u> type, "Uplift/Whitcomb." On the other hand, if we are told that "Minturn predicted an earthquake in December on the basis of the Palmdale bulge," the confusion is between a scientific and a pseudo-scientific announcement. We classify this response under the <u>mixed</u> type, "Uplift/Minturn."

Earthquake Predictions, Forecasts, and Cautions

Type of announcement	Percent of all answers	
General forecasts	36.9	36.9
Scientific announcements		15.4
General scientific	5.3	
Uplift	5.0	
Whitcomb	3.9	
General scientific/Uplift	.3	
General scientific/Whitcomb	.2	
Uplift/Whitcomb	.7	
Pseuoscientific announcements		37.2
Minturn	30.5	
California breakoff	6.0	
Jupiter effect	.3	
Minturn/California breakoff	.3	
Minturn/Jupiter effect	.1	
Prophetic announcements		6.1
Religious prophecies	.8	
Secular prophecies	5.3	
Mixed types		4.4
General scientific/Minturn	1.3	
Whitcomb/Minturn	1.0	
Minturn/Secular prophecies	1.2	
Other mixed types	.9	
Total percent	100.0	100.0
Total number of answers	1788	1788

More than a third of the answers were quite nonspecific; for example: "I heard on television that an earthquake is overdue," or "Everybody says there will be an earthquake soon." These "general forecasts" are detached from the specific source, nature, or grounds for the forecast. Only slightly more specific are the "general scientific" forecasts, such as "Scientists have predicted an earthquake in southern California." If we combine these types, 42.2 percent of all answers were nonspecific. Another 6 percent either mixed or combined types of announcements, thus achieving specificity at the cost of confusion.

Of those who were specific about an announcement, the great majority referred to the pseudoscientific prediction by Henry Minturn. If we include he combined and mixed references to Minturn's prediction, a total of 34.6

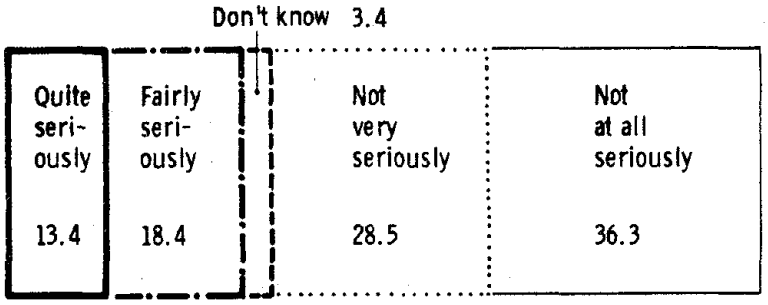
percent of the answers referred to this prediction. The interviewing took place from one to three months after the date when the predicted quake failed to materialize, so recency and intensive media coverage undoubtedly account for much of the salience of Minturn. Without the inflated reference to Minturn, the general category of pseudoscientific announcements probably would not have been so prominent in the table. Nevertheless the second most frequent specific answer was another pseudoscientific tenet, that California will someday break off and slide into the ocean in a great earthquake. If we include mixed and combined references, 6.9 percent of the answers mentioned this belief.

Other answers were quite scattered, reflecting the diversity of forecasts to which southern Californians have been subjected, but indicating no consensus. Different people clearly think of quite different kinds of forecasts when asked about announcements concerning a coming earthquake. It is important to remember, when interpreting these findings, that respondents volunteered their answers without help from the interviewer. Their answers do not detail all of the announcements they have heard, but just those thatwere sufficiently at the forefront of memory that people immediately recalled them when the general subject of earthquake predictionswas broached. If we had been able to follow up each announcement as we did the southern California Uplift by mentioning the forecast or prediction and asking whether respondents had heard of it, many of the announcements would undoubtedly have been recognized by a large share of the people.

It is important to know whether the babel of earthquake forebodings is a matter of potential concern to those who hear it, or merely an amusing diversion from more serious preoccupations. In the course of questioning about each of the respondent's answers, interviewers asked:

> How seriously do or did you take this prediction? Quite seriously, Fairly seriously, Not very seriously, or Not seriously at all?

As the graph indicates, most of the announcements were not taken seriously. Just under a third were taken fairly seriously or quite seriously.



HOW SERIOUSLY EARTHQUAKE ANNOUNCEMENTS ARE TAKEN

In order to gain a refined impression of the awareness of earthquake predictions, forecasts, and cautions, we have tabulated separately the number of announcements that people heard and took seriously. To facilitate comparison we have repeated the percentages from the earlier table. While 86.6 percent

Number of Earthquake Predictions, Forecasts, and Cautions Heard, Taken Seriously, and Involving Casualties

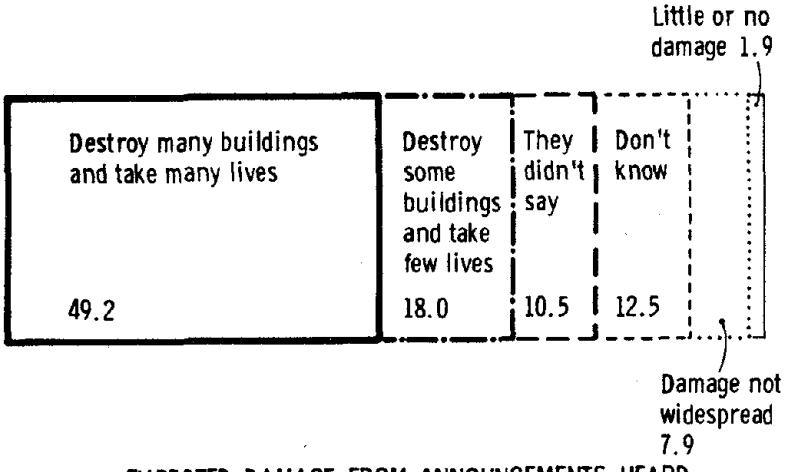
Number of announcements	Heard	Taken seriously	Involving casualties	Taken seriously and casualties
	Percent			
None heard	13.4	13.4	13.4	13.4
None	--	54.7	23.0	56.9
One	57.4	26.1	47.0	24.5
Two	23.2	4.8	14.5	4.4
Three or more	6.0	1.0	2.1	0.8
Total	100.0	100.0	100.0	100.0
Total number	1450	1450	1450	1450
	Cumulative Percent			
One or more	86.6	31.9	63.6	29.7
Two or more	29.2	5.8	16.6	5.2
Three or more	6.0	1.0	2.1	0.8

had heard one or more announcements, only 31.9 percent had heard and taken seriously one or more announcements. And only 5.8 percent had heard and taken seriously two or more. Over half of the people (54.7 percent) had heard one or more announcements but did not take any of them seriously.

People might fail to take an earthquake forecast seriously, not because they don't believe it is likely to come true, but because they don't expect the earthquake to be unusually severe. We attempted to secure an approximate idea of the intensity of the anticipated earthquake for each announcement. Respondents were presented with a card specifying four broad degrees of intensity, and asked the following question:

> Please look at this card and tell me how strong the earthquake is supposed to be. (Destroy many buildings and take many lives; Destroy some buildings and take a few lives; Do some damage, but no widespread destruction; Do little or no damage; or Didn't they say?)

From the graph it is plain that it is not the forecasting of inocuous earthquakes that explains the failure to take announcements seriously. More than three-fourths of the announcements were thought to refer to destructive quakes that would take some lives, and more than half to severe quakes that would "destroy many buildings and take many lives." The forecasts "in the air" in southern California convey the prospect of devastating quakes. Many are not taken seriously in spite of the anticipated high earthquake intensity rather than because of expected low intensity.



EXPECTED DAMAGE FROM ANNOUNCEMENTS HEARD

We look once again at the number of earthquake predictions, forecasts, and cautions that people could name or describe, but this time including only those that are supposed to destroy some or many buildings and take some or many lives. Sixty-four percent of the people have heard at least one announcement concerning an earthquake that is expected to destroy buildings and take lives (see the third column in the preceding table). But few can think quickly of more than one.

The final column in the same table may give the best indication of public awareness of earthquake forecasts and cautions that people see as causes for concern. Here we have included only those announcements that forecast the destruction of buildings and loss of life and are taken seriously by the respondents. About 30 percent of the people in our sample could identify one or more such announcement. Only about 5 percent could identify more than one.

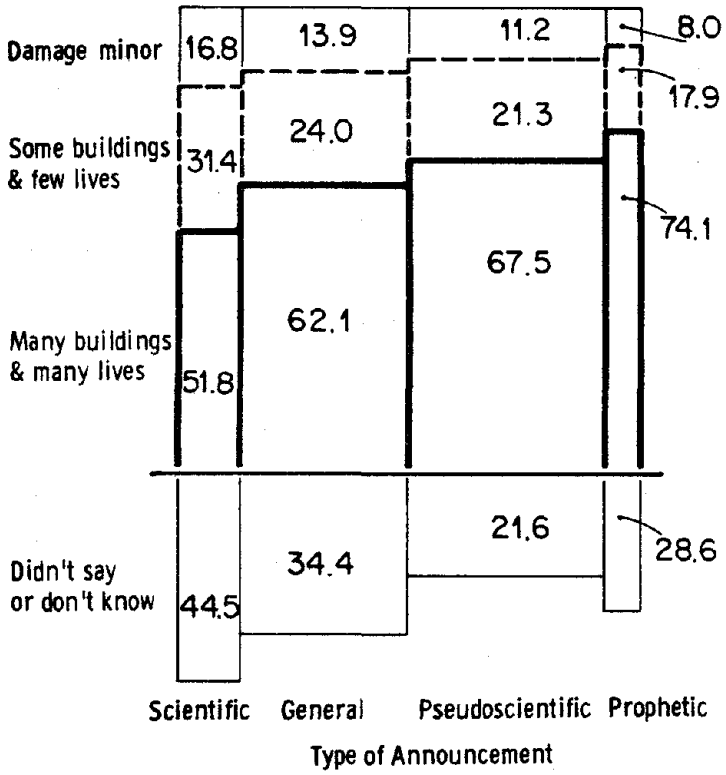
After starting with an amazing array of earthquake forebodings, we have arrived by a series of carefully considered steps at the conclusion that less than a third of the people can identify even one forecast or caution that is a cause for serious concern. And only one in twenty can identify more than one. If forebodings of earthquakes are in the air, they remain ethereal for the majority and are simplified to a single forecast for most of the remaining minority.

Comparing Scientific and Nonscientific Announcements

The predictions, forecasts, and cautions circulating in southern California differ greatly in scientific merit. As we noted, relatively few people think of an identifiable scientific announcement when answering a general question. And most of the announcements are not taken very seriously. It remains to be seen whether there is a difference in the earthquakes expected on the basis of scientific and nonscientific near predictions, and whether the scientific

announcements are taken more seriously.

We first compare the intensity ratings of earthquakes expected for each of the four types of announcement. The relationship is graphed in a slightly different way than previously, so as to convey two distinct items of information. In the square area above the base line the graph shows the amounts of damage expected for each type of announcement in the usual fashion. The differences are not great, but they are significant by the usual statistical tests. On the average, when people think of scientific announcements, they think of less destructive earthquakes than when they think of prophetic forecasts. There is a steady progression in severity from scientific to general to pseudoscientific to prophetic forecasts and near predictions.



EXPECTED DAMAGE BY TYPE OF ANNOUNCEMENT

The figures above the base line apply only to announcements for which people were able to choose an intensity. Below the base line we have graphed the items to which people were unable to attach an intensity. These are the

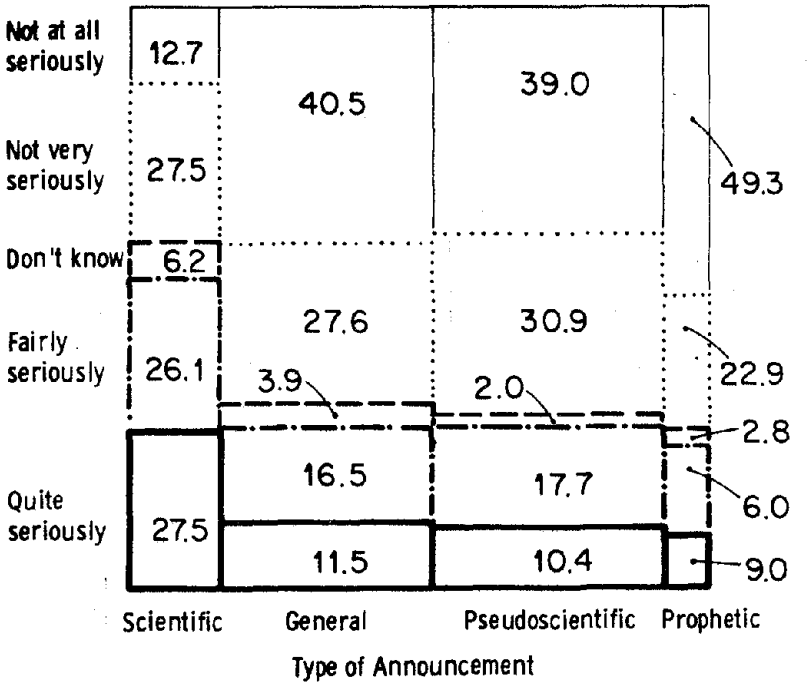
instances in which people have heard that there may or will be an earthquake, but can't say whether it will be mild or destructive. These figures vary considerably by type of announcement. People are least often definite about the intensity of the quake expected on the basis of a scientific announcement, and most definite in the case of pseudoscientific forecasts.

There may be something to be said about the relative potency of scientific and nonscientific announcements from this graph. When people remember scientific near predictions they are less likely to have a clear idea of how destructive an earthquake to expect. If they have a definite idea, it is less likely to be a highly destructive earthquake. The earthquakes associated with scientific announcements are vaguer and more benign than those associated with prophetic and pseudoscientific forecasts. These differences may come about because of the cautious and often reassuring manner in which the scientists announce their near predictions, compared to the sensational way in which seers and divines warn of impending doom. But the differences may tell us more about the perspectives of those people who remember hearing scientific announcements as compared to those who remember prophetic and pseudoscientific announcements. Most of the pseudoscientific references are to the Henry Minturn forecast for December 20, 1976. Minturn himself, in the days shortly before the forecast date, assured the community that the earthquake would not be a very big or destructive one. In spite of his assurances, most people who mentioned his forecast were convinced that a destructive earthquake had been predicted.

Whichever explanation is correct, there is reason for concern that scientific announcements may suffer reduced potency in stirring people to action because they are often vague and benign as they are remembered.

We have a different picture, however, when we ask how seriously people take different kinds of announcements. Considerably more people take seriously the announcements we have classified as scientific than take seriously other

announcements. Prophetic forecasts are least often taken seriously. In spite of the weak character of scientific announcements as people remember them, they are still the ones most likely to be given serious public attention.



HOW SERIOUSLY TAKEN BY TYPE OF ANNOUNCEMENT

We must balance this conclusion, however, by remarking that the public is made up of people who judge the same events quite differently. Fully a quarter of the references to pseudoscientific and prophetic forecasts were taken seriously.

Attributed Sources of Announcements

The preceding discussion compares scientific and nonscientific announcements according to our classification of the information respondents gave us. For example, if a respondent mentioned the Palmdale bulge or an earthquake that was supposed to happen by April, 1977, we classified the statement as referring to a scientific announcement because we recognized the source. If a respondent mentioned an earthquake predicted for December, 1976, we classified the statemen

as pseudoscientific because we knew that the widely publicized prediction for December 20 was made by someone who laid false claim to scientific qualifications. But the respondent may have quite a different idea of the source of the announcement. The question naturally arises, do people generally distinguish correctly between announcements from scientific and nonscientific sources, or do they mix them up, ascribing nonscientific announcements to scientists and vice versa?

For each announcement they mentioned, respondents were asked the following question:

Do you happen to remember who it was that originally made this prediction?

Interviewers were instructed to write down the name or other identification exactly as the respondent gave it. Then a second question was asked, as follows:

> Do you know whether this person was a: Scientist, Seer or Pyschic, Religious Speaker, Amateur scientist, or Some other type of person (specify)?

Not very many pepple knew specific names. Caltech was named 74 times, Jeane Dixon (psychic) was named 37 times, and Minturn was mentioned by name 15 times. In the great majority of instances, the scientific and prophetic announcements were correctly attributed to scientists and secular or religious prophets. But three types of announcement bear closer examination. We should now be able to tell better what people had in mind when they made statements that we could only classify as <u>general</u>. And we can explore further the two popular pseudoscientific forecasts.

Three-quarters of the people who referred to quite vague and general predictions and cautions thought they knew the source. Most frequently they attributed the announcements to scientists, but quite frequently the general alarms were attributed to prophets. The southern California public finds general forebodings of earthquake disaster coming from both scientific and nonscientific sources.

The Henry Minturn prediction is of special interest because it received extensive media coverage and because so many people remembered it. The

How People Identify the Source of Selected Earthquake Predictions, Forecasts, and Cautions

Identified Source	General predictions and forecasts	Minturn forecast	California Breakoff
Scientist	37.7	38.0	15.4
Amateur scientist	7.6	14.4	3.4
Secular or religious prophet	20.9	22.9	49.6
Other	8.5	6.1	6.0
Don't know, not answered	25.3	18.6	25.6
Total	100.0	100.0	100.0
Total references	660	619	117

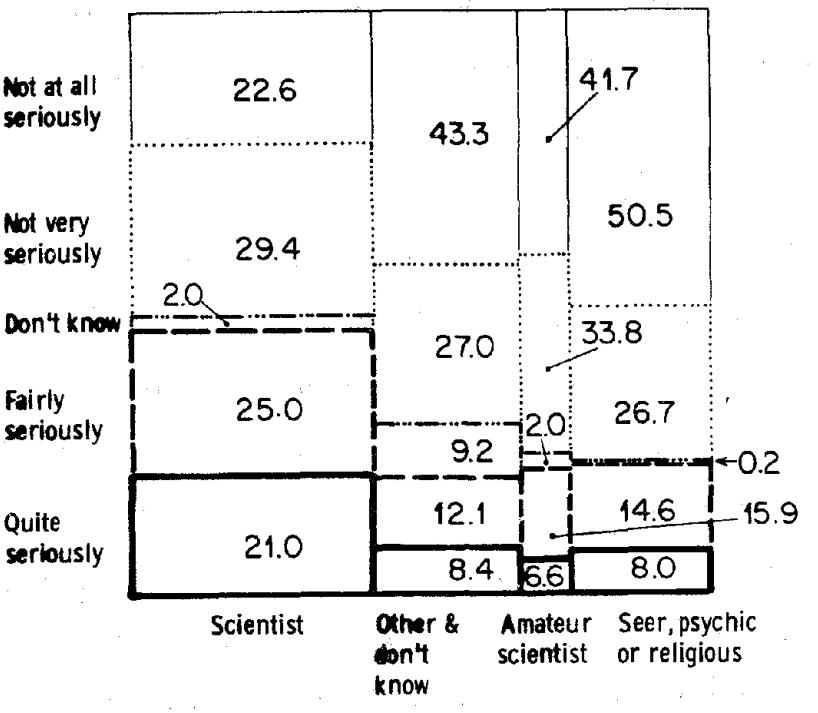
percentages in the table show that there was much confusion over what kind of person made the December 20, 1976, prediction for Los Angeles. Nearly two out of every five who mentioned this announcement thought that it was issued by a scientist. Although Minturn publicly claimed to be a scientist, about 23 percent called him a seer, psychic, or religious speaker. The mass media may have been largely at fault for fostering this confusion.

The idea that California would some day break off from the North American continent and slide into the Pacific Ocean following a great earthquake gained currency from a popularly written book in 1968. By the time of our survey, it was most commonly attributed to seers and psychics. But a small though substantial minority attributed this forecast to scientists.

We are led by these data to the observation that members of the public are generally correct in recognizing a scientific announcement as scientific. But they also often attribute nonscientific announcements to scientists. Scientists are credited or blamed for more than their proper share of the earthquake predictions, forecasts, and cautions to which southern Californians are exposed.

If nonscientific announcements are frequently erroneously attributed to

scientists, do people then take them especially seriously? We found earlier that scientific announcements are more often taken seriously than nonscientific announcements. Is it equally true that people take more seriously the announcements that they attribute to scientists, regardless of whether the true source of the announcements is scientific?



HOW SERIOUSLY ANNOUNCEMENTS ARE TAKEN BY ATTRIBUTED SOURCE

The graph shows principally that the scientific and prophetic categories, formerly the narrower columns, are now the wider columns. The public tends to attribute earthquake predictions, forecasts, and cautions either to scientists or to seers. By casting the "scientist" net more widely, people now include more notices that they do not take so seriously. Enlarging the category of secular and religious seers does not make so much difference. Announcements attributed to scientists are still taken more seriously than other announcements, we now find that over half the announcements attributed to scientists are

not taken particularly seriously.

Because of the complexities of the comparison, we cannot confidently draw further conclusions just from these graphs. But on the basis of more advanced statistical analysis and some informed speculation, the following interpretations appear to be justified. First, whether or not people themselves identify the source of an announcement as scientific has a little more effect on how seriously they take it than whether the source is scientific according to our classification. Accordingly, the media can foster a discriminating public response if they attempt to make unmistakably clear which announcements are scientifically based and which are not. However, the type of prediction as we have classified it also makes a difference, in addition to how people themselves classify the announcements. One plausible interpretation of this additional effect is that announcements are taken more seriously when they are more definite, more specific, and better identified, regardless of the source to which they are attributed. Another plausible interpretation is that the credibility and attention given an announcement by the media--especially television, radio, and newspapers--also affects the seriousness with which it is taken in spite of the attributed source.

Chapter Three

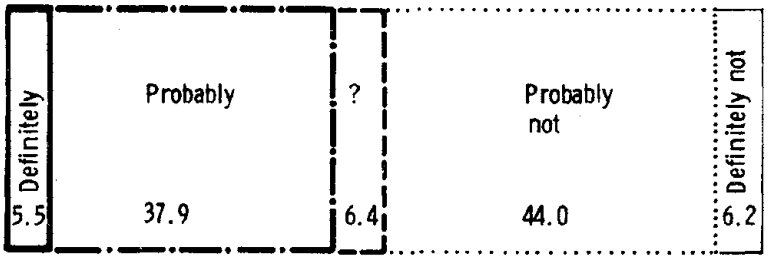
Will There Be an Earthquake Soon?

Earthquake Prospect

The discussion of awareness of earthquake predictions and near predictions during the bumper year from February, 1976, to February, 1977, appropriately culminates in the question whether people expect a damaging earthquake soon. Respondents were asked quite directly:

> How likely do you think it is that there will be a damaging earthquake in southern California within the next year?

Respondents could choose from "definitely," "probably," "probably not," and "definitely not." Again the results are graphed. By only a small majority the respondents vote against the occurrence of a damaging earthquake within the next year. In light of the relatively short lead time of one year, which few scientists would likely have endorsed, the size of the positive vote is striking. Since the question specifically asks about a "damaging" earthquake, the positive expectation is all the more striking.



PROBABILITY OF A DAMAGING EARTHQUAKE WITHIN THE NEXT YEAR

By the time of this writing the 43.4 percent who answered positively have been shown wrong by events. There may be some basis for concern here. If confidence in the ability of scientists to predict earthquakes has led some

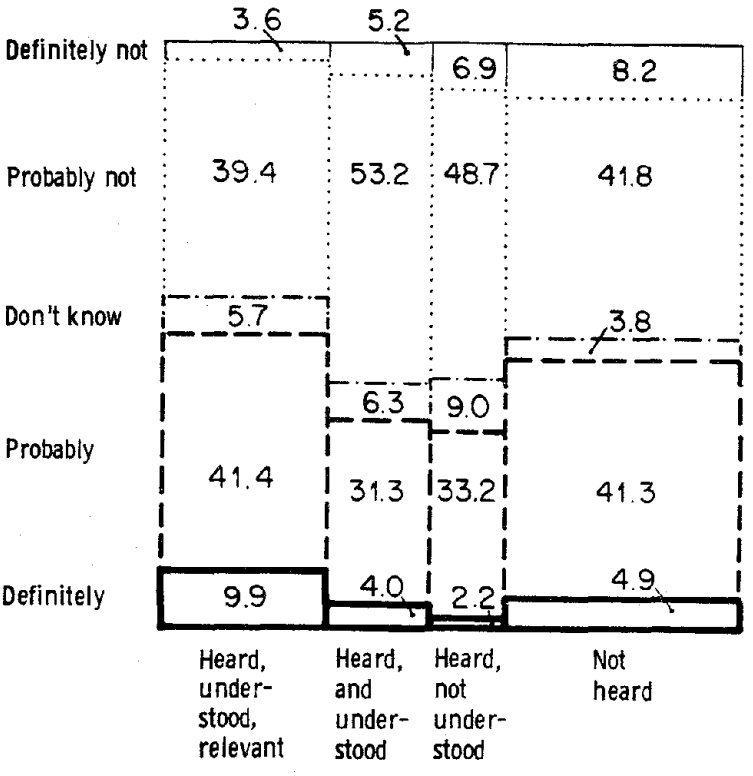
of the public to take the warnings from scientists more seriously than scientists do themselves, with the result that their expectations have not been confirmed, will their confidence in future warnings be diminished? By questioning some of these people again after the year has passed, we hope in a later report to provide a partial answer to this question.

Awareness of Earthquake Announcements and Earthquake Prospect

Why do some people confidently expect a damaging earthquake and others not expect one? We shall not attempt to answer that question comprehensively here. But we can attempt to relate people's convictions to the predictions and near predictions they have heard. Are the people who have heard and remembered the various announcements of earthquake danger the ones who conclude that an earthquake is coming? Or does knowing about the Uplift and Professor Whitcomb's near prediction have nothing to do with whether people expect an earthquake or not?

The first graph shows the relationship between awareness of the Uplift and expectation of a damaging earthquake. Among those who have heard of the Uplift, there is a definite relationship. People who appreciated the relevance of the Uplift most frequently expected an earthquake. The more clearly the message of the Uplift has been understood and applied, the more likely people are to anticipate a damaging earthquake soon.

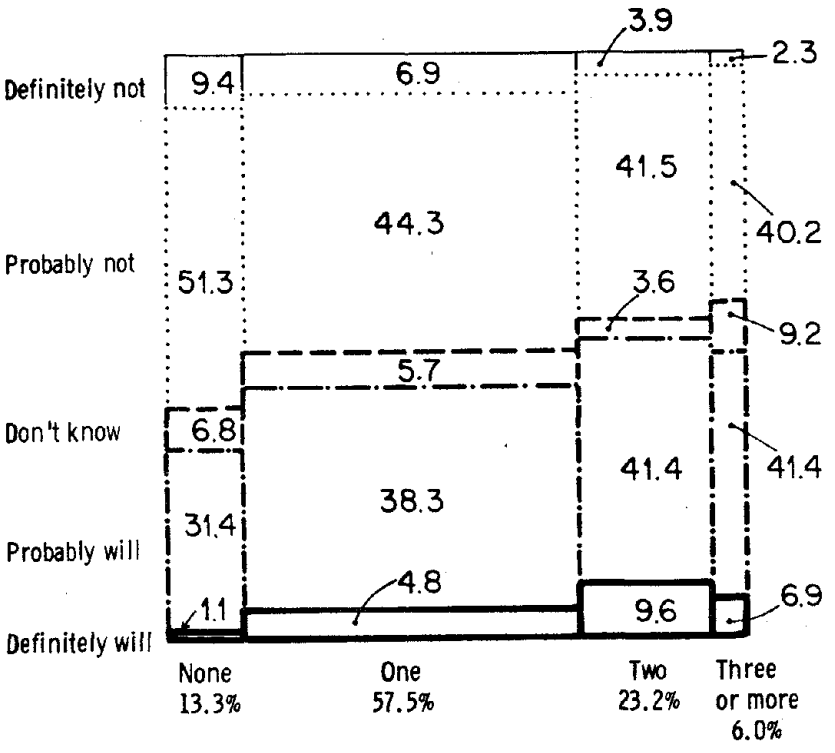
However, there are two important qualifications to this finding. First, those who have not heard of the Uplift at all fall between the respondents who have heard and understood and the respondents who see the Uplift as personally relevant. As we shall see later, people who haven't heard of the Uplift after a year of news and discussion are not immune to other sources of concern over earthquakes. Second, the relationship between awareness of the Uplift and expecting a damaging earthquake is not a strong one. Fully a third of the people



LIKELIHOOD OF A DAMAGING EARTHQUAKE WITHIN THE NEXT YEAR BY AWARENESS OF UPLIFT

who have heard of the Uplift but don't relate it to a possible earthquake nevertheless say there will probably or definitely be a damaging earthquake within a year. And 43.0 percent of those who expect damage where they live in case of an Uplift-connected earthquake do not expect an earthquake within a year. If would be fair to say that understanding and appreciating the Uplift make a small contribution to people's convictions about the earthquake prospect, but not a decisive one.

What of the many announcements, both scientific and nonscientific, warning of an impending earthquake? Are people's expectations related to the number of these announcements they recall under questioning? The graph shows they are. People who remember two announcements are more likely than people who remember only one to expect an earthquake; people who remember one are more likely than people who remember no announcements to expect a damaging earthquake. The relationship is fairly similar to the relationship between

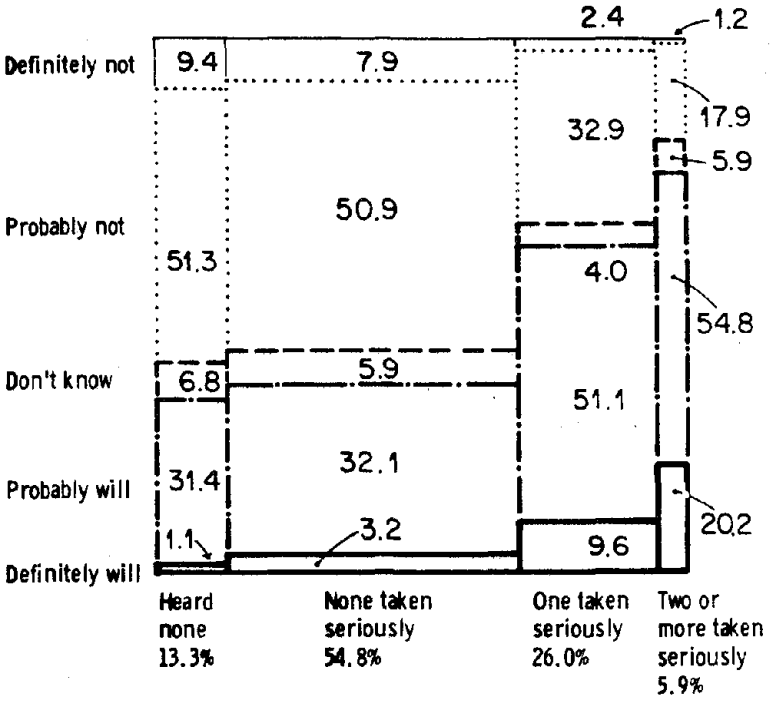


PROBABILITY OF DAMAGING EARTHQUAKE BY NUMBER OF ANNOUNCEMENTS HEARD

awareness of the Uplift and expecting an earthquake.

Since most of the announcements are not taken seriously, the number of announcements that people have heard and taken seriously might be more important in shaping people's expectations. Indeed, as the companion graph shows, the number of announcements people take seriously is more strongly related to expecting an earthquake than whether they have merely heard none, one, or more announcements.

As always, we must be careful not to claim that our data tell us what is cause and what is effect. But there is a relationship between people's awareness of predictions, near predictions, and cautions and their estimate of the probability of a damaging earthquake soon. It is plausible to assume that people who hear and are impressed by the various announcements concerning impending earthquakes are influenced to expect an earthquake soon. At the same time, awareness of earthquake danger is so general in southern California



PROBABILITY OF DAMAGING EARTHQUAKE BY NUMBER OF ANNOUNCEMENTS TAKEN SERIOUSLY

that many people who do not recall any of these announcements nevertheless expect a damaging earthquake soon.

The last point is accented by comparing the number of people who said there will probably or definitely be a damaging earthquake within a year to the number who were able to identify one or more forecasts of a destructive earthquake that they took seriously. The 43.4 percent who expected an earthquake include many more than the 29.7 percent who remembered a prediction, forecast, or caution meriting serious concern (see Chapter Two). Whatever the source of people's convictions about a coming earthquake, the convictions persist when the source can no longer be recalled easily.

Chapter Four

How Fearful and Concerned are People over the Earthquake Threat?

In the first three chapters we learned that most southern Californians are at least vaguely aware of some of the predictions, forecasts, and cautions that a damaging earthquake may strike the region in the near future, that many believe the earthquake is likely to strike within a year, and that few rule out the possibility of imminent disaster. If people are aware of the earthquake threat, are they also concerned and fearful about it, or do they simply disregard it? Are they impassive, indifferent, and apathetic in the face of possible danger as many writers have said? Are they, at the other extreme, frightened and anxious to the point that a more definite prediction or warning would be upsetting and disorienting?

When examining awareness of the southern California Uplift we found it useful to distinguish between awareness and salience. We find it useful to make a similar distinction between simple concern or fear over the earthquake threat and salience of the earthquake threat. Salient concerns are those that are constantly on our minds, that constantly command our attention, that preoccupy us. We are sometimes preoccupied with concerns over which we do not feel very deeply, simply because we are constantly reminded of them. On the other hand, we can be deeply fearful and concerned over some matters, yet seldom think of them because we are preoccupied with other problems.

Salience

In order to discover just how salient the earthquake threat was to southern California residents, we initially avoided telling respondents that

we were interested in their feelings about earthquakes. Once the topic of earthquakes was brought up in the interview, we could expect people to become increasingly preoccupied with the topic until the close of the interview. Hence it was essential to introduce the investigation without mentioning earthquakes, and to ask questions from which we could infer salience. The respondents were first informed that we were interested in studying people's attitudes and opinions about problems facing their local communities and the greater Los Angeles area. We then asked a short series of open-ended questions which gave respondents ample opportunity to mention earthquakes if earthquakes were at the forefront of their attention.

The interview opened with the question,

> First, we would like to know what, in your opinion, are the three most important problems facing the residents of southern California today?

Interviewers were instructed to record the first three problems the respondent mentioned. All but 41 of the 1450 respondents named one or more problems, and most of them named three problems. Even with three chances, only 35 people, or 2.4 percent, mentioned earthquakes.

Next, respondents were asked,

> If a friend was moving to southern California in the near future, is there any particular problem you might warn him or her of before making the decision to move here?

About 64 percent answered "Yes." These 904 respondents were then asked,

> What particular problem about southern California would you point out?

Interviewers were instructed to record only the first answer to this question. Only 26 people mentioned earthquakes.

Finally, we asked what we thought would be a more pointed question sequence to bring out preoccupation with earthquakes. Respondents were asked,

> Compared to other sections of the United States, do you think southern California is a more or less hazardous place to live in?

The largest number of respondents (42.1 percent) answered that it was about the same as other places. Almost a third (30.0 percent) said it was less hazardous, and 19.6 percent felt it was more hazardous. If people thought southern California was either more hazardous or less hazardous, they were asked,

Why do you think southern California is (more/less) hazardous?

Again interviewers recorded only the first answer. Of the 287 who thought southern California was a more hazardous place to live, only 21 gave earthquakes as the reason. Of the 433 who found southern California less hazardous, 25 mentioned earthquakes, saying that the earthquake threat is less severe than the threat from such hazards as tornadoes, hurricanes, winter storms, and floods that are common to other areas.

If we look at the answers to all of these questions together, 95 people, or 6.6 percent of the entire sample, mentioned earthquakes one or more times. For only one person was the earthquake concern so salient that earthquakes were mentioned in answer to each of the three questions. Only 10 people mentioned earthquakes in answer to two of the questions.

Plainly, even after a year of news about the Uplift and other earthquake harbingers, very few people living in earthquake country are preoccupied with the threat to their safety. Problems such as crime, cost of living, taxes, unemployment, smog and pollution, transportation, crowding, and education and busing come to people's minds before they think of earthquake danger. Even those few who find southern California a relatively hazardous place to live more often think of climatic conditions and high population density as the principal hazards.

Fear and Concern

The very low salience of earthquakes might indicate very little

fear and concern over earthquakes, or "apathy," as many popular writers would say. Or earthquakes might have little salience in spite of genuine concern because other problems demand more frequent and immediate attention. Fear and concern were measured by a set of three questions, asked after the respondent had been informed that the rest of the interview dealt with earthquakes.

Respondents were first asked,

> Which of the following best describes your own feelings about the possibility of experiencing a damaging earthquake? Would you say you are very frightened, somewhat frightened, not very frightened, or not at all frightened?

As indicated in the graph, over 60 percent acknowledged being substantially frightened. This figure includes 27 percent who admitted being very frightened and 35 percent who said they were somewhat frightened. Only 14 percent said they were not frightened. These figures are in sharp contrast to the mere 6.6 percent for whom earthquake danger is a salient concern. Since the word "frightened" is quite unambiguous, these figures represent an impressive admission of fear of earthquakes.

In a second question respondents were asked,

> How worried are you about the possibility of a damaging earthquake striking southern California?

Respondents chose from the usual four answers, from "not worried" to "very worried." If we accept the answers at face value, being worried is a little less prevalent than being frightened. If 63 percent admitted being substantially frightened, only 49 percent said they were substantially worried. These worriers include only 15 percent who were very worried, compared with 27 who were very frightened. The number who claimed they were not worried at all (26 percent) is correspondingly greater than the 14 percent who said they were not frightened. Worry has a greater connotation of persisting concern than fright, which can be momentary, and therefore is a little closer to salience. A substantial number of people, while being frightened of earthquakes, do not let the prospect

of an earthquake worry them to a corresponding degree. Nevertheless, about half of our respondents admit that they are substantially worried over the prospect of an earthquake.

Another way to find out how people feel about earthquakes is to ask what they would do in case of a quake. We cannot take literally what people say they would do when asked in hypothetical terms about a situation they have never actually experienced. But we can take the answers as indications of the extent of feeling people have. If people said they were very frightened of earthquakes, but would go on with life as usual if they knew that an earthquake were coming, we should have reason to doubt the seriousness of their fear.

The question was posed,

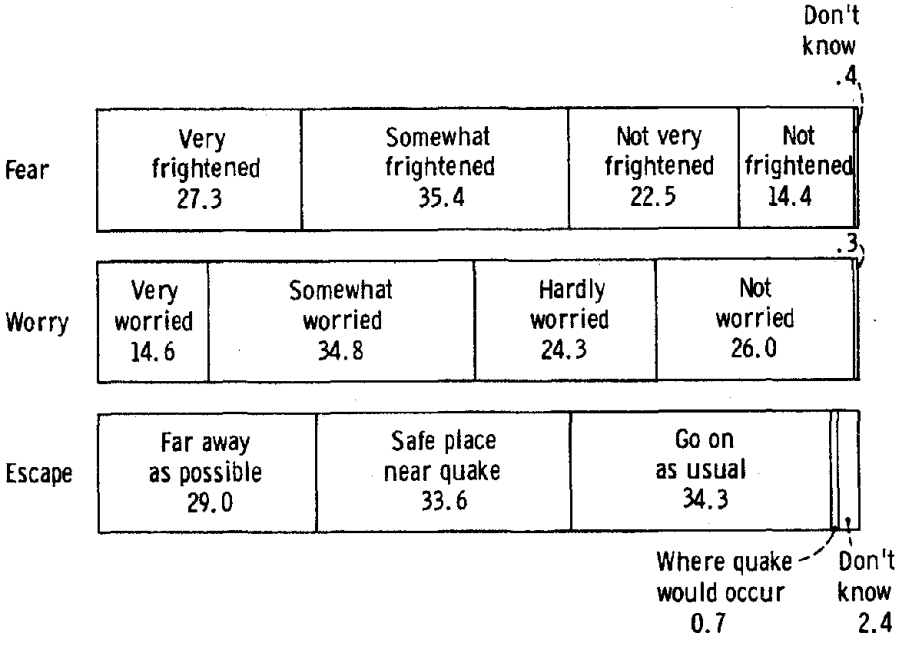
> If you were certain that a damaging earthquake was going to occur at a specific time in a place where you live or work, would you: try to be where the earthquake would occur, try to get as far away as possible, try to find a safe place near the earthquake, or go on as usual and be wherever you are at the time?

Only eleven people were so rash as to choose the first answer, with the bulk of the people dividing fairly evenly among the three remaining answers. A substantial 34 percent said they would go on as usual. These are the people who are often labelled apathetic or fatalistic. Another 34 percent accepted the course most often proposed in disaster mitigation plans, and followed in the People's Republic of China, to find a relatively safe location without trying to leave the immediate earthquake area. Fully 29 percent said that they would try to get as far away as possible. The latter figure is larger than the number who said either that they were very frightened or very worried.

Again it is important not to assume from these answers that 29 percent would actually try to get out of Los Angeles on the freeways, or that a third of the people would actually go on as if nothing out of the ordinary were happening. What people actually do in a crisis situation will depend much more on the kind of leadership and instructions they receive, the amount of advance warning,

the opportunities practically available to them, and other considerations. But these answers confirm our impression from the two preceding questions. The majority of the people are actively concerned about the earthquake danger and not only admit fear and even worry, but feel that they would interrupt their normal routines to some extent in order to minimize personal danger, if they were confident there was to be an earthquake.

Answers to the three questions are summarized in the accompanying graph. By viewing the three graphically it is possible to see how closely the number who are very frightened and the number who would try to get as far away as possible correspond. Likewise the number who are somewhat frightened and the number who would seek a safe place near the quake are very similar. And the number who are hardly frightened or not frightened and the number who would go on as usual correspond closely. Worry, on the other hand, with its implication of preoccupation, is consistently reported by smaller numbers of people.



THREE MEASURES OF CONCERN OVER EARTHQUAKE THREAT

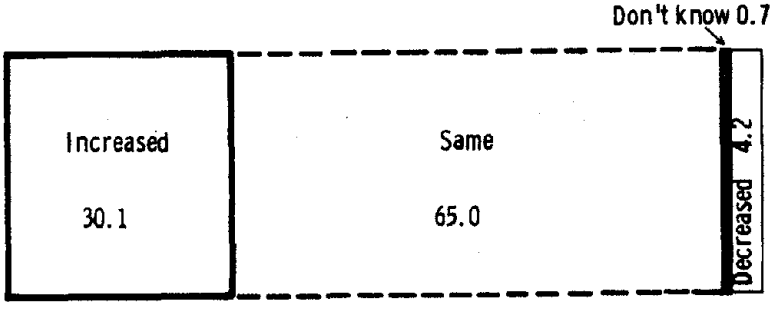
Change in Earthquake Concern

Although we find much concern expressed over the earthquake danger, we have no way to know whether this concern is greater than it was before the announcement of the Uplift and the subsequent public attention to earthquake hazard. In order to be sure whether these events have affected concern about earthquakes or not we should need measures taken both before and after the announcements. In the absence of pre-announcement data we asked people whether their concern had changed. We do not take the results as an accurate indication of the amount of change, but as a measure of how many people think of the "first year of the Uplift" as a time when they became more or less concerned over the earthquake threat.

Respondents were asked,

> During the past year, would you say your concern about a damaging earthquake striking southern California has increased, decreased, or remained about the same?

The majority (65.0 percent) said their concern had not changed. Slightly fewer than one third (30.1 percent) acknowledged an increase in concern, while 4.2 percent said their concern had decreased. Most of the people do not think



CHANGED CONCERN ABOUT A DAMAGING EARTHQUAKE DURING THE PAST YEAR

of the first year of the Uplift as a period in which they have been stirred to greater concern over earthquakes than heretofore. Nevertheless, a substantial minority do remember that year as one of increased concern. The people who reported increased concern are disproportionately the same ones who expressed

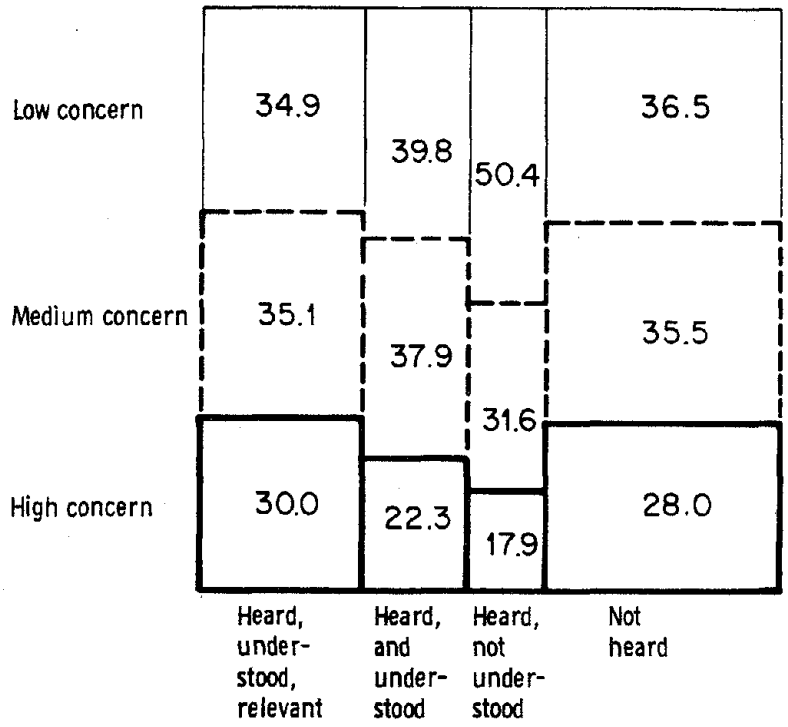
higher degrees of fear and concern over earthquakes in the preceding three questions. There is a significant segment of the population who remember the first year of the Uplift as provoking a new sensitivity to the earthquake danger.

Concern in Relation to Awareness of the Uplift.

Is there any connection between awareness and understanding of the Uplift and the amount of fear and concern that people feel? Does knowledge contribute to peace of mind, lack of concern, and apathy? Or is ignorance bliss? We have graphed two relationships in answer to this question.

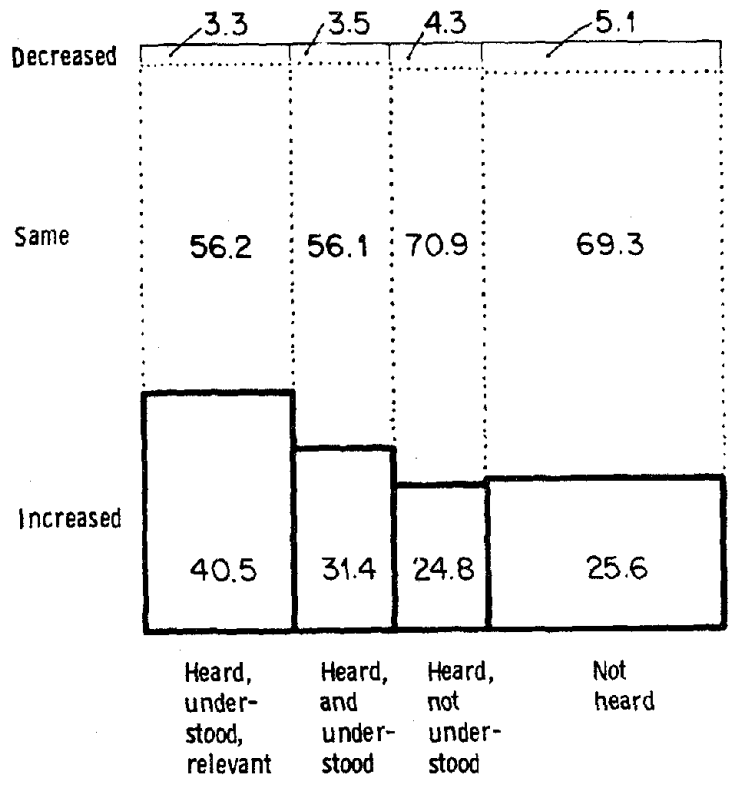
First, the three questions dealing with fear and concern should provide a more reliable indicator of concern when taken together than each does separately. Accordingly, answers to each question were given scores from one to four with four indicating the highest degree of concern. The three scores were added together to produce a simple fear or concern index for each person. For convenience these scores were dividied into three approximately equal groups, which are identified as "high concern," "medium concern," and "low concern." These three groups were then related to awareness of the Uplift. The result is summarized in the accompanying graph.

Although the relationship is not what statisticians would call a strong one, it is very clear. Among those who have heard about the Uplift, concern increases with understanding and relevance. Those who have not even heard of the Uplift seem to be a special group. Perhaps they are people for whom facts and information are unimportant, but who respond according to feelings which they cannot relate to specific information. Or perhaps they are "denyers," people who deal with their fear of earthquakes by forgetting or denying information that might reawaken their fears. At this point we can only speculate about this group. But among those who have heard of the Uplift, understanding and the sense of relevance go with greater concern rather than with unconcern.



EXTENT OF CONCERN OVER EARTHQUAKES
BY AWARENESS OF UPLIFT

A similar relationship can be explored between awareness of the Uplift and changed concern during the past year. This relationship is also summarized in an accompanying graph. Again the relationship is clear except for people who have not heard of the Uplift. The people who understand the connection between the Uplift and a possible earthquake and anticipate damage where they live in case of an earthquake are most likely to remember the first year of the Uplift as a year in which their concern increased. People who have heard of the Uplift but don't understand that it may signify a coming earthquake are most likely to say their concern has been unchanged during the year. People who have not heard of the Uplift are more likely than those who have heard and not understood to say that their concern has increased. They are also more likely than any of the other groups to say their concern has decreased.



CHANGED CONCERN
OVER EARTHQUAKES BY AWARENESS OF UPLIFT

It would be convenient if we could say that understanding the significance and relevance of the Uplift contributes to concern over the earthquake threat. But unfortunately there is no way to decide which is cause and which is effect. It is also plausible to suppose that fear and concern sensitize people so that they are more likely to grasp the significance and relevance of the Uplift than unsensitized people. Perhaps it is more difficult to make a plausible case that a feeling of recently increased concern gives people a fuller appreciation of the significance of the Uplift. While we cannot claim to have demonstrated a cause-and-effect relationship, the interpretation that fuller appreciation of the Uplift contributes to increased concern seems more plausible.

Moving Away from Earthquake Danger

Perhaps the most tangible expression of intense fear stimulated by recent earthquake predictions, forecasts, and cautions would be the decision

of many people to pack up their belongings and move away from southern California. Cursory review of population estimates and district data on real estate listings, as well as the Los Angeles City Attorney's inquiries about San Fernando Valley property values in the wake of Professor Whitcomb's near prediction, fail to to reveal a net exodus from the area. We also have evidence from our survey that bears on this issue.

In a series of questions (outlined in detail in Chapter Nine) we asked respondents which of several earthquake topics they had discussed informally with family members, friends, neighbors, and co-workers. One of the topics was listed simply as "moving out." A total of 22.3 percent of the respondents said that they had discussed moving out at some time during the last year. "Moving out" may refer to a permanent move or only a brief evacuation, and discussions may have been serious or casual. The number who seriously debated the wisdom of moving away from southern California must be much smaller.

Evidence of more serious intentions is supplied by another question. After the main portion of the interview dealing with earthquakes was completed, interviewers announced:

> The following questions are about yourself, your household and your community. These questions help provide the information necessary to define the types of households we collect our opinions from.

After several questions about the local community in which the respondent lived, the interviewer asked:

> Now, thinking ahead to the next five years, how likely is it that you will move from (...name of the local community...) or beyond a three-mile radius from your present home? Would you say you will: Definitely move, Probably move, Probably not move, or Definitely not move?

Respondents who said they would definitely or probably move were then asked

> Why do you think you will move?

Our interest was in ascertaining how many people were seriously contemplating moving because of the fear of earthquakes.

Out of the entire sample of 1450 people, only ten people mentioned earthquakes in answering the follow-up question. Of these ten, seven said

they would definitely move and three said they would probably move. Some of these ten also probably had other reasons besides earthquakes for moving. There is little here to suggest that many people are seriously enough disturbed over the earthquake prospect that they plan to move away.

A skeptic may well retort that the people who feared earthquakes most intensely had already moved before our interviewers arrived and are not included in the sample. This is a superficially plausible argument, but one that cannot stand the test of careful examination. Human attitudes are almost universally distributed among populations in continuous series. If there were a great many people who feared earthquakes so intensely that they moved away within the year after announcement of the southern California Uplift, there would also have been a great many whose fear had not quite carried them past the threshold for moving, but who were close enough that they were still seriously contemplating a move. In the absence of contradictory evidence, the most reasonable interpretation of our data is that only an inconsequential number of people have moved or are likely to move away from the local community because of the earthquake predictions, forecasts, and cautions of 1976.

Chapter Five

Do Southern Californians Want to Hear about Earthquakes?

A favorite theme in popular magazines is the head-in-the-sand mentality of Californians about earthquakes. According to a typical interpretation, residents of earthquake country would rather not hear about earthquake danger. Fearing the "big earthquake " and knowing that one is bound to come sooner or later, they prefer to ignore the risk and live in a comfortable fantasy of invulnerability. According to this view, people ignore and even resent media attention to the earthquake danger because they find it harder not to worry when they are reminded of the real situation. And they would rather be surprised by an earthquake and deal with whatever happens at the time than to be forewarned and foreworried and still have to cope with the actual disaster. As one southern Californian said, speaking of the Uplift and Whitcomb announcements, "I don't know why they tell us these things when there is nothing we can do about them anyway."

In the next chapter we shall note the contrary evidence that few people are willing to claim invulnerability to earthquake disaster. Yet the combination of high fear and low saliency for earthquakes seems consistent with this popular account of southern Californians' attitudes. But the question of whether people really want to know or want to be sheltered from the "bad news" is too important to be answered only by indirection. Hence we have asked people directly about news coverage of earthquake topics and the public release of earthquake predictions. We should be able to say whether this popular theme is correct or a serious distortion.

Media Coverage of Earthquake News

After the extensive media coverage given Henry Minturn's earthquake forecasts during December of 1976, the media were often more careful about airing earthquake news. One often heard it said that the people were "fed up" with hearing about the earthquake threat. After being agitated twice, once by Whitcomb's "hypothesis test" that was subsequently withdrawn, and again by Minturn's forecast of a December 20 earthquake that didn't happen, people didn't want to hear any more on the subject of earthquakes. It was said that earthquake news had reached a point of saturation--people simply couldn't cope with any more. It was also said that the absence of a damaging earthquake in spite of the Uplift, Whitcomb, and Minturn, had undermined the credibility of all efforts to forecast and prepare for an earthquake. According to this view, the desire to hear less rather than more earthquake news became especially strong after the first year of the Uplift.

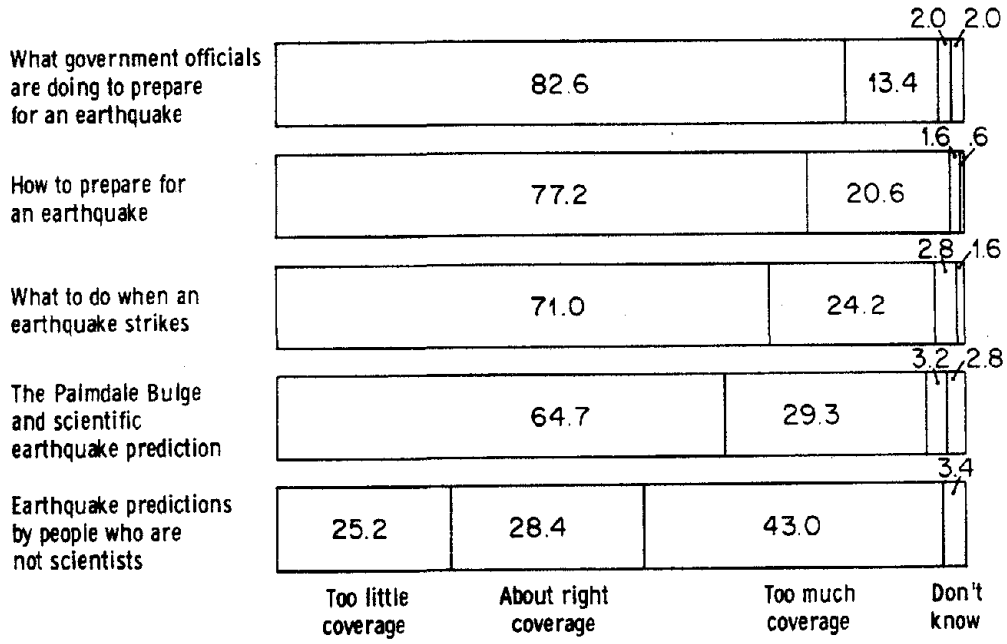
Unfortunately we did not include a question on the general desire for earthquake coverage in the field survey of early 1977. But we remedied this defect a year later by including a battery of five questions in our February, 1978, telephone survey of 500 Los Angeles County residents. Residents were asked:

> Now here are some questions about television, radio, and newspaper coverage during the last six months. We want your personal opinion on each of these questions. Would you say there has been too little coverage, just about the right amount of coverage, or too much coverage for each of the following:
>
> A. Coverage on what to do when an earthquake strikes?
> B. Coverage on how to prepare for an earthquake?
> C. Coverage on the Palmdale bulge and scientific earthquake prediction?
> D. Coverage on earthquake predictions by people who are not scientists?
> E. Coverage on what government officials are doing to prepare for an earthquake?

The five specific items are given in the accompanying graph.

The findings are overwhelmingly one-sided, and the message is surprisingly unambiguous. From 65 to 83 percent of the respondents want more coverage of

the "Palmdale bulge and scientific earthquake prediction," "what to do when an earthquake strikes," "how to prepare for an earthquake," and "what government officials are doing to prepare for an earthquake." The consensus that too little is reported about preparations by government officials is particularly striking. No more than three percent feel there has been too much coverage on any of these topics.



Only on the topic of "predictions by people who are not scientists" do a substantial number feel that the coverage has been excessive. But even on this topic, somewhat less than a majority (43 percent) say the coverage has been excessive, and fully 25 percent would like more coverage.

There is plainly no evidence here to support the fear that well-conceived earthquake news and features will be rejected by a "saturated" public. Most of the public are ready for more extensive treatment of earthquake prediction than they have received in recent months. This is not to say that they will necessarily welcome "warmed over" news and repetitions of what they already

know. But it certainly appears that popular writers have been purveying at the very least a misinterpretation of attitudes in earthquake country. Only a surprisingly miniscule number of people seem to have their heads in the sand.

But the demand for more information to clarify a situation made confusing by vague forecasts and by an absence of visible public leadership for coping with the earthquake prospect may be different from the attitude toward publicly announcing a specific scientifically based earthquake prediction. Questions dealing with release of predictions were included in the initial field survey.

Releasing Earthquake Predictions to the Public

Although it is fairly generally accepted policy in the United States that credible earthquake predictions should not be withheld from the public, there is continuing discussion about the optimal time and circumstances for releasing predictions. Scientific predictions are based on the gradual accumulation of data and step-by-step analysis. The evidence at first merely suggests the possibility of an earthquake, and then provides increasingly firm grounds for making a prediction. It is unlikely that confidence in the grounds for a prediction will ever reach 100 percent certainty. Scientists must therefore decide at some stage in their research that the earthquake indications, though still fallible, are strong enough that the public should be notified. In deciding how certain they should be before making a public announcement, scientists are called upon to weigh the anticipated disruptions of life and the loss of future credibility if the prediction turns out to be false. These "costs" must be weighed against the possible benefits from taking safety precautions on the basis of the prediction. In addition there is argument about the best time to issue a prediction, irrespective of scientific confidence in the prediction. There is concern that a prediction of an earthquake in the too remote future will be ignored by the public and by agencies responsible for disaster prepared-

ness, but will allow time for financial agencies to transfer their assets out of the threatened area and thus provoke a business recession. On the other hand, there are many hazard-reducing steps that could be taken with a fairly long lead time that could not be taken on shorter notice.

Although most people would probably want these issues resolved by informed analysis rather than popular vote, it should be of interest to public officials and scientists to know what popular thinking on these matters is. In addition, public opinion on these issues tells us something about the confidence people have in earthquake prediction as an instrument for advancing the community welfare.

The following question was read to the respondents:

> If there is information indicating that there will be a damaging earthquake in the near future, please look at this card and tell me how certain you think this prediction should be before a public announcement is made.

Simultaneously respondents were handed a card containing the following choices:

90-100%	Definitely sure the earthquake will occur
60-80%	Quite sure the earthquake will occur
40-50%	A fifty/fifty chance the earthquake will occur
20-30%	Somewhat sure the earthquake will occur
0-10%	Not very sure the earthquake will occur

In reading the accompanying table it is important to remember that answers are always biased to some degree by the choices people are given. We did not include in this question the option of not releasing the prediction at all, so we must assume that some of the people who said predictions should be released when scientists are 90 to 100 percent certain and some of those who were recorded under "don't know" might have said "never" if given the option. Furthermore, answers to ensuing questions will show that closeness to the predicted time of occurrence as well as degree of certainty affect people's judgments about releasing predictions.

The easiest way to understand the accompanying table is from the

How Certain Should a Prediction Be Before a Public Announcement is Made

Degree of certainty	Percent	Cumul. Percent
Don't Know or Not Answered	3.5	--
Not very sure (0-10%)	4.3	4.3
Somewhat sure (20-30%)	9.1	13.4
Fifty-fifty chance (40-50%)	23.2	36.6
Quite sure (60-80%)	29.5	66.1
Definitely sure (90-100%)	30.4	96.5
Total percent	100.0	
Total number	1450	

cumulative percentages, reading down the table. Very few people favor the release of predictions about which the scientists themselves are quite unsure. Only 13.4 percent would have scientists publish predictions when they are no more than 30 percent confident that they are correct. Just over a third would have scientists publish predictions when the odds of being right are even. When the odds are solidly in favor of the prediction (60 to 80 percent certain), about two thirds of the people favor publishing the prediction. And if scientists can reach the magic 90 to 100 percent range of certainty, nearly everyone favors releasing the information. We can summarize by saying that once scientists are relatively confident of a prediction the public wants to be told. But most of the public do not want to be told everytime there are signs leading scientists to feel that there is a remote possibility of an earthquake.

The question of how soon to issue a prediction has been examined in conjunction with the degree of confidence scientists have in their predictions. Respondents were asked the same question twice, once for a prediction of which scientists were 50 percent certain, and once for a prediction with 90 to

100 percent certainty. The first question was worded as follows:

> Now let's imagine a situation in which scientists have information indicating that there is a 50-50 chance that a damaging earthquake will occur one year from now. Should this prediction be made public: Immediately, Held back until six months before the quake is to occur, Held back until 2-3 weeks before, Held back until 24-28 hours before, or Not announce the prediction at all?

The second question had similar wording, except that it began,

> Let's imagine that scientists are definitely sure, 90-100%, that a damaging earthquake will occur one year from now....

Again, the table can be understood most easily by reading the cumulative percentages down the table. There is considerable reluctance to release any

How Soon Should Prediction of an Earthquake One Year in the Future be Made Public

How soon prediction should be made public	Percent		Cumulative Percent	
	If 50-50 chance	If 90-100% sure	If 50-50 chance	If 90-100% sure
Immediately	40.4	65.5	40.4	65.5
Six months before quake	19.1	14.2	59.5	79.7
2-3 weeks before quake	17.4	11.0	76.9	90.7
24-48 hours before quake	6.1	4.1	83.0	94.8
Don't announce at all	15.0	4.2	--	--
Don't know or Not answered	2.0	1.0	--	--
Total percent	100.0	100.0		
Total number	1450	1450		

prediction as long as a year before the anticipated quake. Many people feel that six months or even two to three weeks is long enough to know about an earthquake prediction. Very few people would hold back the announcement until one or two days before the expected quake. But the reluctance is less when the prediction is more certain. More than half the people who favor eventually releasing a 50-50 prediction would not favor releasing it as long as a year

before the expected quake. But only 31 percent of those who favor eventual release of a 90-100 percent prediction would object to releasing it a year ahead.

In these two questions the respondents were given the option of saying that they would not favor releasing the prediction at all. Fifteen percent elected this answer for the 50-50 prediction and only 4.2 percent for the 90-100 percent prediction. Surprisingly few people would suppress even the more uncertain prediction altogether. Rather than withholding information entirely, people favor delay in releasing uncertain predictions. The greater the uncertainty, the longer they would wait before going public.

Answers to these three questions on the public announcement of predictions require that we modify the impression gained from the five questions on media coverage. The demand for news is not without reservation when it comes to anything so specific as a scientifically grounded earthquake prediction. A similar concern for the quality of information seems to be expressed in both sets of information. Many people are less than enthusiastic about cluttering the news with reports of earthquake forecasts by nonscientists and with scientifically grounded predictions about which scientists are not relatively confident.

Apparently people also want to weigh the effects of releasing information. While the majority of people wanted to hear more about "the Palmdale bulge and scientific earthquake prediction," the majority was notably smaller than for the more obviously practical questions of what the citizen could do and what government leaders were doing. Similarly, concern with the practical effects of releasing information probably explains why many wish to have predictions withheld until some optimal time before the anticipated quake. But the better the quality of the information, as measured by scientific confidence in a prediction, the fewer people want public announcements delayed. But while there is disagreement over the kind of information that should be released

and the timing of public announcements, the two sets of questions indicate overwhelming public agreement on the most essential point. When there is highly credible information available about the earthquake danger, most people want to be told.

Placing the Responsibility for Announcing Predictions

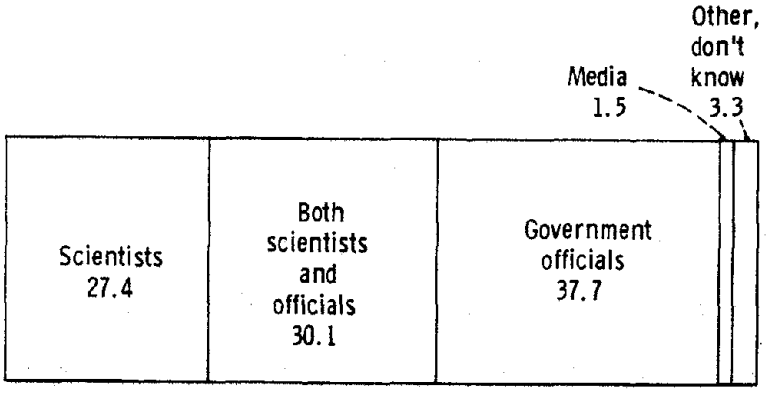
There has also been debate over who should release predictions. Again, current American policy leans in the direction of distinguishing between prediction and warning. According to this view, predictions should be released by the scientists who make them. On the basis of the prediction and other relevant information, public officials should then decide whether the prediction merits issuance of a public warning. But it is unlikely that the public generally been apprised of this subtle distinction. There is also reason to believe that in spite of negative popular attitudes toward politicians and the political process, the public looks to government officials for authoritative leadership and direction at times of potential crisis.

In order to ascertain public views on responsibility for issuing predictions, we asked:

> If the prediction that a damaging earthquake will occur one year from now were to be made, who do you think should be responsible for informing the public? Would you say: The scientists themselves, Government officials, or Someone else?

If respondents chose the third answer they were asked to specify who the "someone else" was. Although it was not read to the respondent, the reply, "Both scientists and government officials" was preprinted on the schedule for use by the interviewer when respondents gave that answer.

As summarized in the accompanying graph, just over one quarter of the respondents place the responsiblity exclusively with scientists. More people see the release of earthquake predictions as a government responsibility, and another sizeable group want collaboration between scientists and government



WHO SHOULD RELEASE PREDICTIONS ?

officials. There are well documented risks of unregulated information leakages, undue delay by public officials, and dissemination of misinformation in any plan which makes government officials responsible for releasing a prediction based on sophisticated scientific evidence. Nevertheless, the great majority of people expect government officials to assume principal or coordinate responsibility in a matter of such vital public concern as releasing an earthquake prediction.

Chapter Six

What Can Be Done?

Southern Californians are a diverse lot, including some people who are very aware and quite fearful of the earthquake danger and others who seem unaware and unconcerned. But most people are not entirely unaware and unconcerned, though very few are preoccupied with earthquakes. What, then, do they think can and should be done about earthquake hazards? To what extent are awareness and concern converted into demands for action?

Fatalism.

The obvious first question is whether people think there is anything that can be done to reduce the hazard of earthquakes. People living on the brink of disaster, like soldiers in combat and residents of hurricane country, often develop fatalistic attitudes. If the course of an enemy bullet or the impact of a hurricane or earthquake is beyond the potential victim's control, there is no point in worrying or in wasting time and energy on protective measures. If fatalistic attitudes toward earthquakes are prevalent, we can expect very little support for hazard-reduction programs by governments and little interest in individual and family preparedness measures.

Four questions were used to measure fatalistic attitudes about earthquakes. The most frequently endorsed expression of fatalistic attitudes was the statement,

> I believe earthquakes are going to cause widespread loss of life and property whether we prepare for them or not.

Sixty one percent of the residents agreed with this statement, including eleven percent who agreed strongly.

Respondents divided about equally in agreeing or disagreeing with a

second statement, as follows:

> If I make preparations for an earthquake, I am almost certain they will work.

About two percent did not answer or could not make up their minds, while 49 percent agreed and 49 percent disagreed. Very few felt sure enough to agree ot disagree strongly.

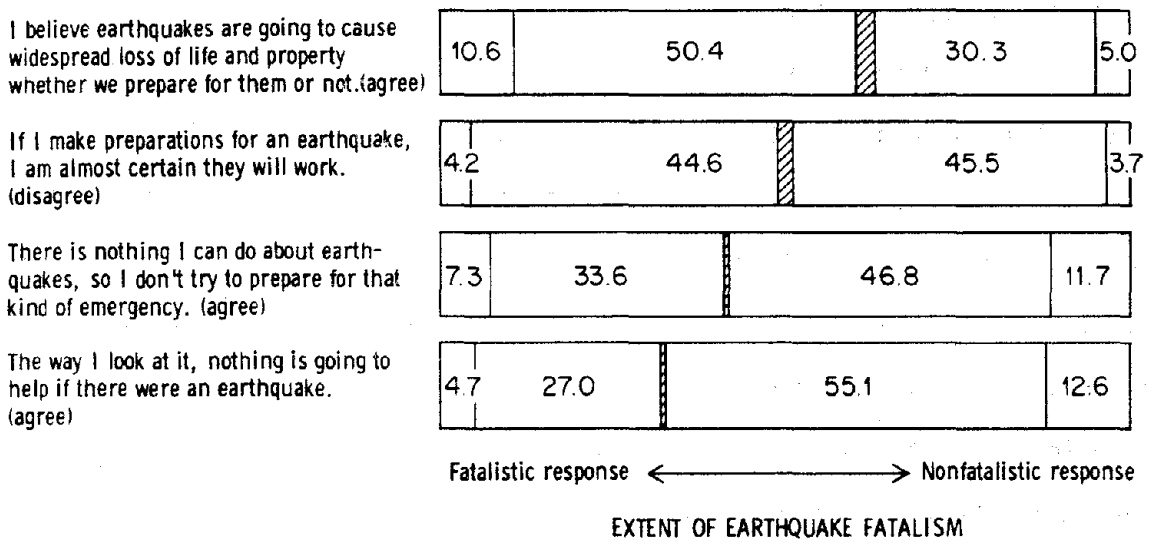
More strongly worded statements of fatalism provoked more disagreement than agreement, though a large minority still clung to fatalistic views. When asked about the statement,

> There is nothing I can do about earthquakes, so I don't try to prepare for that kind of emergency,

41 percent agreed, including 7 percent who agreed strongly. And even the expression of almost total helplessness,

The way I look at it, nothing is going to help if there were an earthquake,

was endorsed by 32 percent of the people.



EXTENT OF EARTHQUAKE FATALISM

Responses from left to right are "strongly agree," "agree," "not answered or don't know," "disagree," and "strongly disagree"; or in reverse order, depending upon which is the more fatalistic answer, as indicated in parentheses following each questionnaire item.

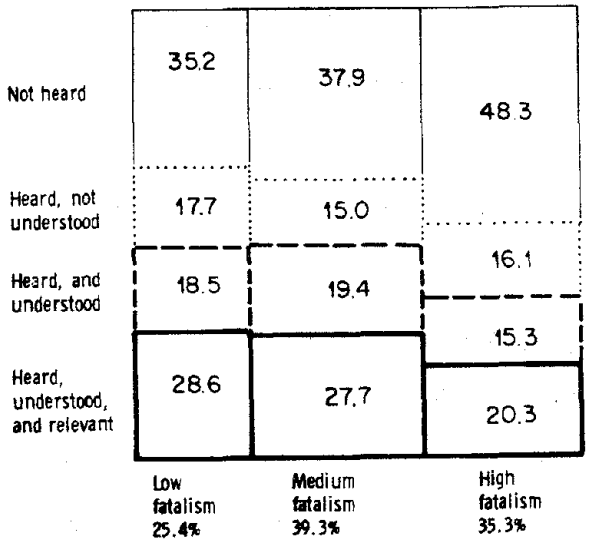
If we compare these statements, three out of five people are fatalistic about the general impact of an earthquake, but fewer are fatalistic when it comes to the possibility of taking steps to protect themselves. Between the most fatalistic and most hopeful are those people who say that earthquakes will inevitably kill and destroy, but that individuals can still take timely steps to improve their own survival chances. The majority are not hopeless about enhancing their own survival chances, but there appears to be widespread lack of confidence in the effectiveness of protective measures currently known to them.

While it is encouraging that more than a third of the people reject fatalism in even its most acceptable garb, the almost equally large minority who endorse the two statements justifying hopelessness and inaction may pose a serious impediment to achieving optimal earthquake preparedness throughout the community. When we add to the "hopeless" those who lack confidence in the effectiveness of the measures they might take, the foundation for concerted community action appears to be shaky.

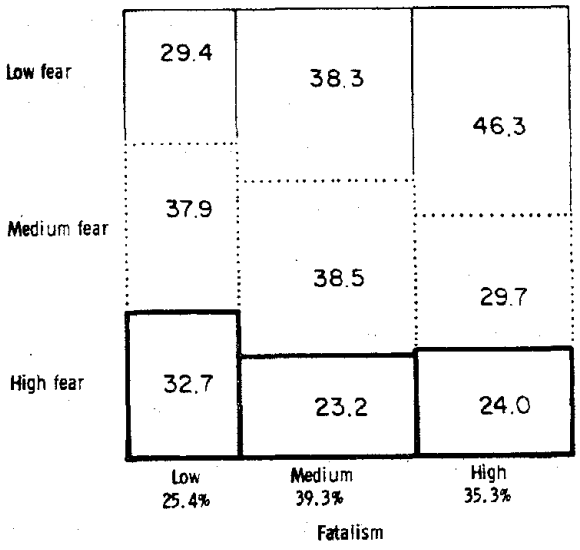
A thoroughly fatalistic or hopeless attitude should not only lead to inaction, but to a lack of interest and concern. If there is nothing to be done about earthquakes there is little reason to keep informed about the earthquake threat. Hence we should not be surprised to find that the more fatalistic respondents are less often aware of the Uplift, and less often understand its significance. Whether fatalists should be more or less fearful and concerned is not obvious. On the one hand, a fatalist might feel there was no point in worrying since there was nothing to be done about the danger. On the other hand, a fatalist might be especially fearful and worried just because there was no way to cope with the danger.

In order to examine these possible relationships, we have assigned values ranging from one to four for answers to each of the four questions and

summed them to produce an index of earthquake fatalism. On the basis of the index scores, respondents have then been divided into three approximately equal groups labelled "high fatalists", "medium fatalists", and "low fatalists". The relationships between fatalism and awareness of the Uplift and between fatalism and the Fear/concern Index are presented in the two accompanying graphs. As expected, fatalists are less likely than others to have heard of the Uplift.



AWARENESS OF UPLIFT BY EARTHQUAKE FATALISM



FEAR AND CONCERN BY EARTHQUAKE FATALISM

However, fatalists who have heard of the Uplift are probably no less likely than others to understand its significance and appreciate its relevance. Fatalists also express less fear and concern over the earthquake danger than nonfatalists. A psychiatrist might wish to explore the possibility that fatalism leads to denial of fear. But if we accept what people say at face value, fatalists apparently don't worry so much as other people because there is nothing they can do anyway.

One other item expresses an attitude often associated with fatalism. In situations of continuing threat and uncertainty, there are often people who develop feelings of personal invulnerability. Automobile commuters, aware of accidents involving other people, often assume that accidents only

happen to other people. Although attitudes of invulnerability are more often implicit than explicit, we included one question to find out how many people would openly admit to a feeling of invulnerability from earthquakes. The statement was worded,

I don't believe an earthquake could really harm me.

Only 8.5 percent of the respondents agreed to this claim of invulnerability. Thus, we conclude that the widespread fatalism about earthquakes is not accompanied by a conscious sense of invulnerability. Since more than ninety percent of the people feel vulnerable to earthquakes, it may be possible to overcome fatalistic attitudes in many people by demonstrating that there are realistic and effective ways of lessening earthquake hazard to the community and to the individual.

Community and Individual Orientations to the Earthquake Prospect.

Some problems divide communities into individuals and households, each seeking a private solution without cooperation or compassion for others. Other problems unite communities, breaking down barriers and evoking compassion and altruism. Research has shown that a widely shared natural disaster usually has the latter effect. A disasterous tornado, hurricane, flood, or earthquake unifies the community for the duration of the emergency period. This orientation toward community welfare and collaborative solutions to problems makes what is probably an indispensable contribution to dealing effectively with the crisis brought on by the disaster.

A truly credible prediction of a destructive earthquake would create a community crisis. The National Research Council Panel on Public Policy Implications of Earthquake Prediction has already asked whether people would respond to a prediction with comparable altruism and community orientation, or whether the attitude would be one of each individual and household for themselves. Without altruism and community orientation the task of public leaders

would be very difficult. We have seen dramatic instances of cooperative response to the visible threat posed by such disasters as brush fires and floods. But in these instances the threat was visible and the disaster agent could be dealt with directly, for example, by cooperative fire fighting or repairing levees. The earthquake threat is not visible and the disaster agent cannot be attacked directly. In light of these differences, we need more direct evidence on whether people think of the threat of an earthquake in cooperative or individualistic terms.

We shall attempt to find partial answers to two questions. First, do people generally think of the prospect of an impending earthquake as a private problem or a problem for community action? Second, what are the prospects for widespread altruistic response to an earthquake prediction? The answer to the second question will be sought by looking for some of the preconditions or foundations on which altruism is built. Much of the groundwork for altruism will have been laid if people are already aware of groups of people who are in greater danger than most of us, if they view these groups and their problems in personal rather than impersonal terms, if they believe that there is something that can be done for them, and if they feel that something ought to be done for them by persons outside of their immediate circle of family and friends. But if these conditions do not prevail, it is difficult to see how a prediction could elicit an immediate outpouring of altruism.

Awareness of especially endangered groups.

The first step in answering these questions is to find out whether people are aware that some groups of people are in greater danger than others in case of an earthquake. Being aware of groups in special need is at least the first step toward cooperation to help them. Respondents were asked,

> If a damaging earthquake were expected in southern California, do you think any particular groups of people would be in greater danger than others, or do you feel the risk is about the same for everyone?

The great majority (62.9%) replied that there were some groups in greater danger. About a third (34.6%) said the danger was the same for everyone, and 2.5 percent didn't know. Respondents who replied that some were in greater danger were then asked,

> Which groups of people do you feel would be in greater danger from a damaging earthquake?

The 62.9 percent broke down into 24.3 percent who named only one group, 18.4 percent who named two, and 20.2 percent who named three or more. These replies tell us that there is fairly widespread awareness that some groups of people are at greater risk than others from earthquakes.

Before we examine the kinds of groups that people identified as subject to special risk, we must take note of the possibility that people mentioned groups to which they themselves belonged. If people were merely identifying their own groups, the replies might be interpreted as expressing a self-serving rather than an altruistic outlook. To be sure which kind of attitude was being expressed, we asked the respondents:

> You said that (.....), (.....). etc. are the groups of people who are in greater danger from a damaging earthquake. Do you consider yourself to be in any of these groups? (Yes or No) (If yes): Which ones?

The interviewer filled in the (.....) spaces by repeating the names of groups the respondent had named. A total of 159 people said they belonged to one of the groups they had mentioned. This leaves 51.8 percent of our entire sample who recognize that certain groups are in special danger, but do not include themselves in the threatened categories. Thus at least half the respondents have the social awareness that is prerequisite to altruism.

We should not be too hasty in assuming that the 159 who placed themselves in specially endangered groups are not also altruistic. Most of them also named other groups to which they did not belong, so their social awareness was not limited to their own plights. Although a fully satisfactory comparison

was difficult, a further analysis of the responses showed that belonging to an endangered group made people more aware, rather than less aware of the plight of other groups. Apparently their own danger sensitized them to the plight of others, increasing the potential for altruism.

The kinds of groups that our respondents identified as being in special danger are summarized in the accompanying table. Because some people identified groups co which they belonged, we present two parallel sets of figures. The first column includes all mentions of groups, whether the respondent was included or not. The second column includes only the mentions of groups in which the respondent did not include himself. Thus the first column can be read as a comprehensive account of public awareness of special vulnerability to earthquakes. The second column can be read as the distribution of potentially altruistic awareness of special vulnerability. Since the two columns of figures are quite similar, some readers may wish to ignore the differences.

For ease of interpretation the groups have been classified into four categories, which in turn can be collapsed into two broader groupings. Some of the answers refer to being located in vulnerable settings, where the risk of physical injury and property damage as a consequence of an earthquake is great. This broad grouping of responses includes people who live or work in potentially unsafe structures and people who live or work in especially unsafe locations. The other broad grouping includes people who have a diminished ability to protect themselves, whether or not they are in especially vulnerable settings. These people are either personally and socially impaired in some way so they are less able to deal with a crisis, or they are in an institutional setting that limits their ability to take self-protective action. Comparing the two broad groupings, we find that nearly twice as many references are made to vulnerable settings (60.9%) as to diminished ability for self-protection (31.0%).

The most frequent references are to potentially unsafe structures.

GROUPS IDENTIFIED AS IN SPECIAL DANGER

Type of endangered group	All groups mentioned		Groups in which respondent is not a member	
Unsafe structures		36.0		35.5
Old/unsafe/pre-1934 buildings	19.1		18.4	
Apartments/high-rise	16.9		17.1	
Unsafe locations		24.9		24.7
Proximity to disaster agent (by fault, near epicenter)	8.6		7.9	
Flooding (below dams, near water)	6.8		6.9	
High density areas	4.8		4.9	
Hillside homes	4.7		5.0	
Personally and socially impaired		18.7		19.1
Elderly	9.9		10.0	
Disabled	7.3		7.5	
Poor	1.5		1.6	
Institutional settings		12.3		13.1
Children in schools	6.5		6.9	
People in hospitals/prisons/ group residential facility	5.8		6.2	
Other	8.1	8.1	7.6	7.6
Total	100.0	100.0	100.0	100.0
Total number of responses	2007		1830	

Nearly one fifth of all references are to old, pre-1934, and otherwise unsafe buildings. In addition there were nearly as many references to apartments and high-rise buildings, suggesting a fear of any tall building in an earthquake.

Next in frequency to structures that people believe are potentially unsafe were potentially unsafe locations. These references were somewhat scattered, so the number of times each particular kind of location was mentioned was relatively small. Less than ten percent each of the references were to locations near a fault or potential earthquake epicenter and to areas subject to flooding (such as below dams), and less than five percent each were to high density areas and hillside homes.

The more common recipients of charitable altruistic concern, the elderly, the disabled, and the poor, were much less often mentioned than people in poten-

tially unsafe structures. References to the elderly and disabled are quite similar in frequency to references to location near a fault and in potential inundation areas.

A still smaller number of respondents thought of people in institutional settings, including children in schools and people in hospitals, prisons, and group residential facilities.

It is important to remember how these questions were asked when we interpret the findings. The answers were volunteered by the respondents without any help from the interviewers. If we had presented a check list of groups, most of the respondents would probably have checked many more of the groups as being especially vulnerable than the number they volunteered. For example, if asked, many more would probably have agreed that the disabled are especially vulnerable in an earthquake and many more would probably have expressed concern over hillside homes.

The information we have must be understood as indicating how people think spontaneously about earthquakes. Does the idea of an earthquake promptly bring to mind a concern for groups of people who are in especially great danger and in need of special attention from the community? If it does, what kinds of groups do people think of first, without prompting? We asked the questions in this way, thinking that the more spontaneous and unprompted responses might provide a better clue to public attention and concern in case of a credible earthquake prediction than the replies to a check list.

The replies suggest that the frequent discussion of unsafe buildings and perhaps the tendency to depict earthquakes concretely by showing pictures of damaged and collapsed structures has sensitized the public to this aspect of earthquake vulnerability. By contrast, far fewer people think spontaneously of the quite realistic danger that one of the many dams in the Los Angeles tropolitan area--some of which are quite old--may collapse in an earthquake.

And relatively few respondents think spontaneously of those people who are least able to help themselves in a crisis. This differential attention can not be explained by prior experience with disaster in southern California. During the 1971 San Fernando-Sylmar earthquake public attention was riveted for several days on the imminent danger that the Van Norman Dam would collapse, and thousands were evacuated as a consequence. Many residents must also remember the disastrous collapse of the Baldwin Hills Dam in 1963 which, while not caused by an earthquake, reminded people of how much of the community lay below dams. Furthermore, the damaged structure most often featured in accounts of the 1971 earthquake, where most of the deaths occured, was the Veterans Administration Hospital. Yet only a small number of people mentioned the special vulnerability of the hospitalized.

As we try to understand the prevailing patterns of thought about earthquakes, we must conclude that while most people are sensitive to unequal risk from earthquakes, their concern is more impersonal than personal. They are not thinking so much of individuals who are bedridden at home or in hospitals and need help in getting to safety as they are of buildings collapsing. Since altruism implies a rather personal concern, the prevalence of impersonal concern suggests that the foundation for a genuinely altruistic outpouring in case of a credible earthquake prediction has not yet been securely laid.

Ameliorability of hazard.

Our discussion of fatalistic attitudes dealt with the prospect of doing something about the earthquake danger in quite general terms, and from the viewpoint of self interest. The ameliorability of earthquake hazard can also be examined in relationship to the groups singled out as being specially vulnerable. After each respondent had named the groups considered to be in special danger, the interviewer asked:

> If a damaging earthquake were expected, is there anything that should be done ahead of time for the (.....)?

In asking the question, the interviewer named the first group mentioned by the respondent and then repeated the question for each of the groups the respondent had named.

When all of the references to all of the groups are considered, 85 percent of the answers to this question are yes. The belief is overwhelming that something can be done for the groups in special danger. When the issue is posed in this way, fatalistic attitudes are much less in evidence.

There are at least three plausible explanations for the contrast between this finding and the earlier finding on fatalistic attitudes. First, respondents were merely asked whether there was something that ought to be done for the elderly, for people living in dangerous buildings, or for whatever other groups they had mentioned. There was no suggestion that risk would thereby have been eliminated. The proposed steps could have been viewed as only a small encroachment on an otherwise inexorable fate. Second, the best way to overcome fatalistic attitudes may be to deal in specifics. When the attention is turned to specific groups and concrete actions, the possibility of dealing constructively with a problem of more manageable proportions may displace the disposition toward fatalism. Third, the social conscience that we acquire as members of society may keep us from being as fatalistic about the prospective misfortunes of others as we are about our own. There is some evidence in our data to support this third explanation. Respondents who identified themselves with the endangered groups were less likely to say that there is anything that ought to be done for members of these groups than respondents who did not belong to the groups in question. This observation applies to the occupants of old unsafe buildings and all four groups of people in unsafe locations. (For other endangered groups there is no difference.)

The proportions of respondents who believe there is something that ought to be done for the endangered groups are so uniformly high that there is

little need to dwell on differences. Suffice it to say that substantially larger minorities among our respondents feel that there is nothing that ought to be done for people in close proximity to the disaster agent and people in apartments and high-rise buildings, and for people in high density areas and hillside homes. These groups of people are viewed more fatalistically than the other endangered groups.

While the evidence of disproportionately impersonal concern suggested an important gap in the foundation for altruism, the widespread belief in the possibility of ameliorating the situations of endangered groups suggests that another segment of the foundation is well established. While only a minority of respondents have mentioned any one of the endangered groups, most of those who mention specific groups believe that something can and should be done for them if an earthquake is expected.

Responsibility for action.

A final clarification of the concern for endangered groups is achieved by asking who is responsible for doing whatever ought to be done. For each group to which the respondent answered "yes"--something should be done ahead of time--the respondent was asked:

Who do you think should be responsible for doing something for the (.....)?

The distribution of responsibility is presented in the accompanying table. Interviewers did not suggest answers to the respondents, and the categories of responsibility were made up from the responses given. In this table the percentages are summed horizontally, unlike most other tables in this report. For ease of reading, the assignments of responsibility are presented first in summary form for each of the four categories of groups, and then in detail for each of the eleven specific groups.

The most consistent and impressive finding from the table is the reliance on government. For every one of the groups, the majority of the respondents

AGENTS RESPONSIBLE FOR ENDANGERED GROUPS

General Category	Responsible Agent: Own Responsibility	Family, Friends	Local Govt.	Local, State,& Federal	Indiv.& Govt.	Prop. Owners	Admin., Mgrs.	Other	Total
Unsafe structures	15.7	0	36.4	32.9	2.5	6.9	1.0	4.6	100.0
Unsafe locations	23.7	0	30.5	36.2	2.5	1.0	1.2	4.9	100.0
Personally and socially impaired	4.9	5.2	30.1	48.9	2.4	.3	3.0	5.2	100.0
Institutional settings	5.4	2.7	25.6	42.6	1.3	.4	15.7	6.3	100.0
Unsafe structures									
Old/unsafe/pre-1934 buildings	10.8	0	40.5	37.9	2.9	4.7	0	3.2	100.0
Apartments/high-rise	22.1	0	31.1	26.6	1.9	9.7	2.2	6.4	100.0
Unsafe locations									
Proximity to disaster agent (by fault, near epicenter)	23.1	0	27.7	37.7	1.5	.8	.8	8.4	100.0
Flooding (below dam, near water)	24.2	0	25.8	44.4	1.6	0	1.6	2.4	100.0
High density areas	11.8	0	46.1	27.6	5.3	4.0	2.6	2.6	100.0
Hillside homes	35.5	0	27.6	29.0	2.6	0	0	5.4	100.0
Personally and socially impaired									
Elderly	3.4	6.9	31.6	49.5	2.9	.6	1.7	3.4	100.0
Disabled	5.4	3.9	26.3	49.6	1.6	0	5.4	7.8	100.0
Poor	11.6	0	38.5	42.3	3.8	0	0	3.8	100.0
Institutional settings									
Children in schools	8.4	3.4	33.6	36.1	1.7	.8	10.1	5.9	100.0
People in hospitals/ prisons/ group residential facilities	1.9	1.9	16.3	50.0	.9	0	22.1	6.0	100.0

place responsibility on local, state, or federal government or some combination of government entities. About four out of five respondents hold government responsible for helping the impaired, while just over two thirds expect government to assume responsibility for each of the other categories. The tendency to hold government responsible is greatest in the case of the elderly, the poor, people who dwell in old unsafe buildings, and the disabled. Government is least often held responsible--though still by more than half the respondents --for people living in hillside homes and in apartments and high-rise buildings, and living near faults and other impact areas. The rate of government responsi-

bility is also relatively low for people in institutional settings. But this observation is deceptive since the agents and managers who are held responsible by 16 percent of the respondents will in most instances be acting as agents of some government entity.

There is considerable disposition to hold people who dwell in hillside homes, in potential inundation areas, in proximity to a fault, or in high-rise and apartment buildings responsible for their own safety when an earthquake is expected. By contrast, very few expect people in institutions, the elderly, and the disabled to look out for themselves. A few people look to family and friends to protect the elderly, the disabled, and children in school, but the numbers are trivial compared to those who look to government. A few people expect property owners to take steps to protect residents in old unsafe buildings, high-rise and apartment buildings, and high density areas.

In spite of widespread feelings that people who have chosen to live in risky settings should therefore assume full responsibility for their own safety, the concept of public responsibility prevails. In general the sense of public responsibility is stronger for people with diminished ability to protect themselves than for people in vulnerable settings. The only exception to this generalization is the assumption of public responsibility for residents of old unsafe structures. No doubt the public attention given to the problem of old buildings has had a significant impact on the public conscience.

On the basis of the entire battery of questions we must conclude that the theme of public responsibility rather than individual responsibility is dominant. People do see the prospect of an earthquake as requiring collective rather than merely individual and family action. And they see government, especially local government, as the appropriate agency for collective response.

Altruism is made possible by several underlying conditions. First

there must be an awareness of people in special need. The majority of respondents acknowledged such an awareness. Second, groups in special need must be seen in personal rather than impersonal terms. Here the support for altruism is less satisfactory, since the preponderant view is more impersonal than personal. Finally there must be a sense that something can be done to help those in need and that there is a public responsibility to do so. In this latter respect the support for altruism is quite strong.

Chapter Seven

What Should Government be Doing?

From the preceding chapter we learned that while there is considerable fatalism about earthquake hazards, many people believe that there are steps that can and should be taken on behalf of those who are especially endangered by earthquakes. In addition we learned that people look overwhelmingly toward government to take these steps. This pattern is consistent with the view reported in Chapter Five, that government should play a major part in the public announcement of predictions. Do people have any ideas about what government should be doing? Are they willing to have public money spent on reducing earthquake hazard? What do they think of current government efforts to deal with earthquake hazard? These are the questions we shall approach in this chapter.

Suggestions for Government Action

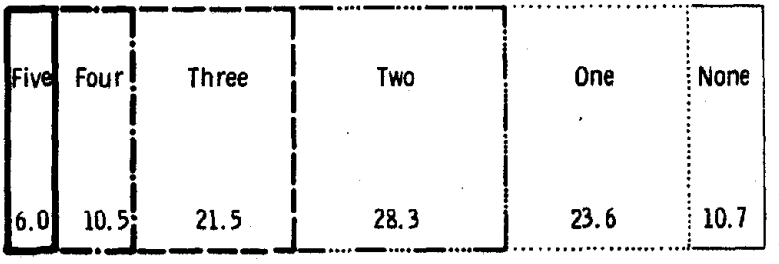
If people look to government at all levels to deal with earthquake hazard, it should be useful to know whether people have any preconceptions about what public officials should be doing. Sometimes public officials feel that the public attitude toward a community problem is that government should do something! Having no idea of what can be done, people may nevertheless clamor for officials to figure something out and then do it. While a demanding but uninformed public leaves officials free to select the programs they consider most prudent, it also places an inordinate burden of unaided decision making on their shoulders. On the other hand, if people have reasonably concrete ideas about what government could be doing, we can justifiably infer that there is genuine public interest and concern. The prospect for public

involvement in shaping and executing government policies and programs is much brighter.

In order to determine whether people have given any thought to the nature of possible government actions to reduce the hazard of earthquakes, interviewers asked the following question of all the people in our sample:

> Given the fact that earthquakes do occur in southern California, what do you think are the most important things government agencies should be doing now to prepare for future earthquakes?

Interviewers were instructed to record answers verbatim, and to record up to five answers per interview. The accompanying graph indicates the number of suggestions people were able to make.



SUGGESTIONS FOR GOVERNMENT ACTION

It appears from the evidence that most people are concerned and have given some thought to what government agencies should be doing. Only one in every ten has nothing to suggest. Two thirds of the people have two or more suggestions to offer, and more than a third have three or more suggestions.

No effort has been made to evaluate the merits of specific suggestions. Some of them are relatively impractical, and many are fairly vague or general. But very few were unreasonable or irrelevant. Only five persons suggested shifting responsibility through prayer. We can safely conclude that most of the people have some ideas about the steps that might be taken or the general directions for government action.

Most of the suggestions can be grouped under three headings. The most

Suggestions for Government Action

Measures suggested	Percent of all suggestions	
Structural Safety		35.8
Make safer buildings, earthquake-proof buildings	9.0	
Enforce building codes	6.7	
Improve building codes	5.7	
Upgrade old buildings	5.6	
Provide loans to upgrade or rebuild	3.2	
Destroy old or unsafe buildings	2.2	
Prohibit building on faults	.9	
Other suggestions concerning buildings	1.1	
Upgrade dam safety	1.0	
Improve safety of high way construction	.4	
Education		26.2
General reference to public education	22.9	
Conduct drills in public buildings	2.3	
Other specific educational measures	.6	
Other educational suggestions	.4	
Plan for Emergency Care and Relief		25.7
Establish more emergency shelters	6.0	
Establish centers with emergency supplies	5.5	
Develop an effective civil defense program	3.6	
Improve the general emergency plan	3.3	
Provide for emergency medical care	3.1	
Develop an evacuation plan	2.8	
Develop emergency communication systems	1.0	
Other emergency care and relief	.4	
Improve Scientific Research and Technology, including Prediction		7.6
More scientific research needed (unspecified)	3.1	
Refine prediction techniques	2.7	
Subsidize groups to improve scientific research or prediction	1.7	
Control earthquakes scientificially	.1	
Upgrade Utilities	2.0	2.0
Collective and Voluntary Action		.8
Organize people, work as a community	.5	
Organize care for groups in special need	.3	
Regulate Announcement of Earthquake Predictions		.7
Monitor or control release of predictions	.3	
Announce all predictions	.2	
Reduce sensationalism concerning predictions	.2	
Other suggestions		1.2
Make earthquake insurance available and affordable	.2	
Other financial suggestions	.2	
Pray	.1	
Other	.7	
Total number of suggestions	3146	
Total	100.0	100.0

frequent references were to structural improvements (upgrading and enforcing building codes, reinforcing or destroying unsafe buildings, making dams and freeways safer), comprising a third of all specific suggestions. References

to the need for educating the public about earthquake safety and predictions and conducting earthquake drills in public buildings followed closely (26.2%). "Educating people" was by far the most frequently suggested (22.7%) specific preparedness item. The third major category of response (25.7%) involved achieving a state of emergency preparedness and readiness to handle problems after the disaster strikes--insuring the adequacy and availability of shelters and supplies, medical care, evacuation plans, and good communication systems.

Because some readers may be interested in the public support for specific programs, we have reproduced a fairly detailed list of the suggestions made. The detailed list of suggestions reveals a prevailing emphasis on immediately and obviously practical steps. Steps that are only indirectly practical are much less popular. For example, increased support for scientific research on earthquakes makes up only 4.8 percent of the responses, and the improvement of earthquake prediction only 3.5 percent. In light of continuing study of the desirability and feasibility of government subsidized earthquake insurance, it is also striking that only seven people suggested that government agencies should make earthquake insurance available.

Hazard reduction and emergency preparedness. A recurring issue in disaster preparedness is the distribution of effort and resources between hazard reduction and emergency response. The distinction is between preparations to minimize disruption, damage, and casualties when an earthquake strikes, and preparations that enable us to deal promptly and effectively with disruption, damage, and casualties after the earthquake. Emergency planning includes such steps as preparing a community emergency plan, storing food and medical supplies, and establishing emergency communication systems to be used in case regular communications are disrupted by the quake. Hazard reduction includes such steps as stricter enforcement of building saftey codes and educational

programs to teach people how to make their homes safer in the event of an earthquake.

Emergency response is more dramatic and its effects are more obvious and immediate than hazard reduction. Saving the lives of the injured, putting out fires, getting snarled traffic moving, and reuniting families after an earthquake are more exciting and heroic than inspecting buildings for safety, ordering unsafe dams drained, and helping householders to locate and remove objects that might fall and injure them in a quake. Consequently, there has been fear in some quarters that the public may not appreciate the need for hazard-reducing programs as fully as they do the importance of emergency preparedness. Coupled with the fact the police and fire officials often play a more significant role than planning and building safety officials in local disaster preparedness planning, this fear leads many to hold out little hope for developing the hazard reduction component in a balanced community response to earthquake prediction.

A careful effort has been made to classify each of the suggestions made by our respondents into hazard reduction and emergency modes of response. If the benefits of the proposed action will be realized in a reduction of disruption, damage, and casualties when the quake strikes, the action is classified under the hazard-reduction mode of response. If the benefits are to be realized after the quake has struck in dealing more effectively with the resulting disruption, damage, and casualties, the suggested action is classified as emergency-response mode. A goodly proportion of the suggestions could not be confidently classified in one mode or the other, so they are placed in an undetermined category. The accompanying graph shows the relative frequency of the two modes and the unclassifiable responses.

Contrary to the fear just mentioned, considerably more of the suggestions fall into the hazard reduction mode than into the emergency mode. It

Hazard reduction	Undetermined	Emergency response
49.4	21.1	29.4

PROPOSED MODE OF ACTION

is reassuring to realize the extent of potential public support for hazard reduction programs. While we cannot be certain how much support will be forthcoming in actual situations, we can draw two important conclusions from this finding. First, there is widespread public understanding of the need to prepare for earthquakes through programs aimed at reducing the hazard of earthquakes as well as through improving emergency response capability. Second, when people think of earthquake planning, they think of reducing the earthquake hazard more often than they do of upgrading emergency response capability.

At the risk of repeating information already contained in the comprehensive table of suggestions for government action, we have listed separately the principal suggestions for hazard reduction and for emergency response. Proposals for education are prominent in both modes of response. But the bulk of the hazard reduction proposals are aimed at enhancing building safety. Clearly the primary importance of building safety for communities in earthquake country is well and widely understood in Los Angeles County. Stockpiling needed supplies and perfecting evacuation plans constitute most of the emergency response planning.

Suggestions for Government Action by Hazard Reduction and Emergency Response Modes

Measures suggested	Percent of suggestions by response mode
Hazard Reduction Mode	
Structural safety	65.6
Education	15.7
Improve scientific research and technology, including prediction	9.7
Plan for emergency care and relief	5.2
Regulate announcement of earthquake predictions	.9
Collective and voluntary action	.2
Other hazard reduction	.8
Total	100.0
Total number of hazard reduction suggestions	1020
Emergency Response Mode	
Plan for emergency care and relief	74.3
Education	12.2
Structural safety	7.0
Upgrade utilities	3.1
Collective and voluntary action	2.0
Improve scientific research and technology, including prediction	.5
Regulate announcement of earthquake predictions	.2
Other emergency response	.7
Total	100.0
Total number of emergency response suggestions	925

Building and Dam Safety Issues.

For several years, now, two specific issues of earthquake hazard reduction have smoldered, periodically flaring up into public controversy. One is the problem of what to do about unreinforced masonry structures built before the codes requiring earthquake-resistent construction took effect in 1934. The other is the threat posed by dams, many of which were not built in con-

formity with current earthquake safety standards. Because both of these issues flared up shortly after our basic survey was initiated, we included questions about them in a follow-up telephone survey a few months later. The replies to these later questions provide a focused view of public conceptions of government responsibility.

A 1973 call for a Seismic Safety Ordinance to deal with pre-1934 unreinforced masonry buildings was followed by public hearings in 1975 and 1976 as the Los Angeles City Council wrestled with the problem of building safety. By the end of 1976 the Council debated an ordinance that would require the posting of warning signs outside of unsafe buildings until they were brought up to standard. Following tumultuous public hearings, the City Council on January 25, 1977, instituted a two-year survey of buildings, declining to require upgrading or posting of buildings during the interim. Similar proposals were explored in other municipalities. The safety of certain dams in case of earthquake also became an issue, with controversy over whether to continue using the dams while a workable long-range solution was developed.

Public opinion was mobilized in the debate on these issues and expressed through public hearings, letters to public officials and newspapers, editorials, and through spokesmen for various interest groups. There has been relatively little information, however, on views held by the public at large.

In July and August, 1977, two questions were included in a telephone survey of 977 adults, representative of the total population of Los Angeles County. Some of these adults had been interviewed previously on the subject of the earthquake threat, but not on these issues, while some were interviewed for the first time. Since there were no significant differences in the answers given by the two groups, we have combined them in reporting the findings. One question concerned building safety; the other concerned dam safety.

The first question asked what should be done about buildings that engineers say are likely to collapse in a strong earthquake.

> Quite a few people live and work in buildings that engineers say are likely to collapse in a strong earthquake. Which one of the following statements do you most agree with?

The answers from which people chose are reproduced in the table. In light of the articulate and often effective resistance marshalled against even the

What to Do about Unsafe Buildings

These buildings should all be closed down until they can be reinforced for safety.	41.1%
These buildings should not be closed down, but they should be posted with signs warning people of danger in case of an earthquake.	47.2%
These buildings should not be closed down or posted unless the owners want to do so.	4.3%
Other (answer volunteered by respondent)--Don't close down buildings but repair them.	2.1%
Other, don't know, and not answered.	5.3%
	100.0%

moderate "posting" legislation, it is striking that a mere four percent of our sample would grant discretion to building owners. Just over two percent volunteered their own more palatable alternative--don't close down the buildings but repair them! But nearly nine out of ten people favored either posting the buildings or closing them down.

There is less agreement on the second question dealing with dams that might be unsafe in a major earthquake.

> Inspection has shown that a few of the dams in southern California might be unsafe in a major earthquake. Yet, at the same time, we need all the water we can get because of the drought. As I read the following statements, please tell me which one you most agree with.

Only one in eight favored draining the dams immediately, though another six and a half percent volunteered their own proposal to drain and repair the dams now. Just over a third favored the compromise proposal to lower the

What to Do about Unsafe Dams

Unsafe dams should be drained immediately to prevent the possibility of flooding.	12.4%
Unsafe dams should have their water levels reduced immediately to lessen any damage that may occur.	36.4%
Unsafe dams should be used for water storage until a damaging earthquake is predicted.	13.9%
We should take our chance with an earthquake and keep on using these dams for water storage.	23.5%
Other (answer volunteered by respondent)-- Dams should be drained and repaired now.	6.5%
Other, don't know, and not answered.	7.3%
	100.0%

water level rather than drain the dams. Altogether just over half (55.3%) favored some kind of immediate action. In contrast, nearly a quarter were willing that we "take our chances on an earthquake and keep on using these dams for water storage". One seventh would put their faith in earthquake prediction and continue using the dams until a damaging earthquake is predicted.

It should be remembered that southern California was in the second year of a severe drought when this question was asked. We can only guess whether there would be less resistance to draining the water from unsafe dams now that the drought has been broken by the heaviest sustained rainfall on record here.

People often view a concrete situation that affects them personally quite differently from the way they view the same situation in the abstract. So these findings cannot be used to predict the amount of support and opposition that specific proposals will generate. But they probably give a more faithful account of how people feel on the broad policy issues than does the extent of mobilized opposition and support during a crisis. In principle the public looks to government officials to take decisive action to deal with earthquake hazard. The "disinterested public" favors prompt action to post unsafe structures and require owners to reinforce or vacate them within a reasonable

period of time. There is no consensus on dam safety, however, and policy makers will have to contend with sizeable opposing blocs who support and oppose immediate action, even when viewed in the abstract.

Investment for Hazard Reduction.

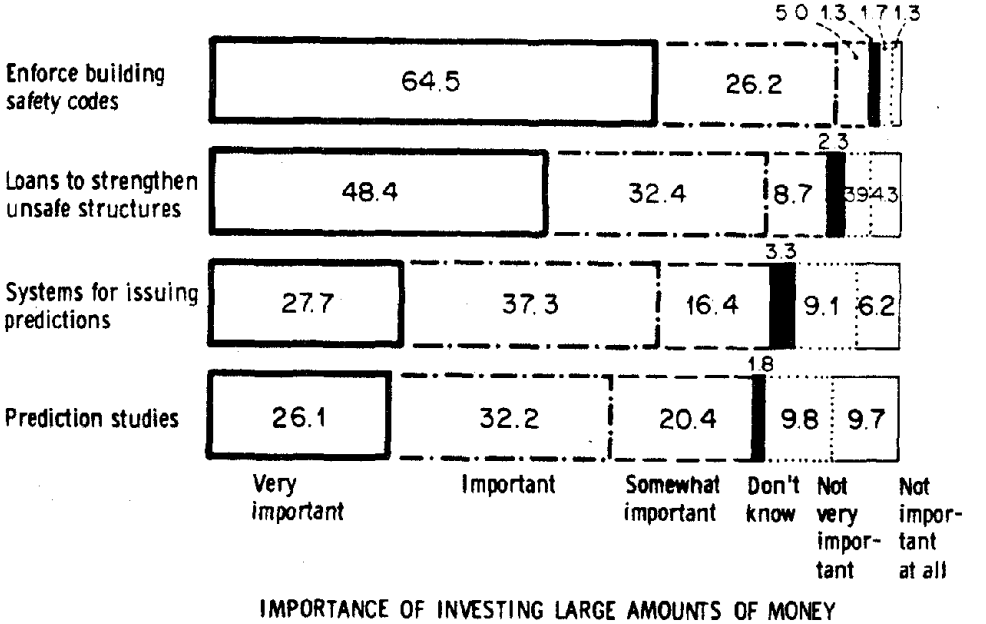
One of the difficulties in converting public support for hazard reduction activities in principle into support for specific programs is the cost of such programs. In an effort to subject the public attitude to a more severe test, we asked a set of four questions in which the cost of selected hazard reduction activities was emphasized. Respondents were asked the following general question:

> Please look at this card and tell me how important you think it is for the government to reduce the possible hazards of earthquakes by investing large amounts of money into:

The question was asked four times, with the following completions:

A. Prediction studies?
B. Enforcement of building safety codes and building repairs?
C. Establishing new systems for issuing scientific earthquake predictions?
D. Loans to rebuild or reinforce unsafe structures before an earthquake?

Respondents could choose among the answers: "Very Important", "Important", "Somewhat Important", "Not Very Important", and "Not Important At All". The results are summarized in the accompanying graph.



IMPORTANCE OF INVESTING LARGE AMOUNTS OF MONEY

The respondents answered overwhelmingly in the affirmative for all four of the specified investment areas. For each proposal, 80 percent or more said that substantial investment was at least "somewhat important". Even for the least popular item, more than a quarter of the respondents thought investing large amounts of money was very important.

In spite of the generally positive responses, there are clear differences in support among the items. The two items concerning structural safety received considerably more support than the two items dealing with earthquake predictions. And in connection with structural safety, people are considerably less enthusiastic about providing loans to upgrade existing buildings than they are for strict enforcement of building codes. Nevertheless, the finding that more than 80 percent find it unqualifiedly important for government to invest large sums of money in loans for upgrading unsafe structures lends support to the previous findings concerning the building and safety issue.

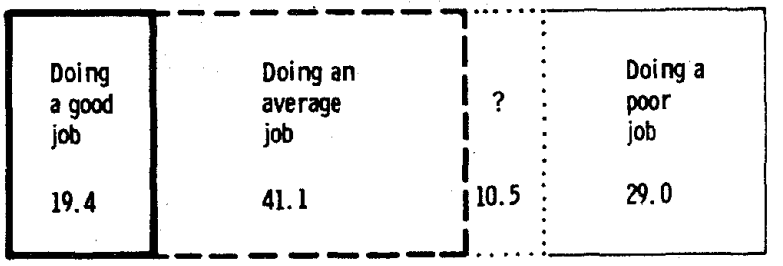
Evaluation of Official Handling of Earthquake Preparedness.

We have established that there is widespread public support for government action, that most people have some ideas about what government should be doing, that there is an understanding of the need for hazard reduction as well as emergency response planning, and that in the abstract, people are willing to have government funds spent for hazard reduction. But are they satisfied with what their government officials have done already?

Respondents were asked the following question:

> In dealing with earthquake preparedness problems, would you say public officials are doing a: Good job, Average job, or a Poor job?

As indicated in the graph, the largest number accepted the noncommital answer, "doing an average job". A sizable ten percent were unable to answer. But of the nearly 50 percent who took a stand, a considerably larger number said that officials were doing a poor job than said they were doing a good job.



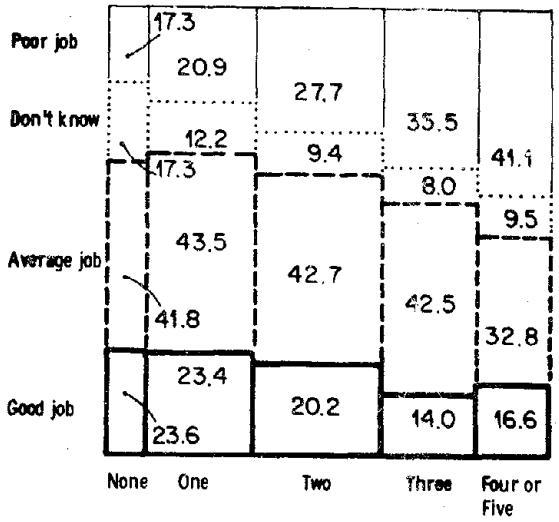
HOW ARE PUBLIC OFFICIALS DEALING WITH EARTHQUAKE PREPAREDNESS?

Only one in five of the total sample is willing to state that public officials are doing a good job.

This finding should be viewed in connection with the finding in Chapter Five, that more than four of every five respondents would like to hear more about what public officials are doing to prepare for an earthquake. Although we could not explore the grounds for public dissatisfaction with government preparations, it is plausible that the negative judgment reflects a sense that too little is being done.

Some help in understanding this finding could come from observing the kinds of people who make positive and negative evaluations. A finding that those who are strongest in supporting government activity are least favorable in their evaluations of official accomplishments would lend credence to the interpretation that government officials appear to be doing too little. A finding that respondents who are most aware of the earthquake threat and have most ideas on what government should be doing make the least favorable evaluations of official progress would lend significance to the public uneasiness.

The accompanying graphs show a weak tendency for people with fewer ideas about what should be done to have more favorable views of what government is doing, but little if any relationship between attitudes toward spending for hazard reduction and evaluation of government action. Compared with people who have no ideas, twice as many of the people who have three or more ideas for government action say that public officials are doing a poor job in

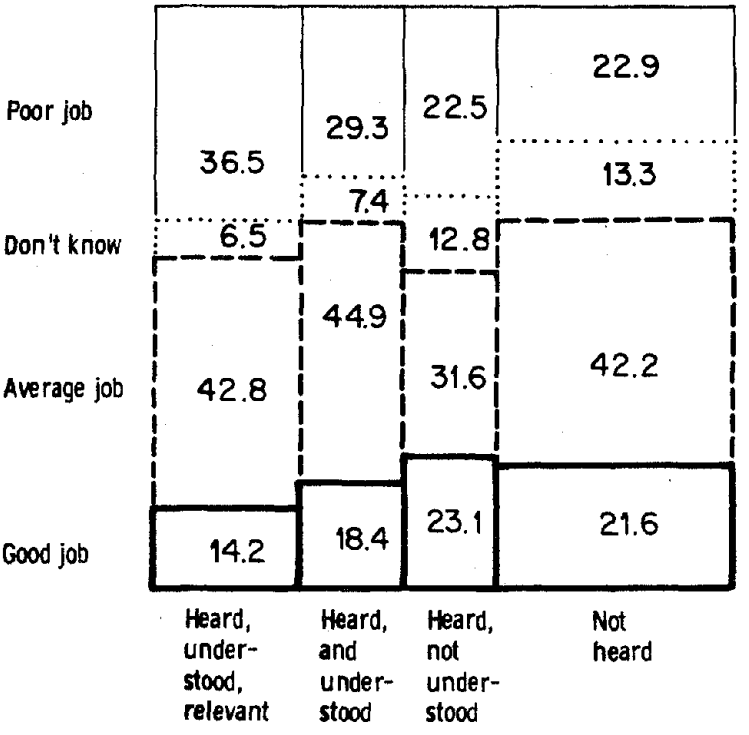


EVALUATION OF GOVERNMENT EARTHQUAKE PREPAREDNESS BY NUMBERS OF SUGGESTIONS FOR GOVERNMENT ACTION

EVALUATION OF GOVERNMENT EARTHQUAKE PREPAREDNESS BY ATTITUDE TOWARD GOVERNMENT SPENDING FOR HAZARD REDUCTION

dealing with earthquake preparedness problems. This finding could mean that people who believe it is important to do something about the earthquake danger are dissatisfied with apparent government inaction. If that interpretation were correct we should expect an equally clear relationship between attitude toward government spending and evaluation of government action. Since there is not a consistent relationship between attitude toward government spending and evaluation of government, this interpretation is not very plausible.

Instead, the underlying relationship is probably between knowledge or awareness of earthquake hazard and unfavorable evaluation. The third graph does indeed show that people who understand and appreciate the relevance of the southern California Uplift have a poorer opinion of the accomplishments of public officials than people with less appreciation of the Uplift. This finding, coupled with the finding on number of suggestions for government action, suggests that it is not so much a blind demand to do something (or spend money) that leads to dissatisfaction with government progress. Rather it is an awareness and appreciation of the earthquake hazard as reflected in understanding the significance of the Uplift and having thought about what



EVALUATION OF GOVERNMENT EARTHQUAKE PREPAREDNESS BY AWARENESS OF THE UPLIFT

might be done that leads to disappointment with government progress in dealing with the earthquake hazard.

Since the more alert and informed citizens have the least favorable view of government progress, there is reason to be concerned about the generally lukewarm appraisal of official action for earthquake preparedness. We cannot be sure that the same attitudes prevail at the present time. For example, some of the more informed citizens may have been reassured by delivery of the Task Force Report on Earthquake Prediction to the Mayor of Los Angeles. But this report is more a promise than a plan, and other public actions are equally lacking in dramatic impact. The status of government response in relation to popular expectations should be a matter of continuing concern.

Chapter Eight

What Have People Done for Themselves?

Many people are willing or even anxious to see public action to reduce earthquake hazards. But what have they done for themselves? Has the concern that was expressed through support for government action led people to do what they could to protect themselves and their families?

As a basis for answering this question we prepared a check list of suggestions that are frequently made to individuals and householders. The list is not exhaustive. It had to be kept to manageable length, and it had to be limited to steps that could be communicated easily in the interview. But the list of sixteen measures is diversified and representative enough to indicate the extent of personal preparation reliably. In addition, people were given opportunities to name other supplies that they had on hand for the possible emergency and to mention any other preparations they had made that were not on the list of sixteen. The number of respondents who had anything to add was quite small and the steps were varied, so these replies have been disregarded in the ensuing analysis.

Even with a check list there is no simple way to classify people as prepared or unprepared for an earthquake. One difficulty is that most of the suggested measures for earthquake preparedness are steps that people often take for other reasons. The normally resourceful and prudent person would probably have a battery-operated radio and a flashlight in working condition, regardless of the earthquake threat. We have tried to deal with this problem by asking people whether each suggested action was taken because of a future earthquake or for other reasons. Even this solution is not altogether satisfactory, since people often cannot discriminate precisely among the reasons

for a given action. Furthermore, we have evidence to suggest that the phrase "because of a future earthquake" was sometimes interpreted too narrowly. The amount of action stimulated by the earthquake threat may have been underestimated a little in our data.

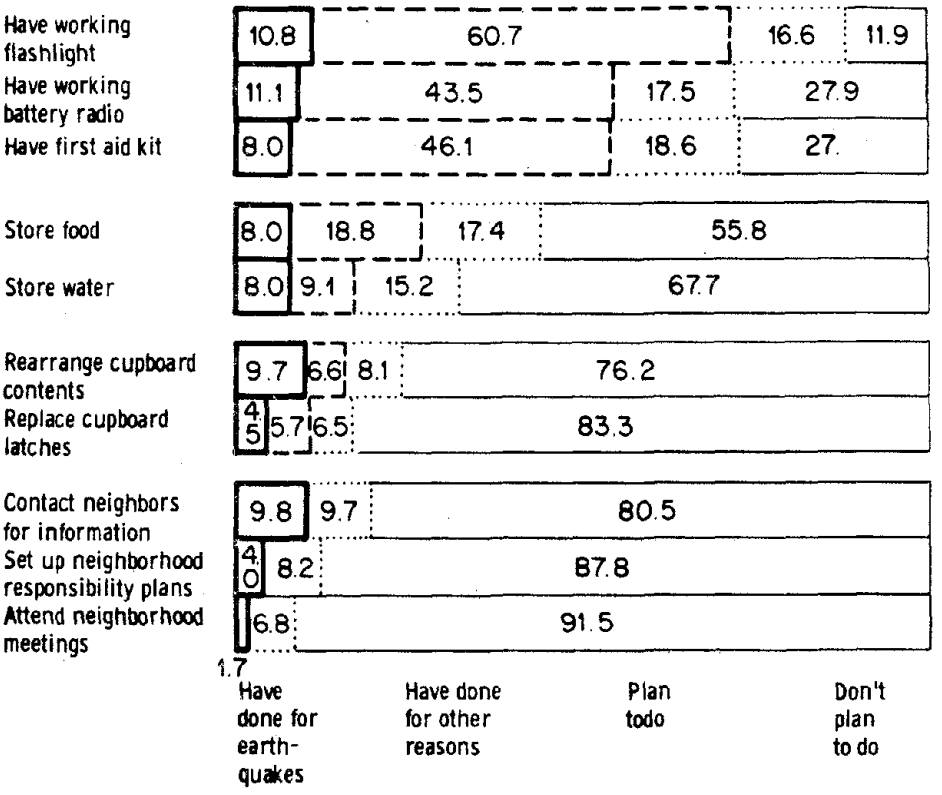
Another difficulty with assessing preparation for an earthquake is the respondent's desire to appear admirable in the interviewer's eyes. Respondents may claim to have made preparations that they have not actually made. It is principally the responsibility of the interviewer to counter this tendency by the relationship he or she establishes with the respondent. But we also employed one device to make it easier for respondents to admit they had not taken particular steps. Besides telling us what steps they had taken, respondents were invited to tell us what steps they planned to take. We do not accept literally the respondents' declarations of measures they plan to take. But we felt it would sometimes be easier for respondents to admit the many preparations they had not taken if they were given the opportunity to say at the same time that they still planned to take them.

The list of answers was printed on a card that the interviewer handed to the respondent. The actual wording of the leading question was as follows:

> I am going to read you a list of preparation suggestions that have been made by various agencies and groups that are concerned with earthquake preparedness. (HAND CARD) As I read each of the following, please tell me if you <u>have done</u> any of these things either because of a future earthquake or for some other reasons, whether you <u>plan to do</u> any of these things because of a future earthquake or for some other reasons, or whether you <u>don't plan to do any of these</u>.

As a general observation, most of the people readily admitted not having taken most of the suggested steps. Whatever ingratiation effect there was could not have been overly distorting.

We look first at ten basic steps that anyone could have taken, regardless of family status and home ownership. The items have been grouped into closely related clusters, as verified by the statistical procedure of factor analysis.



PERSONAL EARTHQUAKE PREPARATIONS

The majority of the people say that they have working flashlights, battery-operated radios, and first aid kits. Most people have these items irrespective of the earthquake threat, though about one person in ten attributes possession of these items to the prospect of an earthquake. Although the majority have made these simple preparations, more than a quarter of the people would be without emergency light and 45 percent would have no way to follow emergency broadcasts in case electric service were disrupted in an earthquake. Similarly, 46 percent would be without first aid supplies.

Since water supply and the local distribution of food items are likely to be interrupted in a severe earthquake, people are often encouraged to maintain emergency supplies of water and canned and dehydrated food. Many fewer people have taken these two steps. But if they have done so, the prospect of an earthquake is more likely to have been the reason. An uninterrupted water supply seems to be taken more generally for granted than continued food distribution.

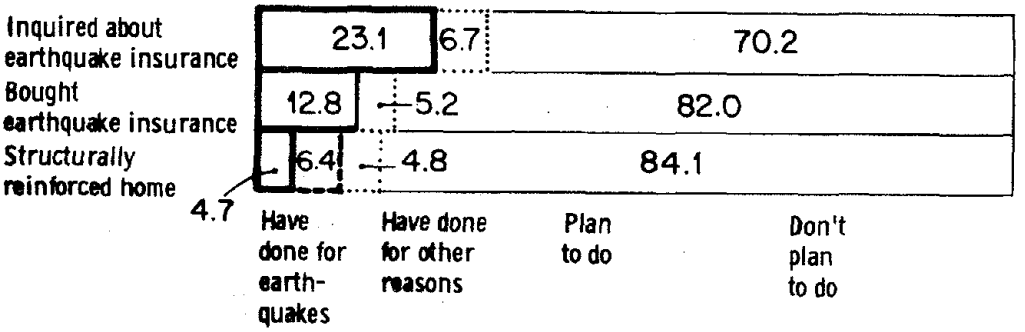
Twice as many people have stored food in anticipation of an earthquake as have stored water.

The danger of objects falling from shelves and breaking or injuring people below is of concern in an earthquake. The frequent suggestions to rearrange the contents of cupboards so as to minimize the risk of breakage, and to install or replace secure latches on cupboard doors have been even less widely followed than the suggestions to store food and water.

Finally, neighborhood cooperation has been proposed as an aid to individual families in preparing for an earthquake. The simple step of soliciting information and ideas from neighbors and friends is acknowledged by less than one in ten of our respondents. Only one in twenty-five has participated in setting up neighborhood responsibility plans for children, the elderly, and others who require special care. And only one person in fifty-nine has attended a neighborhood or block meeting about earthquakes.

From this review we are forced to conclude that most households are unprepared for an earthquake, and that the prospect of an earthquake has stimulated relatively little preparatory action.

Three more items on the list presented to respondents applied primarily to homeowner-occupied dwellings rather than rented homes. Out of our total sample, 689 (47.5 percent) lived in owner-occupied households. In just under a quarter of these households inquiries have been made about earthquake insurance.

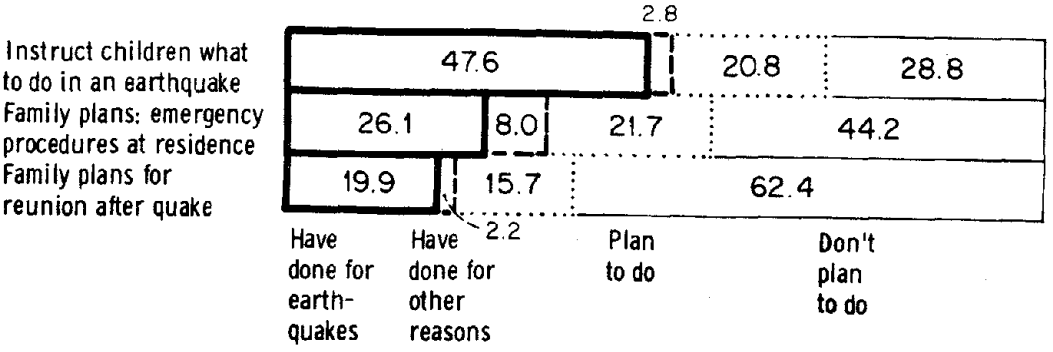


HOME OWNERS' EARTHQUAKE PREPARATIONS

Only about half of these inquiries led to the purchase of earthquake insurance. The figure, 12.8 percent, probably exaggerates the number of homes covered by earthquake insurance. Respondents in some instances may not have known what householder's insurance coverage was in effect, and may not have distinguished between earthquake and other forms of insurance. A few people said that their homes had been structurally reinforced in some way for earthquake reasons.

Since the ratio of benefit to cost for earthquake insurance is different for different homes and different locations, and since many buildings do not require structural reinforcement, the failure to take these two steps does not necessarily mean that the homeowner is unprepared or lacking in forethought. On the other hand, without at least making inquiries about earthquake insurance, the householder could hardly weigh the possible benefits against the costs so as to make an intelligent decision to purchase or not to purchase insurance. In three out of every four households, so far as the respondent knew, these inquiries had not been made.

A final three items were especially applicable to households in which there were children. We do not count all families with children--only those in which one or more children were living at home at the time of the interview. Six hundred (41.4 percent) of the households had minor children living at home. Three steps have been widely recommended for parents in such households. In the graph of these three measures we find the first substantial indication



EARTHQUAKE PREPARATIONS FOR HOUSEHOLDS WITH CHILDREN

of precautions taken specifically in preparation for an earthquake. Nearly half of the 600 respondents report that they have instructed the children in what to do in case of an earthquake. More than a quarter have developed family plans to be followed in an emergency, such as shutting off gas, etc. And about one family in five has some plan for getting the family members together again after an earthquake. Compared to the general disregard of most other earthquake preparations, this evidence of families with children planning to maintain the supportive family unit in an emergency is encouraging. Nevertheless, these minimal parental responsibilities for the welfare of children have still been ignored in a large share of homes.

The household containing children and the owner-occupied household have responsibilities in preparing for earthquake disaster that are not applicable to other households. It is possible that people in these households may also take more seriously the complete range of personal preparedness measures. In the accompanying table we list the ten personal preparedness items discussed earlier. Completion rates for each measure are reported so as to compare owner-occupied households with all other households, and households containing minor children with childless households. We record the percent who have acted, whether they did so because of a coming earthquake or for some other reason.

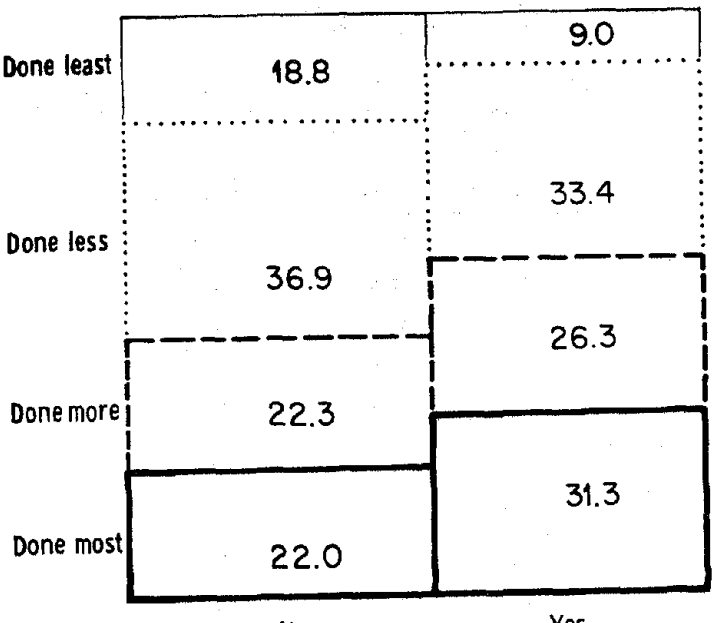
Both households with children and owner-occupied households have slightly higher rates of preparedness than other households. However, the effect of owner occupancy is stronger and more consistent than the effect of having children in the home. Owner occupancy makes an especially noticeable difference in possession of the household emergency staples--flashlight, battery-operated radio, and first-aid kit--while having children makes little or no difference.

EFFECT OF OWNER-OCCUPANCY AND MINOR CHILDREN IN HOUSEHOLD ON PERSONAL EARTHQUAKE PREPAREDNESS MEASURES TAKEN

	Percent who have taken action for any reason			
Preparedness measure	Owner-occupied households	all others	One or more child(ren) in household	all others
Have working flashlight	81.0	63.2	71.0	72.1
Have working battery radio	62.6	47.5	54.6	54.7
Have first aid kit	60.1	48.7	56.3	52.6
Store food	29.5	24.4	27.8	26.2
Store water	19.2	15.3	18.4	16.3
Rearrange cupboard contents	17.3	14.2	16.7	15.0
Replace cupboard latches	14.2	6.4	10.9	9.6
Contact neighbors for information	10.0	9.7	10.7	9.3
Set up neighborhood responsibility plans	4.8	3.2	6.5	2.1
Attend neighborhood meetings	2.6	0.9	2.2	1.4

Who is Prepared?

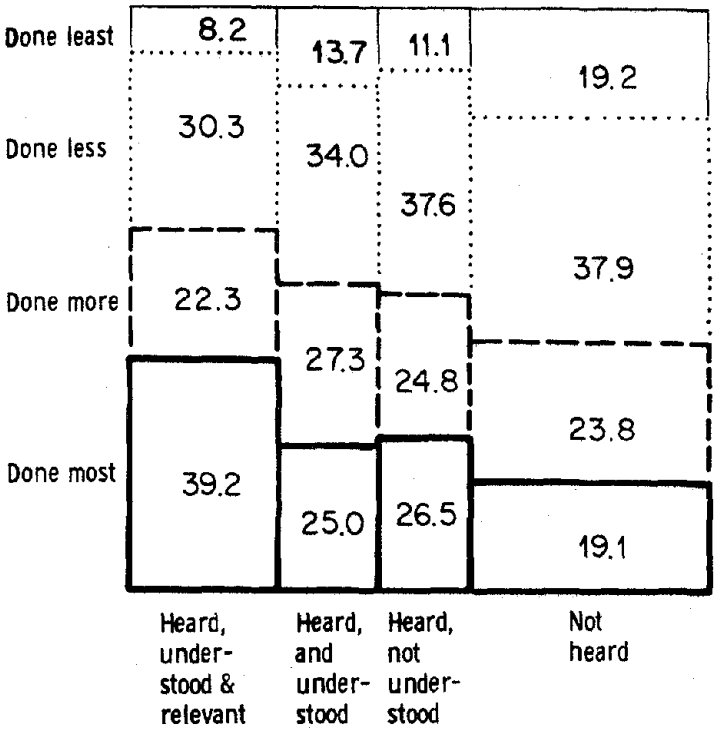
The general evidence of unpreparedness signals important work to be done--at least in the event of a true earthquake prediction and warning. In attempting to correct the underpreparedness it should be helpful to know which segments of the public are more and less well prepared. We have already seen that having minor children in the home makes little difference in the level of preparedness, while owner-occupied households are noticeably better prepared than rental households. In order to simplify comparisons of preparedness we have computed a preparedness index. The index simply states the number of measures taken (whether for earthquake or other reasons) as a proportion of the measures that could be taken. The latter number is different for owner-occupied, adult-child, and other households. The resulting index scores were then simplified so as to identify four sets of respondents, from the most prepared to the least prepared. The higher level of preparedness in owner-



EARTHQUAKE PREPAREDNESS BY
WHETHER HOME IS OWNED BY MEMBER OF HOUSEHOLD

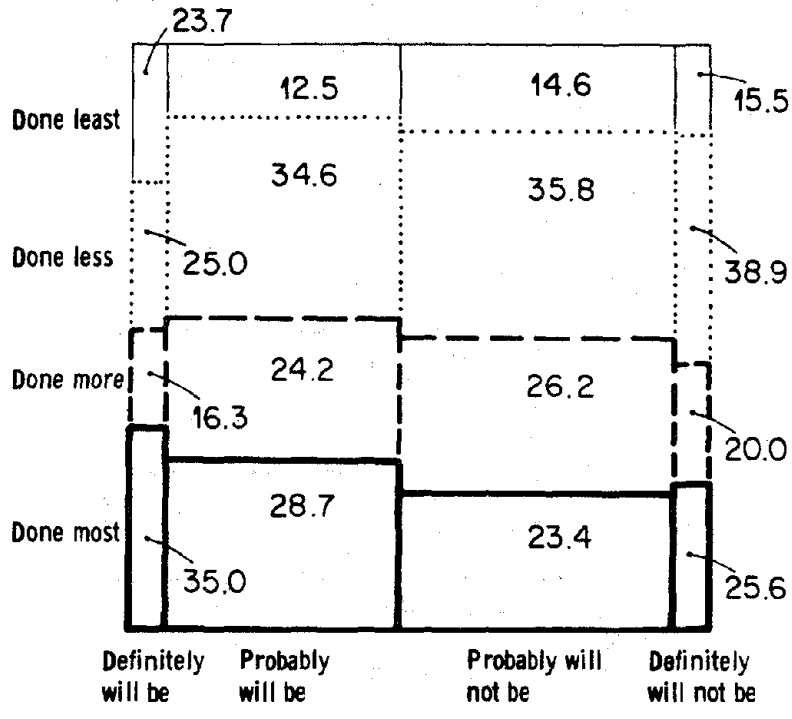
occupied dwellings that we have just noted is illustrated, using the index, in the accompanying graph.

We began this report by surveying the extent of awareness and appreciation of the southern California Uplift as a possible earthquake precursor. The obvious question is whether awareness and appreciation of the Uplift are converted into precautionary action. The graph shows that there is a clear correlation between awareness and action. When we compare the people who have heard of the Uplift, understood its significance, and realized that the earthquake it signifies might cause damage where they live, with people who don't remember hearing of the Uplift, twice as many of the former are among those who have taken the most steps in earthquake preparedness.



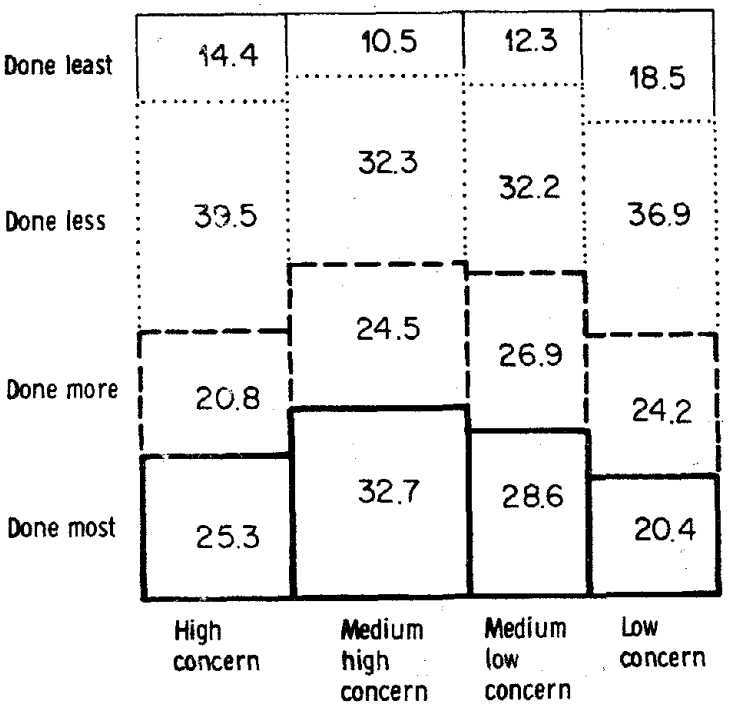
EARTHQUAKE PREPAREDNESS BY AWARENESS OF THE UPLIFT

In Chapter Three we were struck by the large proportion of Los Angeles County residents who expected a damaging earthquake within a year, and the detachment of this expectation in many cases from knowledge of any specific prediction, forecast, or caution. As the next graph shows, people who expected a damaging earthquake were more likely to have made some preparations than people who did not. However, this relationship is less striking than the relationship with awareness and appreciation of the Uplift. The difference between those who expect a quake and those who don't expect a quake is not nearly so great as between those who appreciate the relevance of the Uplift and those who don't remember hearing of it.



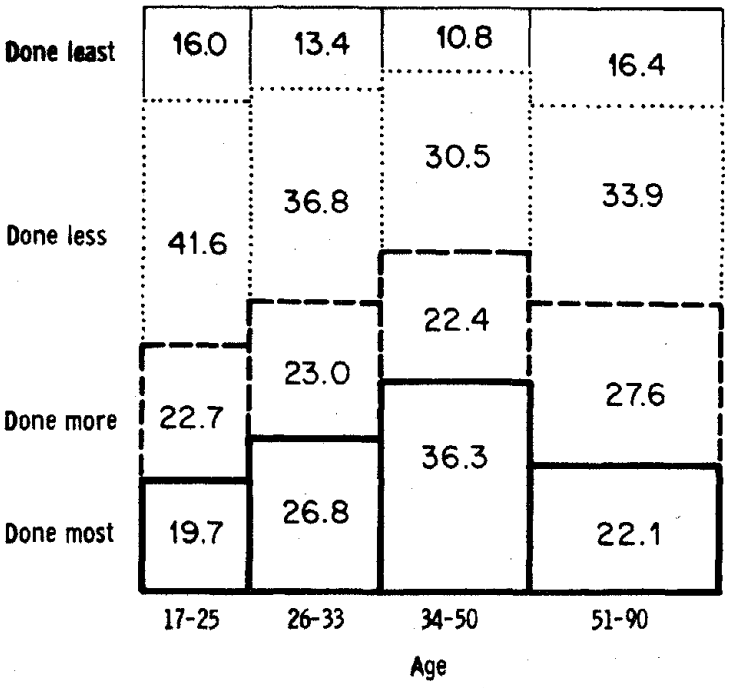
EARTHQUAKE PREPAREDNESS
BY EXPECTATION OF AN EARTHQUAKE

In Chapter Four we explored fear and concern over earthquakes. Again the obvious question is whether fear and concern are converted into action. Again, there is a clear relationship, but it is not so strong as for awareness of the Uplift. But the graph is interesting for the support it gives to a widely held hypothesis about the relationship between fear and action. This is the thesis that fear motivates action, but only up to a point. When the amount of fear exceeds a critical threshold, the effect is a sort of paralysis. From the graph we see that actions increase as fear and concern increase until we reach the highest level of concern, at which point the level of preparedness drops markedly and consistently.



EARTHQUAKE PREPAREDNESS
BY EXTENT OF CONCERN OVER EARTHQUAKES

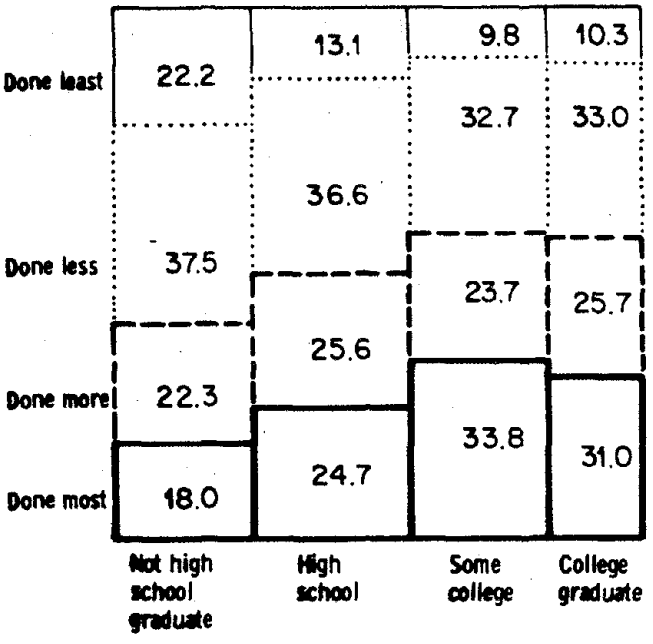
Thus far, awareness of the Uplift and living in owner-occupied housing are the most promising correlates of preparedness. It should be useful to examine the population groupings that we found were related to awareness of the Uplift in Chapter One. Awareness increased with age and was more widespread among men than among women. Since most of the measures apply to the household rather than to the individual, it is not surprising that men and women do not differ in preparedness. There is a relationship between age and preparedness, but it is not so simple as the relationship between age and awareness of the Uplift. Preparedness does increase fairly decisively with age until we reach people above fifty. For this oldest group there is a substantial drop in preparedness below the level of both 34 to 50 years and 26 to 33 years. Although the elderly are the most likely to appreciate the meaning and relevance of the Uplift, they are less well prepared for an earthquake than all but the



EARTHQUAKE PREPAREDNESS BY AGE

youngest group.

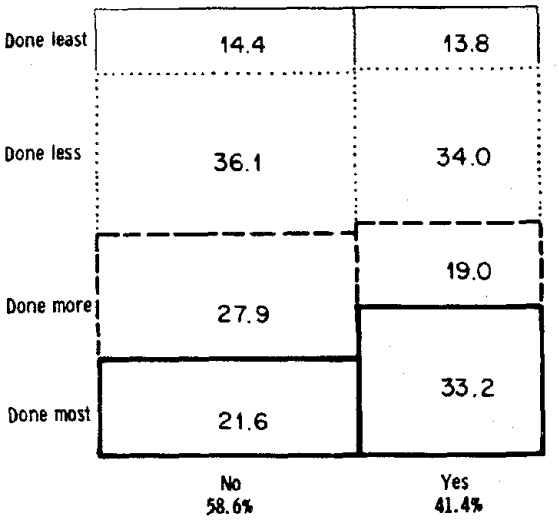
People who read a newspaper regularly appreciate the Uplift more fully and are also better prepared. Awareness increases consistently with educational attainment, but a similar relationship for preparedness does not extend to



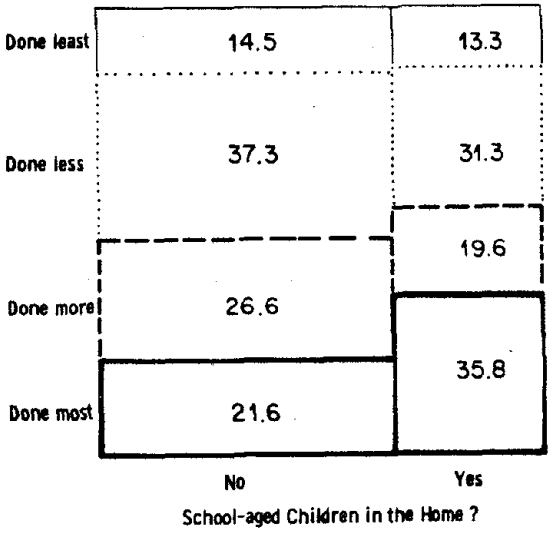
EARTHQUAKE PREPAREDNESS
BY EDUCATIONAL ATTAINMENT

college graduates. As with age, a decisively upward trend stops short of the highest category. College graduates are no better prepared--and possibly even a little less well prepared--than people who attended college without graduating from a four-year institution.

We were surprised to find less awareness of the Uplift in homes where there were school aged children than in homes without school aged children. We have already noted that the relationship for preparedness is in just the opposite direction. The relationship between children in the home and preparedness is presented again, this time in graph form using the index. In addition, for comparability with the finding for awareness of the Uplift we present the slightly different graph comparing households with and without school-aged children. Limiting our consideration to school-aged children augments the effect of children in the home on preparedness, in contrast to the opposite relationship to awareness of the Uplift.

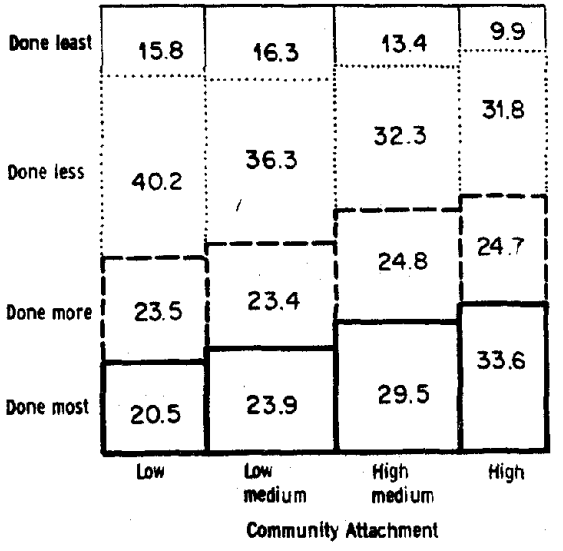


EARTHQUAKE PREPAREDNESS BY
PRESENCE OR ABSENCE OF CHILDREN IN HOUSEHOLD

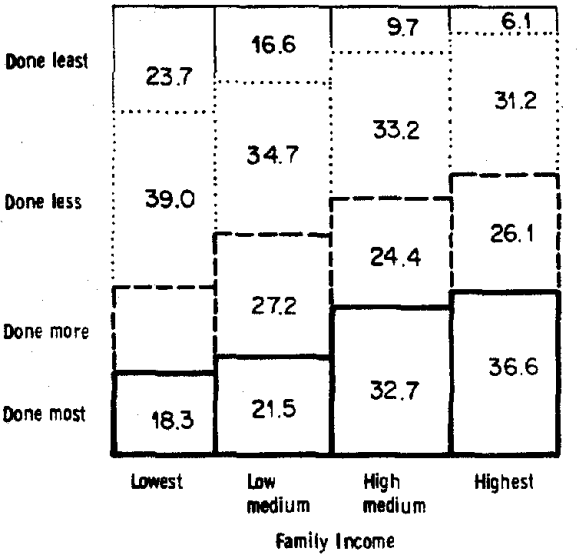


EARTHQUAKE PREPAREDNESS BY PRESENCE
OR ABSENCE OF SCHOOL-AGED CHILDREN IN THE HOME

Preparedness and awareness of the Uplift are consistently related to community attachment, both increasing as attachment increases. The same is [redacted] for family income. Whites are both more aware and better prepared than

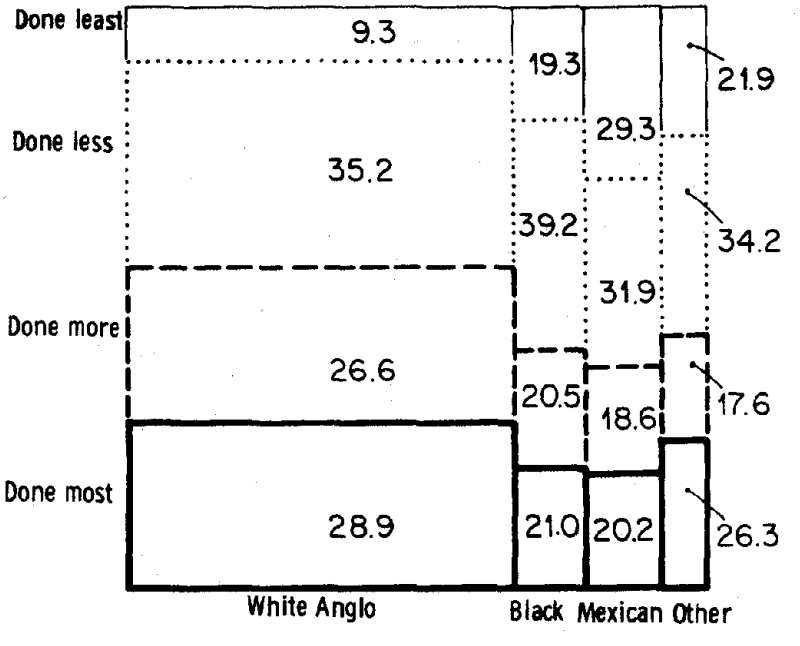


EARTHQUAKE PREPAREDNESS BY COMMUNITY ATTACHMENT



EARTHQUAKE PREPAREDNESS BY FAMILY INCOME

Blacks or Mexican-Americans, though persons of "other" ethnicity are even less aware of the Uplift but better prepared than Blacks and Mexican-Americans.



EARTHQUAKE PREPAREDNESS BY ETHNIC GROUP

We found an encouraging sign in the observation that the small group of people living in housing that was most vulnerable to earthquakes was also most often aware of the Uplift. But preparedness is unrelated to vulnerability.

The findings, viewed as a whole, indicate that there is a generally applicable tendency for the people who are most aware of the Uplift to be best prepared for an earthquake. But the correlation is far from perfect and there are notable exceptions. Greater awareness is not converted into more extensive earthquake preparedness among people over fifty years of age, among college graduates, among people who fear earthquakes intensely, and among people who live in the most vulnerable housing. On the other hand, people living in households where there are minor children, and especially children of school age, are better prepared than people in households without children in spite of being less aware of the Uplift.

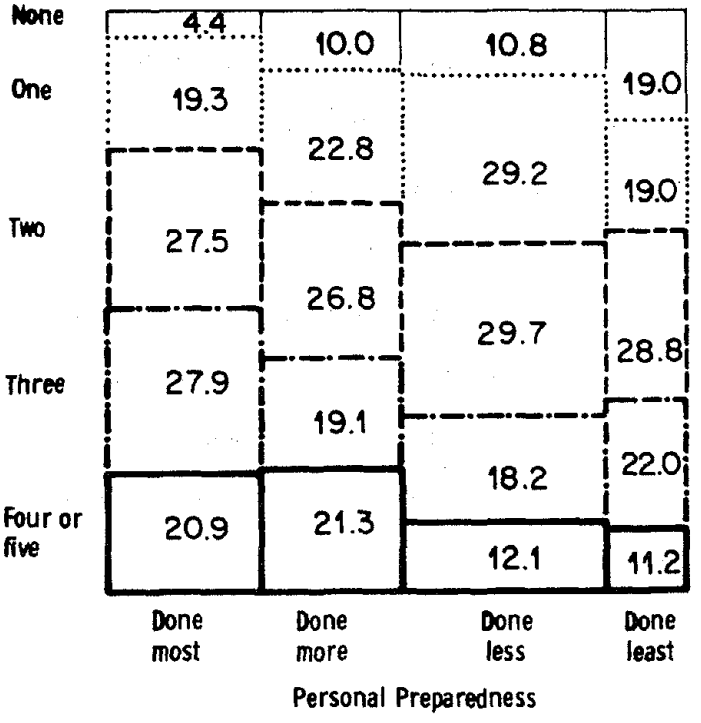
Once again we must repeat the caution that correlation does not necessarily mean causation, and causation is much more difficult to establish. It is plausible to conclude, though it is far from proven, that a program to increase awareness and appreciation of the Uplift and other information pointing toward a possible earthquake in the near future would also stimulate people to make reasonable preparations for an earthquake. But it would be essential in planning such a program to employ other approaches to deal with groups like those we have identified for whom the translation of awareness into action does not occur.

Personal Preparedness and Suggestions for Government Action

In this and the preceding chapters we encountered a widespread tendency to look to government to deal with earthquake hazard, coupled with a rather low level of personal preparedness. It is appropriate to take brief notice of whether having ideas for government action is related to personal preparedness

or not. Having many ideas for government action might be the expression of a "Let George do it!" attitude. In that case we should find no relationship between personal preparedness and suggestions for government action. We might even find that the people who are least prepared are the most ready to say what government should be doing. On the other hand, personal preparedness and being able to offer suggestions for government action might both be expressions of intelligent concern for earthquake safety. If this is true we should expect to find that people who are personally more prepared are also the ones who have offered the most suggestions for government action. We should then have reason to take their suggestions more seriously.

The graph shows the relationship between the number of suggestions for government action and the personal preparedness score. The relationship is



SUGGESTIONS FOR GOVERNMENT ACTION BY PERSONAL EARTHQUAKE PREPAREDNESS

not as strong as some we have encountered in this report, but it is clear and positive. In general the people who have more suggestions for public officials are themselves better prepared for an earthquake.

Chapter Nine

Where Do People Hear About Earthquake Danger and Earthquake Safety?

We have explored many aspects of awareness, feeling, and action about earthquake danger. We have established that most people would like to be better informed than they are about the earthquake prospect and what to do about it. But how have they acquired the information (and misinformation) they already have? And where do they look for more information? In sorting out what they have heard, how do people make up their minds? In this chapter we shall examine the principal sources of information on earthquake matters and the extent of discussion among friends and associates. The practical importance of such information to officials and others with responsibility for keeping the public informed and insuring preparedness is too obvious to need comment.

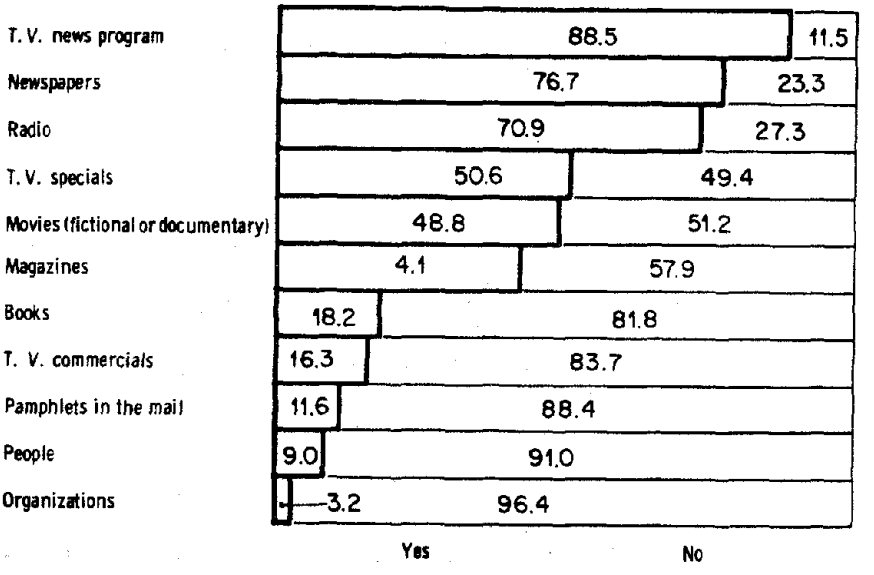
The Mass Media

Sources of Information. One question in the interview provides the most general answer to the queries we have just posed. During the latter half of the interview respondents were asked:

> We'd now like to ask you some questions regarding where you have heard about earthquakes. During the past year have you heard about earthquakes or earthquake predictions or earthquake preparedness from any of the following sources?

Respondents answered "yes" or "no" to each item on a list of sources, which are given in the graph. The sources "people" and "organizations" were not on the list that was read to the respondents, but were most frequently mentioned in response to the concluding item, "Any other source?"

The sources break down roughly into four groups. The great majority of people have heard about earthquake matters from television news programs,



SOURCES OF INFORMATION ABOUT EARTHQUAKES, EARTHQUAKE PREDICTIONS, AND EARTHQUAKE PREPAREDNESS

radio, and newspapers. The television news program stands out as the nearly universal source. About half the people have learned from television specials, fictional or documentary movies, and magazines. Television specials are an important source of earthquake information, but they cannot rival the highly selected and abbreviated reports given on regular television news programs in reaching the community.

Small but significant minorities have heard or read about earthquakes in books, television commercials, pamphlets in the mail, or from friends, family members, and associates. More respondents might have given "people" as an information source if it had been listed on the interview schedule rather than volunteered as an additional source. In listing television commercials and pamphlets in the mail we were thinking of the short cartoons on earthquake preparedness that were developed by the California Office of Emergency Services and aired on many television channels during 1976, and the home preparedness leaflets distributed with utility bills. Although these sources had a significant impact, they did not command the public attention that items on regul

television news programs might have done. Finally, organizations appear to have played a rather insignificant part in the information process, though again, organizations might have been mentioned more often if listed in the interview.

It is important to remember that most people do not rely exclusively on one source for their information. In the table we have indicated the number of different media sources from which each person has heard or read about earthquakes. The cumulative percentages show that nearly half of the respondents

Number of Media Sources of Information about Earthquakes,[1] Earthquake Predictions, and Earthquake Preparedness

Number of sources	Percent	Cumulative Percent
None	2.3	---
One	7.2	97.7
Two	10.7	90.5
Three	15.5	79.8
Four	17.9	64.3
Five	17.7	46.4
Six	15.5	28.7
Seven	8.3	13.2
Eight	3.8	4.9
Nine	1.1	1.1
Total	100.0	
Number of persons	1450	

have heard or read about earthquakes from five or more of the sources. Nearly two-thirds have used four or more sources. Only one person in every fourteen has heard of earthquakes from just one media source.

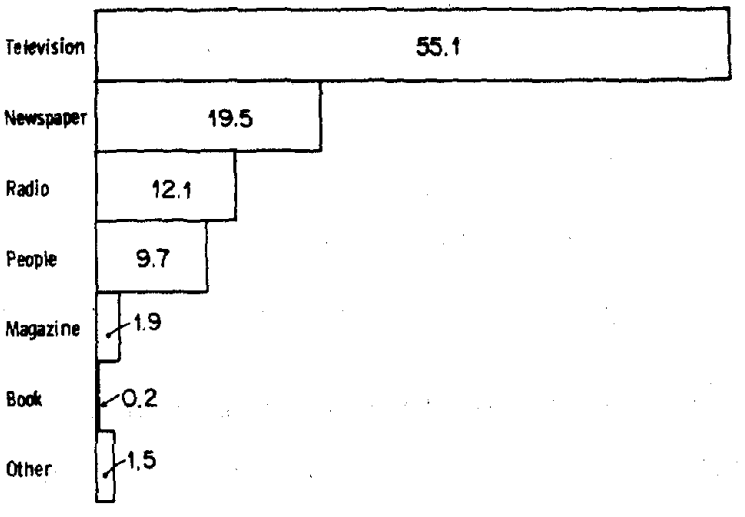
Further evidence on information sources comes from a question asked about each of the earthquake predictions, forecasts, and cautions people remembered hearing during the preceding year. The series of questions about each of the announcements that people remembered was described in Chapter

Two. As part of this series, we included the question:

> Do you remember what your chief source of information about this prediction was?

Specific answers were not suggested to the respondents, and the interviewer was to write down only the one chief source. The question was asked about each of the announcements the respondent mentioned. Consequently, for people who did not remember any announcement the question was not asked at all, while for others it could be asked as many as five times.

The graph based on this question cannot be precisely compared with the previous graph because percentages are based on the 1788 reports of announcements rather than the 1450 respondents, and because the volunteered answers could not be broken down into exactly the same categories. However we can make a general comparison between where people most frequently hear about earthquake matters and which sources they rate as most important.



CHIEF SOURCE OF INFORMATION ABOUT EARTHQUAKE PREDICTIONS, FORECASTS, AND CAUTIONS

The three primary sources and their order remain the same. But the differences in relative importance are greatly accentuated. Television stands out as the principal source for the majority of people. Television is named by nearly three times as many people as newspapers, and more than four times as many as radio. Later in the chapter we will report a breakdown of "p-

sources. But here we see that "people" sources assume greater importance than before, surpassing magazines and books. While not many respondents think of their family, friends, and associates as a source of information on earthquakes, many of those who do are inclined to rely on people as their chief source of information. Thus in spite of the preponderant reliance on the three principal media of mass communication, it may still be necessary to reach some people through personal networks.

Sources by Type of Announcement. Answers to the question on chief source of information can be analyzed further to determine whether people learn about different kinds of predictions, forecasts, and cautions from different media sources, and whether they take what they learn from some sources more seriously than what they learn from other sources. First we grouped the announcements people mentioned into scientific, general, pseudoscientific, and prophetic, according to the classification used in Chapter Two. In addition we looked separately at the Minturn forecast and the forecast that California will break off and fall into the Pacific Ocean. These two forecasts merit separate attention because of the wide recognition they received. For each we record the chief source of information as given to us by the respondents. By comparing the columns in the table we can decide whether different media are associated with different kinds of predictions and near predictions.

The most general observation from the table is that the order of reliance on the media remains largely the same irrespective of the type of prediction. Television is the principal source for all types of announcement and newspapers come next. There is a reversal, however, between radio, which usually ranks third, and "people," which usually ranks fourth, in case of prophetic announcements. A similar reversal also applies to the folkloristic belief that California will fall into the ocean. Magazines and books fall behind

Chief Source of Information by Type of Earthquake Prediction, Forecast, or Caution

Type of Medium	Inclusive types of announcements				Specific announcements	
	Scientific	General	Pseudo-scientific	Prophetic	Minturn	Calif. Breakoff
Television	47.1	58.3	51.3	43.7	54.9	37.4
Newspapers	27.5	14.1	18.5	23.6	17.9	22.0
Radio	10.1	11.4	13.6	5.6	13.4	11.4
People	6.2	8.8	11.1	7.6	9.7	15.4
Magazines	22.2	1.5	1.3	5.6	1.0	4.1
Books	0	0	.3	.7	.2	.8
Other, Don't know	6.9	5.9	3.9	13.2	2.9	8.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of announcements mentioned	276	660	708	144	619	123

the other media except again in the case of prophetic announcements, in which they rank ahead of radio but behind "people."

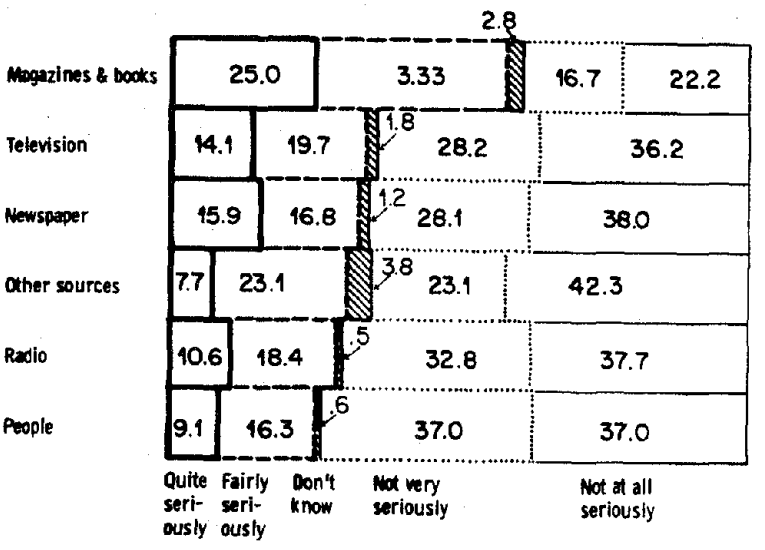
Bearing in mind that the general order of reliance on the media is more similar than dissimilar and that television and newspapers are the most important media in all cases, we can still observe some affinities between particular media and types of announcements. There is some affinity between television and general announcements. Relatively more of the people who mentioned rather vague and general earthquake forecasts credited them to television. Perhaps television commands a low level of attention for detail, or specializes in very brief news items, or perhaps it is just that more people are exposed for longer periods to television. In contrast, there is an affinity between newspapers and scientific announcements. The reporting of scientific announcements is facilitated by the provision for longer items in the newspaper, and people who are interested in science are probably more motivated to make the effort to read newspaper stories. Radio and "people" as sources show affinity with pseudoscientific announcements. The affinity also shows separately for both the Minturn and "Breakoff" forecasts. It is quite in accordance with theorie

of rumor that pseudoscientific beliefs should be spread especially by word of mouth while the printed word is especially prominent in the spread of scientific information. The special role of radio, however, may be a historical accident relating to the circumstances under which the Minturn forecast was publicized. On the other hand, radio "call in" and "talk" shows may contribute to the spread of rumors by airing them and being especially responsive to timely public preoccupations, even while program moderators attempt to discredit them.

Prophetic announcements, while credited principally to the leading media, show a distinct affinity with books and magazines and with "other and don't know" as a source. One interpretation of this affinity is that the worlds of secular and religious prophecy have their own networks and media for communicating among those who are interested in prophecy. To a greater extent than is true for the other types of announcement, they supplement the standard media with their own books and magazines and, perhaps, tracts and meetings.

We also have a separate record of people's chief source of information about the southern California Uplift. The record includes people who mentioned the Uplift in answer to the open question about predictions, forecasts, and cautions, and the much larger number of people who remembered hearing about the Uplift when asked about "a bulge in the earth near Palmdale in the Mojave Desert." The pattern of information sources is almost identical to that for all scientific announcements, and equally different from the pattern for general, pseudoscientific, and prophetic announcements.

Credibility of Sources. We have established the dominance of television as a source of information on earthquake-related topics, modified by some affinity between particular types of near prediction and particular media. We have yet to ask whether the media differ in their credibility. In Chapter Two we reported that some predictions, forecasts, and cautions were taken more seriously than others. It is a straightforward matter to compare the seriousness with which announcements attributed to different media are taken. This comparison



HOW SERIOUSLY PREDICTIONS, FORECASTS, AND CAUTIONS ARE TAKEN BY CHIEF SOURCE OF INFORMATION

is presented graphically.

The most striking finding is that magazines and books are given much higher credibility than the other sources. From the infrequency with which magazines and books were identified as the chief sources for predictions and near predictions, we might have prematurely discounted their importance in communication for earthquake preparedness. But with more than half of the announcements being taken seriously, the importance of magazines and books is greater than the frequency with which they are cited would suggest. Perhaps, too, prophetic announcements would have been taken seriously less often if they were not disproportionately reported in magazines and books.

The differences among the other sources are not striking. Television and newspapers are about equally credible, coming next after magazines and books. Radio falls below television and newspapers, having about half the credibility of magazines and books. The variable mixture of "other sources" falls between radio and the leading media in average credibility.

Although the difference is slight, "people" have the least credibility as sources of information about predictions, forecasts, and cautions. This observation confirms the impression formed earlier in this chapter that "peo

as information sources are distinctively associated with rumor. The low level of credibility suggests that many people recognize the difference between rumor and more carefully substantiated information. This finding also underlines the power of the mass media. Although discussion with family, friends, and co-workers undoubtedly contributes to the interpretation of earthquake announcements, attention by the media is more effective than word of mouth dissemination in leading people to take an earthquake forecast or prediction seriously.

Groups and Individuals as Information Sources

Group meetings. An important means for disseminating self-help information and stimulating activity in American society is through group meetings. Either established organizations such as schools, service clubs, and work groups schedule meetings on the chosen topic, or ad hoc neighborhood groups are created to hold meetings. Speakers on earthquake preparedness are secured from the local Civil Defense Coordinator or comparable official, a service agency, a university, the U.S. Geological Survey, or a private group organized to offer such presentations. We are interested in how many people have been exposed to this source of information. Neighborhood meetings are often considered superior to the mass media because they command the listeners' undivided attention for an hour or so in a way that television, radio, and newspapers in the home cannot. In addition, the personal presence of the speaker, the opportunity for questions and discussion that relate the message to the local situation, and the spirit of neighborhood cooperation that is often aroused in the process of organizing a meeting should all contribute to the effectiveness of this kind of communication.

Respondents were asked whether they had heard about earthquakes, earthquake predictions, or earthquake preparedness from club meetings, school programs,

church group meetings, work group meetings, neighborhood or block meetings, or other types of meetings within the last year. The table indicates how many people participated in one or more of these kinds of meetings. From the

Number of Different Types of Group Meetings on Earthquake Topics Attended

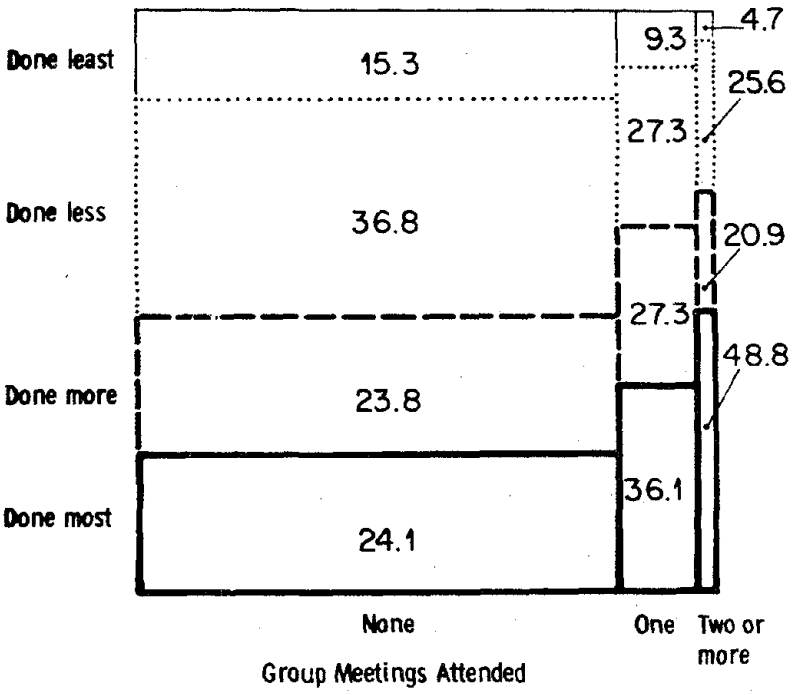
Number of types	Percent	Cumulative percent
None	82.7	---
One	13.4	16.3
Two	2.0	3.0
Three	.7	.9
Four	.2	.2
Total	100.0	
Number of persons	1450	

column of cumulative percentages we can see that 16.3 percent of the respondents had participated in one or more kinds of meetings, while only 3 percent had participated in two or more kinds of meetings. Since very few people attended more than one meeting of a given type, these figures correspond quite closely to the total number of meetings people attended.

The great majority of the people had not been exposed to meetings as a source of earthquake information at the time of our survey. The figures in the table may even exaggerate the true rates of participation since followup interviews indicated that a few respondents were thinking of meetings at the time of the 1971 San Fernando earthquake, and a few were thinking of quite casual conversations rather than organized meetings. The first impression is that group meetings have made very little contribution to earthquake awareness and preparedness. However, it is quite possible that people who attend meetings become a source of information for others, thus multiplying the influence of the meetings. One might also speculate that participation in meetings by a

many as 15 percent of the population at a time when urgency and salience of the earthquake threat are low is an indication that many more people would be ready to participate if the threat became more urgent.

The following graph relating attendance at meetings with personal preparedness, while it cannot demonstrate what is cause and what is effect, does show a substantial correlation. People who have attended a meeting are



PERSONAL PREPAREDNESS BY GROUP MEETINGS ATTENDED

better prepared than those who have not, and those who have attended more than one meeting are even better prepared. Meetings should therefore not be slighted as an important device in promoting awareness and preparedness.

The relative importance of the different types of meetings is indicated

Types of Group Meetings on Earthquake Topics Attended

Type of Group	Percent
Club meeting	1.5
School program	6.5
Church group	2.8
Work group	6.7
Neighborhood/block meeting	.8
Other type	2.1

by a second table. The majority of the meetings were work group sessions and school programs. Church programs and club meetings come in a distant third and fourth in frequency of attendance. Only twelve people remembered attending a neighborhood or block meeting. The meaning of these figures is rather clear. Strictly grass roots organization in which a local catalyst stirs neighbors and friends to arrange a meeting at which they can learn about earthquake preparedness is extremely rare. Meetings are most frequently organized by employers or school officials who have both a moral and legal responsibility for the wellbeing of their personnel. The initiative for many of these meetings may have come from employees or the parents of school children, but the meetings were planned under the auspices of the employer or the school. As a general rule, meetings to reach a large spectrum of the population can probably be organized more effectively by taking advantage of institutional responsibility and established facilities than by attempting to stimulate a truly grassroots movement.

Local experts. We recall that some of our respondents heard about earthquakes from family members, friends, and associates, and that "people" were given as the chief source of information about nearly 10 percent of the predictions, forecasts, and cautions remembered. The table indicates that

People as the Chief Source of Information about Earthquake Predictions, Forecasts, and Cautions

Type of relationship	Percent of all respondents
Friend or neighbor	5.6
Family member	1.7
Co-worker	1.5
Relative	.9
Total	9.7
Total number	167

respondents who name some person as their chief source of information name someone outside of the family and the work group. Neighborhood and friendship networks are most important here.

Studies of public opinion formation have shown that on many issues people turn for information and advice to specific friends and acquaintances who are believed to have special knowledge or wisdom on the subject under debate. These people have been called "opinion leaders" or "local experts." They often play a critical role in shaping public opinion. In order to determine whether such local experts might be influential in forming attitudes and stimulating action on earthquake preparedness, we asked the following question:

> Including yourself, is there anyone in your circle of friends who seems most knowledgeable about earthquakes or earthquake predictions?

If the answer was "yes," respondents were asked:

> Who is that?

A total of 259 respondents, or 17.9 percent of the entire sample, said they knew a local expert. When we separate the 36 respondents who named themselves, 15.4 percent of the sample knew someone they regard as expert and another 2.5 percent identify themselves as neighborhood experts. About half of the experts were identified as friends, about a third as relatives and

members of the immediate household, and about one eighth as work associates.

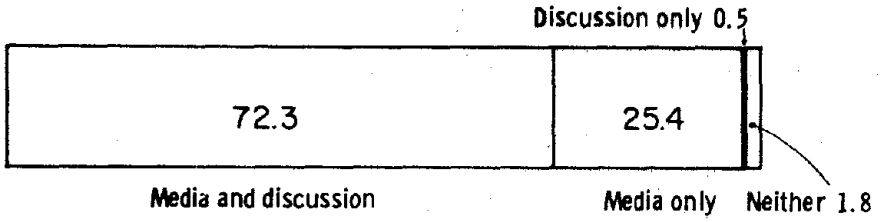
The overwhelming majority of the people have no one in a personal relationship that they can turn to for their special knowledge or wisdom on earthquake matters. If theories about the role of local expert or opinion leader are correct, this lack may contribute to public uncertainty and indecisiveness. Perhaps, too, it leaves public attitudes more directly at the mercy of the mass media than is true in many other realms of public concern.

Informal Discussion of Earthquake Matters

Whether there are local experts and grass roots organizations to turn to or not, people usually discuss what they hear and read in the mass media with family members, friends, neighbors, and associates before they act on it. To what extent have earthquake near predictions and other communications stimulated informal discussion? A series of questions was devised to let us know how much discussion occurred, with whom it took place, and on what aspect of the earthquake concern. Questioning began as follows:

> To this point, we have discussed public sources of information on earthquakes. We would now like to know whether, within the last year, you have talked with anyone about the possibility of an earthquake happening in southern California.

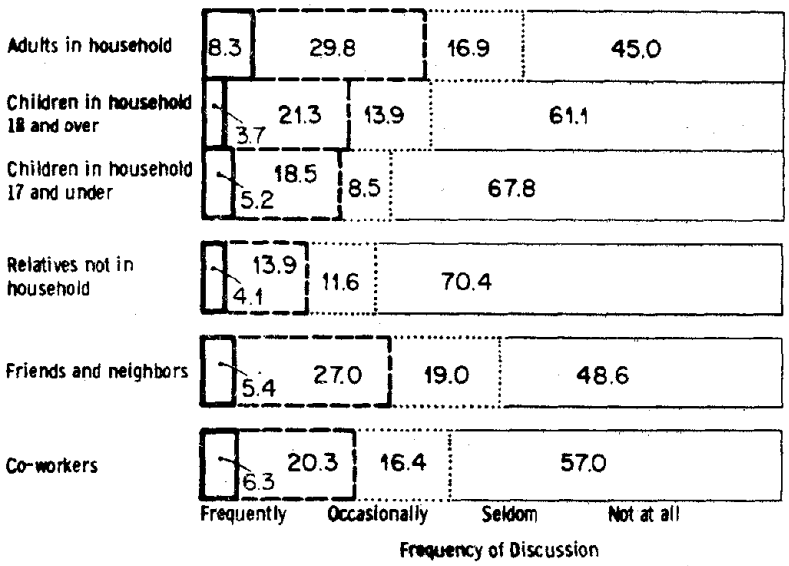
A large majority (72.8 percent) said they had participated in such a discussion. The question naturally follows, is this discussion a substitute for other information sources or a supplement? One answer to that question can be secured by putting each individual's answer to this item together with his answer to the previous question about media sources. The graph reveals that nearly three-quarters of the respondents combined use of media sources of information with informal discussion. About a quarter of the people said they heard about earthquakes from the media, but did not supplement that information by entering into discussion with family, friends or associates. Only eight people used discussion as a substitute for the media information sources. Although inform



RELIANCE ON MEDIA SOURCES
AND DISCUSSION OF EARTHQUAKE CONCERNS

discussion does not take the place of the mass media, it is extensively enough used as a supplement to play an important role in shaping public opinions and actions.

The answer to the question, with whom do people discuss earthquake matters? is found in the next graph. As would be expected, adults in the



PARTNERS IN INFORMAL DISCUSSION OF EARTHQUAKE MATTERS

household are most often partners in discussion. But children are either sheltered from these discussions or considered less interested or knowledgeable. Friends and neighbors are next in importance after adults in the same household, and co-workers come next.

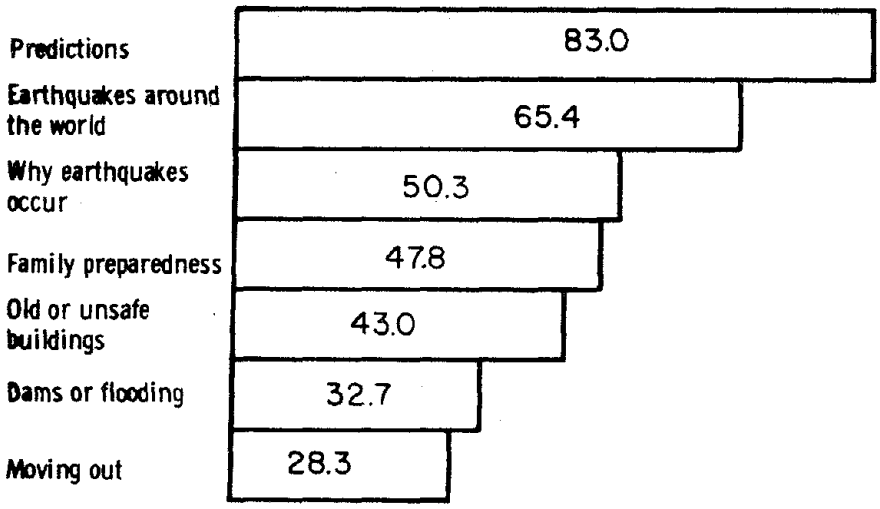
In computing the percentages used in the graph we have made adjustments he number of people who could possibly have discussions with each type

of partner. Since only 944 of our respondents lived in households with one or more other adults, we used 944 rather than 1450 in computing percentages. Similar adjustments were made for the 884 who were employed full- or part-time, the 600 with children in the household under the age of 18 years, and the 108 with children eighteen years old and over in the household. It was assumed that everyone could talk with friends and neighbors and with relatives not in the household, so these percentages are based on the total sample of 1450 persons.

If we were measuring the contribution of discussion with each type of partner to total public consideration of earthquake matters, the rank order would be changed. Conversations with friends and neighbors make the greatest contribution to total public discussion, followed (in order) by conversations with adults in the same household (35.8 percent), with relatives not in the household (29.6 percent), and co-workers (26.2 percent). Children make a much less numerous contribution to public discussion, with 13.3 percent of respondents discussing earthquakes with children under eighteen and only 2.9 percent doing so with children eighteen years and older.

At least two simple observations are warranted by this analysis. First, although there is a good deal of discussion within the family or household, discussion is important in establishing linkages between the household and the neighborhood, the extended family, and the workplace. All of these linkages can be important in supplying perspective from which to interpret the news. Second, children are less often mentioned than might have been expected if they are learning things of relevance at school or if they are regularly part of planning for family wellbeing in case of disaster.

The topics that are discussed are presented in the next graph. The list of topics was read to the respondents, who were asked to indicate which ones they had discussed during the preceding year. The relative frequencies for the seven topics are surprising from one point of view. If we assumed that



INFORMAL DISCUSSION BY EARTHQUAKE TOPICS

people are most interested in the immediately practical matters, we might have expected more discussion of family preparedness. Because of the sensational character of news about the Tangshan and northern Italy earthquakes and others during the preceding year, it is not surprising that "earthquakes around the world" is a popular topic for conversation. But it is striking that 83 percent have discussed predictions--more than can remember any specific prediction or near prediction (Chapter Two)! And it is also striking that half the people say they have discussed "why earthquakes occur." Here is an indication that many people want to understand what is going on about them.

These observations serve to complement the findings reported in Chapter Five, that most people would like to hear more rather than less about even the relatively abstract topic of scientific earthquake prediction. That the topic of predictions commands nearly double the attention that family preparedness does may lend support to the view that people are not likely to turn much attention to preparedness until they are confident that they are subject to fairly certain and imminent danger. Perhaps at this stage people are more interested in knowing whether there will be an earthquake than in what to do

[illegible]ut it.

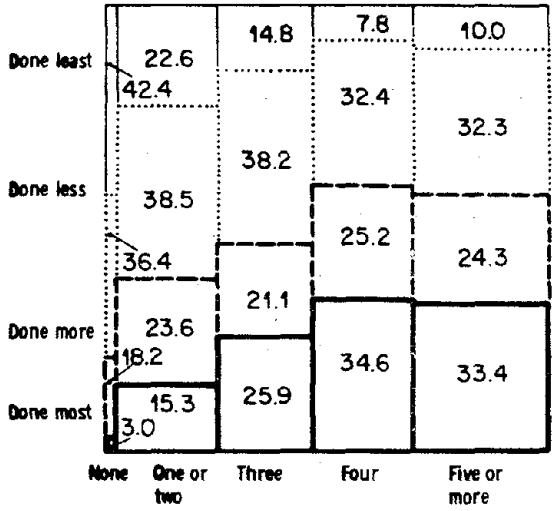
The Significance of Communication

A final question is whether it makes any difference how extensively people make use of the mass media and personal discussion in learning about the earthquake prospect and deciding what to do about it. We have already provided a partial answer to this question by showing that people who have attended one or more meetings on an earthquake topic are better prepared for an earthquake than those who have not.

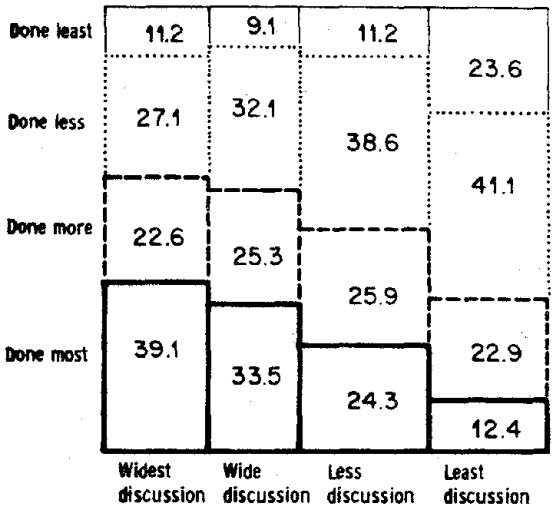
We have combined some of the crucial information presented in this chapter into two indexes, one dealing with use of the mass media and one dealing with informal discussion. The first index is simply the number of media sources from which the respondent has learned about earthquake matters. People who score high have used a variety of media sources; people who score low have relied on only one or a very few sources. The second index is based on the number of different kinds of partners with whom the respondent has discussed the possibility of an earthquake happening in southern California. Someone who had not entered into discussion with anyone, or who had talked only with a spouse or only with co-workers, for example, received a low score. Someone who had talked about earthquakes both in and out of the family, with co-workers and with friends, with adults and with children, received a high score. In order to make comparable scores possible for all respondents, indexes were adjusted according to household composition and whether the respondent worked or not.

The two indexes were related to three measures of significance that are already familiar to readers of this report. First, we asked whether people who used the media more extensively and people who discussed the earthquake prospect more widely were more often aware of the southern California Uplift and more appreciative of its personal relevance (Chapter One). Second, we asked whether use of the media and informal discussion contributed to having several ideas about what government should be doing about the earthquake

hazard. Finally, we asked whether people who made more diversified use of the media and engaged in informal discussion with a wider range of partners were personally better prepared for an earthquake. In all instances the answers are strongly positive. The relationships are all of quite similar magnitude, except that the number of ideas for government action is more strongly related to informal discussion than to the use of the media, for reasons that we find obscure. Because the relationships are generally similar, we have graphed only the two relationships involving personal preparedness.



PERSONAL EARTHQUAKE PREPAREDNESS BY MEDIA SOURCES OF INFORMATION ABOUT EARTHQUAKES



PERSONAL EARTHQUAKE PREPAREDNESS BY RANGE OF DISCUSSION PARTNERS

As always, we must be careful not to interpret these relationships as if we have demonstrated cause and effect. It is certainly plausible to conclude that hearing about earthquakes from a variety of media sources and being engaged in informal discussion in a variety of social settings contributes to awareness and appreciation of the earthquake prospect, having ideas about what government can do to lessen the prospect of disaster, and maintaining some degree of personal preparedness. But we cannot rule out the alternative possibility that interest or awareness is the initial cause, accounting for a high level of attention to discussions of earthquakes and a degree

of preparedness. In either case, the data clearly show that communication and intercommunication are integrally related to appreciation and action in dealing with earthquake hazard.

A brief final note is in order concerning the involvement of different segments of the public in the communication process. Based on the two indexes described above, men report a wider use of the mass media while women report a wider range of discussion partners. Both the range of media use and the range of discussion partners decline for people over fifty years of age. The widest discussion occurs between the ages of twenty-six and fifty. Both media use and range of discussion partners increases fairly steadily with education and income. Whites are more extensively involved with both media reports on earthquakes and informal discussion of earthquakes than either blacks or Mexican Americans. Blacks and Mexican Americans are quite similar in the numbers who use the media very little if at all for earthquake information. But more blacks than either whites or Mexican Americans are included among persons who learn about earthquakes from nearly all the media, indicating more polarization between high and low media use among blacks. Mexican Americans are more widely involved in informal discussion of earthquake topics than blacks.

High residential vulnerability to earthquakes, which contributed to awareness and appreciation of the Uplift, is unrelated to either media use or discussion. The same is true of community attachment. Having school children in the household meant lessened awareness of the Uplift but a higher level of personal earthquake preparedness. The pattern of complex relationships continues as we find that having school children in the household is unrelated to use of the media for earthquake information, but does mean more widespread discussion of earthquake topics, even with partners other than children.

Chapter Ten

Is Science Respected?

A constructive response to an earthquake warning depends crucially on public respect for science. When meteorologists issue tornado or hurricane forecasts, people often decide whether to take the forecasts seriously or not by looking for telltale cloud formations and wind changes or "feeling" for sudden temperature drops. But there are no generally accepted signs by which people can confirm an earthquake forecast through the testimony of their own senses. The scientific conclusion will probably be the only information people have in deciding whether to take protective action or go on with life as usual. Public appreciation of science and trust in scientists is therefore likely to be more important in determining how people respond to warning of an impending earthquake than it is for other kinds of natural disaster.

Respect for Science

In Chapter Two we have already noted that scientifically based predictions and near-predictions are more often taken seriously than forecasts from other sources. While this finding seemed to indicate substantial respect for science, the conclusion is weakened by two associated findings. First, many people have heard scientific announcements of earthquake danger that they did not take seriously. And second, even fewer of the announcements that people attribute to scientific sources are taken seriously. A series of questions was included in the survey in order to shed further light on the public appreciation of science.

The first question is whether people believe that scientists can predict

earthquakes. Respondents were asked:

> How accurately do you believe scientists can predict earthquakes at the present time? Would you say: Quite accurately, Somewhat accurately, Not too accurately, or Not at all?

As indicated in the table, only one in twenty believes that scientists can now

How Accurately Scientists Can Predict Earthquakes Now

Degree of accuracy	Percent
Quite accurately	5.4
Somewhat accurately	36.4
Not too accurately	38.3
Not at all accurately	18.1
Don't know	1.7
Total	100.0
Total number	1450

predict earthquakes quite accurately. But a striking 42 percent believe that scientists can predict earthquakes "somewhat accurately" or better. Since relatively few earthquake scientists would have claimed the ability to predict fairly accurately at the present time, these replies express a striking vote of confidence--or overconfidence-- in science. The majority are more skeptical. But the large minority who credit scientists with more than they can do constitutes an important segment of the public. Either these people have not read and listened carefully for the many reminders of fallibility that are part of the typical scientific announcement, or they think of science as a sophisticated form of magic.

A more adequate indication of faith in science can be gained from belief in the future capability to predict earthquakes. All the respondents who did not say that scientists can now predict earthquakes quite accurately were next asked:

In the future, how accurately do you think scientists will be able to predict earthquakes? Would you say: Quite accurately, Somewhat accurately, Not too accurately, or Not at all?

Here we find that a striking 83.6 percent believe that scientists either can or will be able to predict earthquakes fairly accurately. About half of these people believe that quite accurate prediction is either here or in the future.

How Accurately Scientists Will Be Able to Predict Earthquakes in the Future

Degree of accuracy	Percent
Now: Quite accurately	5.4
In the future:	
Quite accurately	36.7
Somewhat accurately	41.5
Not too accurately	9.1
Not at all accurately	4.2
Don't know, depends, or no answer	3.1
Total	100.0
Total number	1450

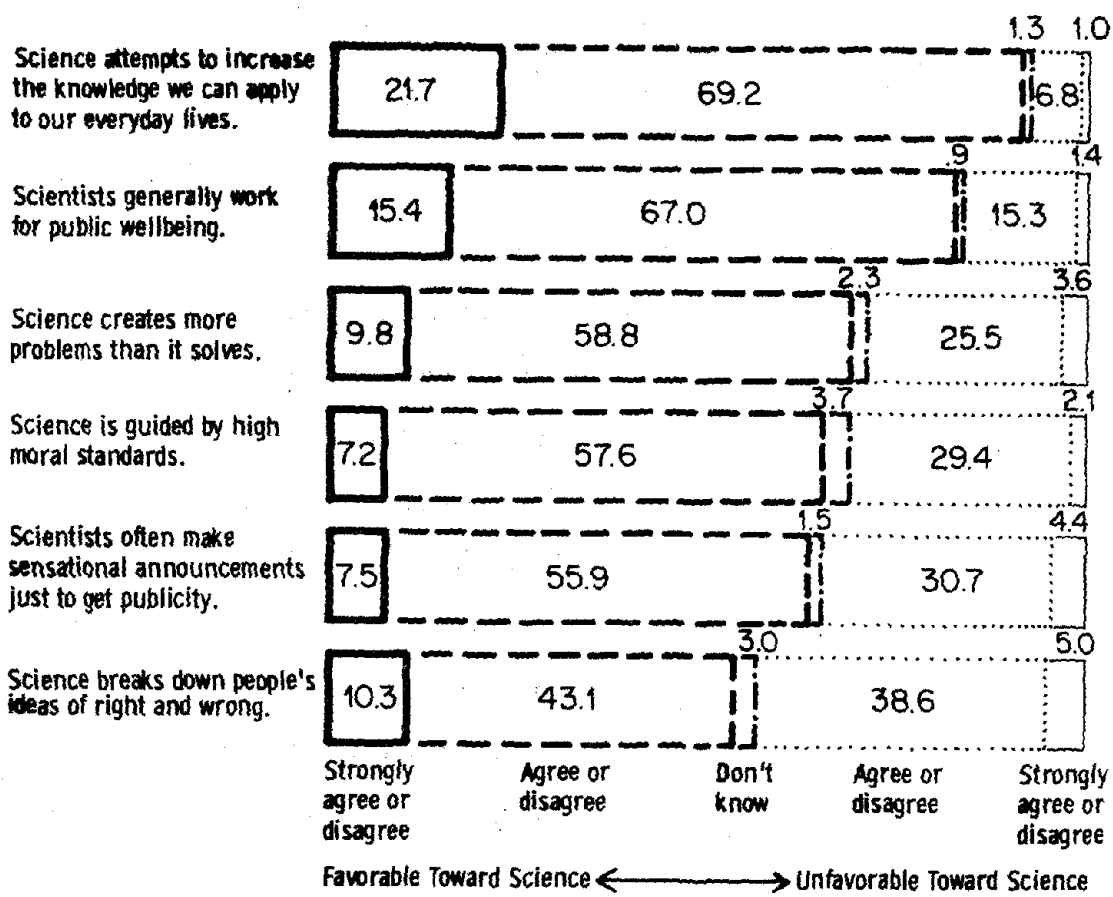
Only one person in fourteen is either completely skeptical or unwilling to make a judgment. Certainly the level of confidence in science is high. Problems with the public are more likely to revolve about overconfidence and excessive expectations than about skepticism of scientific claims.

The confidence that most of our respondents place in the prospects for scientific earthquake prediction does not preclude some ambivalence toward science and scientists. Nor does it preclude the existence of an actively antiscientific attitude in a significant minority of the population. A series of six questions about science and scientists in general was used to look for possible ambivalence. A card was prepared with the four desired answers on it. The interviewer announced the series of questions as follows:

In this part of the questionnaire we will be asking your opinions about science and scientists in general.
(Hand card to respondent) As I read each of the following, please tell me whether you strongly agree, agree, disagree, or strongly disagree with each of these statements.

The wording of the six statements is reproduced in the accompanying graph.

In order to interpret the graph it is important to recognize that three of the statements were worded so that agreement expressed a positive attitude toward science and scientists, and three of the statements were worded so that disagreement expressed a positive attitude. Positive and negative statements must be balanced in this way to counteract a tendency for some people to agree with almost any statement. For ease of interpretation, we have arranged the answers on a graph so that replies favorable toward science always appear to the left. As a result, half of the answers on the extreme left are "strongly agree" and half are "strongly disagree," depending upon the specific statement.



ATTITUDES TOWARD SCIENCE

The responses are overwhelmingly favorable toward science. None of the six items draws less than 53.4 percent favorable responses, and one item draws 90.0 percent favorable responses. Nevertheless the range of responses is interesting and reveals something about where the ambivalence toward science is felt. Less than 9 percent dissent from the view that science attempts to increase the knowledge we can apply to our daily lives, and less than one person in five questions that scientists generally work for the public wellbeing. There is very little ambivalence revealed by these two items. Only a very small minority deny that science is constructively oriented toward human use.

At the other extreme, 43.6 percent agree that science breaks down people's ideas of right and wrong. More than a third agree that scientists often make sensational announcements just to get publicity and about a third question whether science is guided by high moral standards. Thus the more widely shared reservations about science relate to the moral dimensions of science and the scientific enterprise. Although nearly everyone recognizes that science is useful and that scientists try to serve the public wellbeing, many suspect that scientists are not immune from less admirable motivations. Furthermore the cost paid for the benefits of science can include weakening the moral fabric of the community. Nevertheless, a majority of the respondents do not indicate that they share even these reservations about science.

Midway between the items that reveal the most and the least ambivalence is the statement that two-thirds of the respondents reject, that science creates more problems than it solves. The 29.1 percent who agree with this statement are again expressing awareness of an uncertain ratio of benefits to costs in the scientific enterprise. But fewer people will go so far as to say that science creates more problems than it solves than will acknowledge that undermining moral beliefs can be a cost of scientific accomplishment. There is considerable ambivalence about the costs of science, but relatively few will say the costs outweigh the benefits.

Unlike splitting the atom or learning how to fertilize the human ovum in a test tube, earthquake prediction probably evokes relatively little moral concern. If earthquake prediction is morally rather neutral, it may not be viewed with the ambivalence that is expressed toward many scientific enterprises. Positive attitudes based on its potential human usefulness may be paramount.

However, a large enough block of people harbor doubts about the balance of costs to benefits that focusing public attention on possible economic and social problems induced by earthquake predictions could stimulate unfavorable attitudes toward scientific work in this field.

The view of more than a third of the people that scientists sometimes make sensational announcements for the sake of publicity reminds us that there is also ambivalence about the early release of earthquake predictions (Chapter Five). When these doubts about releasing predictions and the suspicion that scientists are often publicity seekers are held by the same people, the responsible issuance of a scientific prediction is very likely to be viewed as an exercise in publicity seeking.

The image of publicity-hungry scientists must be balanced with another view often expressed, that scientists know a great deal more than they are willing to tell the public. After a major disaster we sometimes hear that the scientists knew the disaster was imminent but were afraid to tell the public for fear of creating an even worse disaster. And sometimes there are dark hints that scientists withhold information to serve their own ends. We tapped this sentiment by asking:

> Do you think scientists and public officials are giving us all the information they have on earthquake predictions, or are they holding back information?

Answers to this question were coded according to whether people said that either scientists or public officials or both were holding back information. Respondents who believed information was being withheld were then asked:

Do you think they are holding information back: Because of their concern for the people's welfare, or To protect their own interests?

Only those who say that scientists are withholding information to serve their own interests can clearly be said to distrust scientists.

In the table we have combined answers to the two questions and also separated the evaluations of scientists and public officials for comparison.

Are Scientists and Public Officials Withholding Information?

Action and reason	Scientists	Public officials
Giving all information	45.2	42.6
Holding back information	46.1	48.6
For people's welfare	21.5	22.4
For their own interests	11.2	12.5
For both people's welfare and their own interests	8.7	9.0
Other and don't know	4.7	4.7
Don't know or not answered	8.7	8.8
Total	100.0	100.0
Total number	1450	1450

People are evenly divided over whether scientists are telling all or holding back information. But more of the people who think scientists are holding back information attribute this to concern for the public interest than to self interest. Nevertheless, nearly one person in five suspects scientists of holding back information about earthquake predictions at least partly out of self interest. The difference in attitude toward scientists and public officials is not striking, though scientists are trusted somewhat more than public officials.

rames of Reference

. A more difficult question to explore than whether people believe in

science and have favorable attitudes toward scientific enterprise is whether people think about earthquakes in a manner that is compatible with science. We do not expect the public to be masters of scientific thought. Even well trained scientists often lapse into unscientific ways of thinking about events outside of their scientific specialties. Nor do we expect the ordinary citizen to have a deep and correct understanding of techtonic plate theory and other advanced earth science theories. But we are concerned over whether people think of earthquakes as physical events, manifesting physical processes, and having physical causes. If people employ a physical frame of reference when they think about earthquakes, communication between scientists and the public should be facilitated. In contrast, people might apply a mystical or magical frame of reference, with earthquakes occurring because of the ideas in someone's head or because of the work of a sorcerer. Or they might apply a teleological or religious frame of reference, with earthquakes being part of some grand design for the world, a punishment for the sins of mankind, or harbingers of the millenium. People who think of earthquakes in these terms will have great difficulty interpreting a scientifically based earthquake warning as it is intended to be understood.

As a basis for deciding whether people employed frames of reference that were compatible or incompatible with science, we asked the following question and completely open-ended probe:

> People have various ideas about why there are earthquakes. Do you have any ideas why earthquakes occur? Yes or No.

If the answer was "Yes,"

> What are they? (Probe fully; record verbatim)

Spaces were provided for as many as five separate answers.

Of the 1450 respondents, 75.1 percent responded affirmatively. When their replies to the follow-up question were classified, 93.2 percent of the answers refer to physical causes. Causes classified as physical are not

necessarily scientifically valid. All that is required is that there be a plausible physical connection between the cause and occurrence of an earthquake. For example, "launching satellites that pollute the atmosphere" was classified as magical or mystical because there seemed to be no plausible physical connection between atmospheric pollution and the occurrence of an earthquake. The nonphysical explanations referred principally to Divine Plan, punishment for the sins of mankind, and a secular theme of interfering with nature.

There is a further distinction of importance. Whether causes are physical or nonphysical, they may lie outside of human control or may involve some kind of human action to trigger the physical causes. For example, if an earthquake is precipitated by the weight of the water newly impounded behind a dam, the immediate cause is physical (increased pressure because of the weight of the water), but it was human action that put the water there. Similarly in cases of nonphysical explanations, an earthquake that was foreordained as part of an ancient Divine Plan is different from an earthquake that is visited on the people of a sinful nation.

Some people volunteered references to human action in answer to the leading question on why earthquakes occur. But whether people did so or not, when they finished answering the question they were asked a second leading query, followed again by an open-ended probe:

> Do you think there are things that <u>people do</u> that make earthquakes <u>more</u> likely to occur? Yes or No.

If the answer was "Yes,"

> What are some of these things? (Probe fully; record verbatim)

We were able to use the answers to both open questions in searching for answers that involved human triggering actions.

When the two classifications are combined, as in the table, 81.4 percent of the explanations identify naturally occurring physical causes and another percent identify physical causes triggered by human action. The small

Causes for Earthquakes

Earthquake cause	Percent	
Physical: Naturally occurring		81.4
Fault movement	23.1	
Earth movement	25.0	
Earth's heat	10.0	
Sea, tidal waves	1.8	
Moon, planets	3.2	
Other	18.3	
Physical: Human action		11.8
Drilling, digging	6.3	
Underground explosions	4.2	
Dam filling	.3	
Scientific research	.2	
Other	.8	
Nonphysical: Naturally occurring	(3.8)	3.8
Nonphysical: Human action		3.0
Divine retribution, evil forces	.9	
Unreasonable physical link	2.1	
Total	100.0	100.0
Total responses	1816	1816

group of nonphysical causes divides fairly equally between naturally occurring causes and causes triggered by human action.

The category of physical causes triggered by human action deserves special attention. Most of the responses do not refer to scientifically accepted mechanisms such as impounding water behind dams. They have rather the flavor of interfering too deeply with nature or doing something that is socially reprehensible. The fear that drilling and digging in the earth is likely to set off an earthquake implies as much of magic as of physical causation. The second most frequent answer in this category, underground bomb testing, undoubtedly reflects some of the abhorrence of atomic warfare. Hence a great many if not all of these answers are a melding of physical frameworks with either a magical or a moralistic framework. This is an important observation. While people understand earthquakes overwhelmingly in physical terms, the physical frameworks they use are sometimes contaminated by other frameworks that are less compatible with science.

Our discussion of physical and nonphysical frames of reference has been presented strictly by the number of answers falling into each category, and not according to how many people employ each of the frames. We are left with the question whether most people employ a strictly physical frame of reference, and whether they understand earthquakes as strictly naturally occurring physical events. Since nearly everyone gives one or more naturally occurring physical causes, we classified anyone who gave as many as one nonphysical answer under the nonphysical heading. We followed the same procedure with human causation. The result is that people who use nonphysical frames of reference in understanding earthquakes remain a very small group. But half

Types of Belief about Causes of Earthquakes

Types of causes	Percent
Strictly naturally occurring physical causes	33.4
Strictly physical causes, but some triggered by human action	34.8
Some nonphysical causes, but strictly naturally occurring	2.7
Some nonphysical causes, and some triggered by human action	4.1
No idea	25.0
Total	100.0
Total number of respondents	1450

of the people who employ exclusively physical explanations give at least one cause for earthquakes involving a human triggering effect. Not all of these are nonscientific, but many of them do incorporate an element of less scientific thinking.

Coexistence of Science and Nonscience

The last observations underline a point: scientific and nonscientific

ways of viewing the world often coexist in the same individual. Accepting an explanation for earthquakes that is compatible with science does not necessarily mean rejecting all explanations that are incompatible with science. Earlier we were impressed with the overwhelming faith in the capacity of science to predict earthquakes. Now we must look back at whether this acceptance of scientific claims means an equal rejection of claims by the competitors of science.

Directly after answering the question on how accurately scientists will be able to predict earthquakes, respondents were asked:

> Are there any other people besides scientists who can sometimes tell when an earthquake is coming? Yes or No.

If the answer was "Yes,"

> Who are these people?

A total of 31.2 percent of our sample answered "Yes," that there were others

Who Besides Scientists Can Predict Earthquakes

Type of predictor	Percent of total sample*
Psychics, mystics, etc.	20.8
Religious leaders, etc.	3.4
Political leaders	.1
Farmers	1.5
Other	4.4
Don't know, not answered	1.4

* Total sample = 1450 cases

who can sometimes tell when an earthquake is coming. Most of these people (20.8 percent of the total sample) identified the forecasters as psychics, mystics, occultists, and the like. Another 3.4 percent ascribed this capacity to religious figures. A few thought that farmers could tell. Other answers were scattered or too vague to classify.

This question was followed by another, designed to identify belief in a sort of folk wisdom that ordinary people can apply.

> As I read each of the following, please tell me if you think people can use any of the following signs in their daily life to tell when an earthquake might be coming: Unusual animal behavior? Unusual weather? Premonitions, instinct, or ESP? Unusual aches or pains? Any other signs? (Specify).

Answers were entered as simply "yes" or "no." If a respondent said "sometimes" or "some people," the answer was treated as "yes."

Signs in Daily Life Used to Predict Earthquakes

Signs in daily life	Percent of total sample*
Unusual animal behavior	67.5
Unusual weather	43.5
Premonition, instinct, ESP	38.5
Unusual aches, pains	7.9
Small tremors	1.0
Water levels	.8
Other	3.3

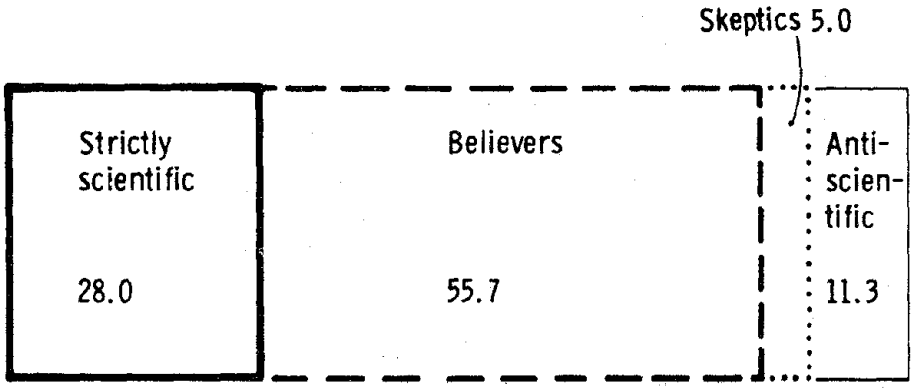
* Total sample = 1450 cases

Three of the folk signs are widely accepted. Two-thirds believe in animal behavior, more than two-fifths in earthquake weather, and more than a third accept premonition. A few people volunteered "small tremors" and "water levels" as signs, probably reflecting popular awareness of the Chinese experience.

Two significant conclusions about the public and science are justified. First, the widespread belief in folk signs suggests that people feel that nature can be apprehended directly and personally, without appeal to an authority or to technical knowledge. Even among the believers in mystical [illegible]asting, it is surprising that more people accept the validity of personal

premonitions than spontaneously mention mystics and similar people as able to predict earthquakes. This observation can be put together with the finding that most people had some ideas about earthquake causes and are able to state their own understanding of the physical causes. Whether people are scientific or nonscientific in their approaches, the majority seek to understand earthquakes personally and directly rather than leaving such matters to authorities and specialists. If our interpretation of these findings is correct, scientists who take the trouble to explain earthquake announcements in terms that are comprehensible to the public will find a more receptive public than those who rely on the authority of science.

A more far-reaching but related conclusion is that respect for science and nonscience coexist in public thought. Faith in the capability of scientists to predict earthquakes coexists comfortably with faith in folk prediction and mysticism. In order to see the extent to which faith in scientific and non-scientific forecasting coexist in individuals, we have classified individuals into four types. People who believe that scientists will be able to predict earthquakes somewhat or quite accurately in the future or can do so quite accurately now, but reject all other predictors and folk signs except animal behavior, are called the strictly scientific. Since many scientists are taking seriously the possibility of using animal behavior as an earthquake sign, we felt that one could believe in animal behavior as an earthquake sign and still be strictly scientific. People who express faith in scientific prediction but also believe in one or more other ways of predicting have been called believers. These are people who combine faith in science with faith in nonscience in their view of earthquake prediction. The anti-scientific are those who do not believe in the future of scientific prediction, but accept some other kind of predictor. And the skeptics are those who reject both scientific and nonscientific prediction capabilities.

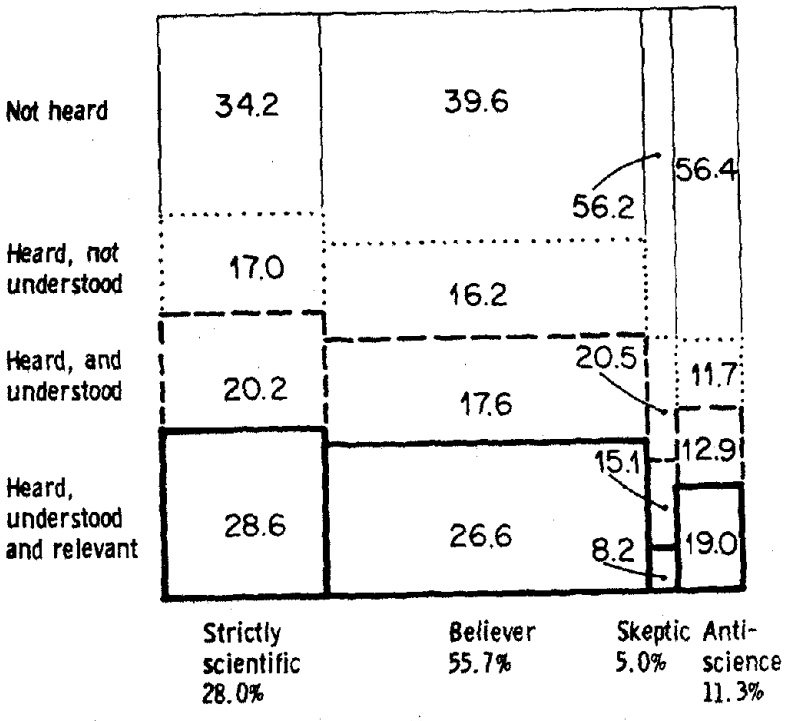


TYPES OF PREDICTION BELIEF

More than half of the people in our sample are classified as believers, indicating that they have faith in the prospect for scientific prediction, but also accept some nonscientific form of prediction. There are about half as many strictly scientifics as believers. About one person in nine accepts some nonscientific basis for anticipating an earthquake but lacks confidence in the eventual prediction of earthquakes by scientists. Skeptics make up the smallest group, only about one person in twenty disbelieving altogether in the forecasting of earthquakes.

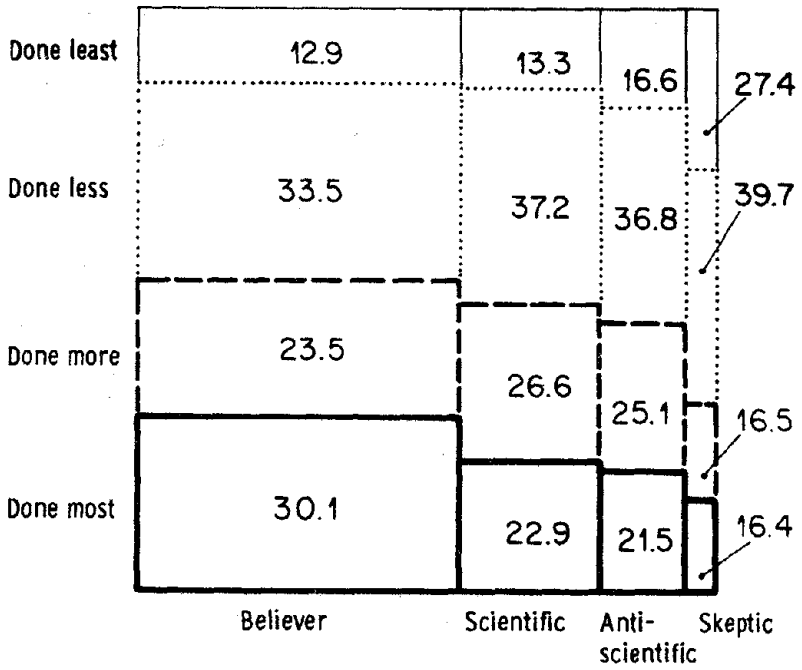
The reader may justly ask at this point whether we are simply reporting a curious finding or an observation of some importance. The best way to answer this question is to find out whether the type of prediction belief is related to variables of more obvious significance. We have examined two such relationships, with awareness and appreciation of the Uplift and with extent of personal earthquake preparedness. The first is an indication of awareness and understanding and the second is an indication of action. In both instances there is a significant relationship, but the pattern in the two cases is different.

As graphed, people who believe only in scientific prediction show least awareness of the Uplift. People who believe in both scientific and



AWARENESS OF UPLIFT BY THE TYPE OF PREDICTION BELIEF

nonscientific prediction are only a little less aware of the Uplift and its significance. The skeptics, who do not believe in any form of prediction, are least aware of the Uplift. But when it comes to action rather than awareness, the believers are better prepared for an earthquake than the strictly scientific respondents. While quite different proportions of the strictly scientific and the anti-scientific respondents are aware of the Uplift, the two groups are quite similar in extent of personal earthquake preparedness. The skeptics are both least aware and prepared.



PERSONAL EARTHQUAKE PREPAREDNESS
BY TYPE OF PREDICTION BELIEF

The difference may be that awareness is a more intellectual activity and the strictly scientific respondents probably include the more intellectually inclined, while preparedness is a matter of action. The more grounds for prediction people believe in, the more likely they are to prepare themselves for earthquakes or other emergencies.

These findings also seem to have practical implications for the communication of scientific information about earthquakes. Scientists must be prepared to deal constructively with a public that puts its faith overwhelmingly in science, but is not ready to pledge exclusive allegiance to science. Scientists must expect most of the believers in science to turn occasionally to other realms for whatever help they can get in foretelling earthquakes.

A brief concluding note on science and religion may be in order. Although the great majority of our respondents say religion is important in their lives, very few of them suppose that religious leaders can forecast earthquakes and few try to explain earthquakes in religious terms. It is the secular mystics rather than religious mystics who today offer an alternative to scientific prediction of earthquakes. Likewise, those to whom religion is most important are no less favorable toward science and no less confident in the prospect for scientific earthquake prediction than the less religiously inclined. In short, there is no evidence here to suggest that religion plays a part in whatever resistance we have found to the acceptance of scientific earthquake prediction.

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