SOCIAL RESPONSE TO THE FIRST "A" ALERT OF THE PARKFIELD EARTHQUAKE PREDICTION EXPERIMENT

By

Colleen Fitzpatrick, Ph.D.
and
Paul W. O'Brien, Ph.D.
Hazards Assessment Laboratory
and
Department of Sociology
Colorado State University
Fort Collins, Colorado 80523

QUICK RESPONSE RESEARCH REPORT #54

1992

Social Response to the First "A" Alert of the Parkfield Earthquake Prediction Experiment

Colleen Fitzpatrick, Ph.D. and
Paul W. O'Brien, Ph.D.
Hazards Assessment Laboratory
and Department of Sociology
Colorado State University
Fort Collins, Colorado 80523

Submitted to:
The Natural Hazards Research and
Applications Information Center
University of Colorado
Boulder, Colorado 80309

December 1992

Social Response to the First "A" Alert of the Parkfield Earthquake Prediction Experiment

Until just a few years ago Parkfield was but a sleepy, obscure little town tucked away in the Diablo Range of the Sierra Madre mountains of southern Monterey County in central California. But in 1985 the residents of Parkfield were awakened from a state of slumber when the U.S. Geological Survey (USGS) issued an official earthquake prediction, with time, place and magnitude of occurrence specifically indicated. This peaceful ranching town, of about 34 residents with slightly over 100 in its surrounding environs, has been stirred from a sense of solitude and quiescent isolation many times in the past several years. Parkfield is now the site of the world's most premier earthquake prediction experiment. The 20 mile long Parkfield segment of the San Andreas fault is home to more earthquake prediction instruments (devices designed to detect anomalies which might provide indicators to effectively predict the occurrence of long- and short-term earthquake events) than anywhere on earth.

The long-term prediction, for a quake of Richter magnitude 5.5 to 6.0 to occur near Parkfield by 1993, is the first earthquake prediction to be endorsed by both the National (NEPEC) and California (CEPEC) Earthquake Prediction Evaluation Councils. Included in the prediction is the possibility that the next Parkfield quake could be as strong as 7.0.

Parkfield has a long history of regularly occurring quake activity. Earthquakes in the 6.0 or greater range are known to have happened there in 1857, 1881, 1901, 1922, 1934 and 1966. The "characteristic" 6.0 temblor could cause damage to windows, chimneys, walls and glassware in Parkfield, and may have slightly similar impacts in the surrounding communities of Paso Robles, Coalinga, San Miguel, and Avenal. If the next Parkfield quake is in the 7.0 range, it could affect a geographic circumference comprised of all or parts of seven counties. The larger quake could have some damaging impacts and at least be felt in the counties of northern Santa Barbara, San Luis Obispo, San Benito, southern Monterey, Kings, western Kern, and Fresno.

Announcement of the Parkfield prediction drew the attention of the media from across the nation. Reporters flocked to Parkfield to interview its few residents, and scientists have been frequenting the area since. Initial public reaction to the prediction was formally studied shortly after it was publicly announced (Mileti and Hutton 1987).

In 1988, the Southern California Earthquake Preparedness Project of the Governor's Office of Emergency Services (OES) distributed a brochure detailing the prediction. Mailed to some 122,000 households in the seven-county region, the brochure included a description of the prediction, advise on how to get ready for earthquakes, what to do during and immediately after an earthquake, places to call for more information, and a depiction of the alert levels designed to portray the predicted quake's likelihoods of occurrence. In addition, over the years the public has been exposed to this unique prediction phenomenon and to advise on how to become earthquake ready by a multitude

of sources and through a wide variety of communication channels. The risk communication process involved in this prediction experiment has also been formally investigated, and analyzed in a number of ways (Mileti, Fitzpatrick and Farhar 1990, Fitzpatrick 1992, Mileti, Fitzpatrick and Farhar 1992, Mileti and Fitzpatrick 1992).

Since announcement of the prediction, Parkfield has had many days in the spotlight of public attention. Its most recent focused attention began late in the evening of October 19, 1992 when the USGS declared an earthquake alert for the Parkfield segment of the San Andreas fault. In effect, the alert was a short-term earthquake prediction, the first such NEPEC/CEPEC approved prediction to be issued in United States history. In response, the State OES declared an "A-level" alert, its highest type of public earthquake advisory. This alert amounted to a short-term earthquake warning for residents of the seven-county region surrounding Parkfield. It also represents yet another chapter in the continuing saga of the Parkfield Earthquake Prediction Experiment.

The following depicts what alerts are in the context of the Parkfield Earthquake Prediction Experiment and the unfolding of events surrounding the first Parkfield A-level alert. The purpose of researching the alert and the methods used to investigate this phenomenon are then presented. Results from interviews and observations acquired from social research on the alert and the derived findings complete this report.

The Alert

Alerts, in the Parkfield Experiment, represent various levels of likelihood that the Parkfield earthquake may occur. Six levels of alert have been established for Parkfield with levels C, B, and A representing the three highest levels. The highest level of alert is "A".

> At the A alert stage, the USGS predicts there is at least a 37 percent chance of the 'characteristic' Parkfield earthquake occurring within 72 hours. The greatest likelihood is immediately after announcement of the alert, the probabilities diminish during the following 72 hours. An alert stage lasts 72 hours unless a longer period is warranted by subsequent instrument activity at Parkfield. An A level alert means that the highest estimated likelihood—37%+—has been reached, not that the earthquake is certain to occur (Governor's Office of Emergency Services 1988, p. 6).

A level "B" alert means that the USGS believes there to be an 11% to 37% increased likelihood of the Parkfield earthquake occurring within a 72 hour period, and a level "C" represents a 2.8% to 11% increased chance of occurrence and that instruments need to be very closely monitored for indicators which might lead to higher level alerts. Threshold criteria for issuing a short-term prediction, or A-level alert, had been established by CEPEC when the *Parkfield Earthquake Prediction Response Plan* (Governor's Office of Emergency Services 1988) was developed during the initial years

of the prediction project. Threshold criteria allow for a "real time review" to be foregone when indicators suggest that the "characteristic" Parkfield quake is imminent.

"To avoid the repetition of 'false alarms' and because the USGS considers only the A level alert to be a short-term prediction", a level A alert is the only one which necessitates a public warning (Governor's Office of Emergency Services 1988, p. 6). Until this event, level A alert had never been issued.

The first Parkfield "A" alert was triggered when the USGS picked up seismic readings of a 4.7 Richter magnitude earthquake under Middle Mountain just north of Parkfield at about 10:28 p.m. on Monday, October 19, 1992. An earthquake of this approximate size had been predetermined to be a prime signal that the "characteristic" quake was imminent and that a level A alert should be issued. The alert notice also indicated that the "'characteristic' Parkfield earthquake (the Magnitude 6) could trigger, or grow into, a larger earthquake, as large as Magnitude 7. This could result in severe shaking intensities . . . and could result in casualties and damage [but that] CEPEC considers this larger event much less likely than the 'characteristic' earthquake" (California Office of Emergency Services 1992, p. 3).

By 10:52 p.m., on this same night, the USGS notified the State OES that "'there is a significant likelihood that an earthquake of Magnitude 6 will occur on the San Andreas Fault near Parkfield in the next 72 hours'" (California Office of Emergency Services 1992, p. 3). This notification complied with the pre-established procedure of communication between the USGS and the OES set forth in the *Parkfield Earthquake Prediction Response Plan.*

As soon as the State OES received the alert from the USGS, it began notifying offices of emergency services in all seven of the potentially impacted counties. Simultaneously, State Operations Centers in Sacramento and Regional Operations Centers in Regions I (Los Alamitos), II (Pleasant Hill), and V (Fresno) were activated. Key state agencies with response roles (i.e., California Highway Patrol), organizations providing lifeline services (i.e., Diablo Canyon Nuclear Power Plant, Pacific Gas & Electric), and facilities which could threaten the public safety (e.g., dams, pipelines, toxic waste sites) were also immediately notified of the alert. Then at 1:00 a.m. on October 20, 1992, about two hours after receiving the alert from the USGS, the OES issued a News Release which restated the advisory that had previously been sent to the county OESs. The State also dispatched staff to Cholame, the pre-designated site for setting up the State's mobile command post, and to USGS offices in Menlo Park, California.

The principal role of the State OES during such an alert period is to assist local jurisdictions and to transmit any updates on the earthquake hazard to the more localized emergency response agencies, and to the press. In addition, during the warning period as well as during an eventual emergency, the State OES is prepared to provide assistance to local government jurisdictions by providing personnel and equipment upon requests made through mutual aid procedures.

The A alert indicated that the Parkfield earthquake had a significantly increased likelihood of occurring within a 72 hour (three day) period of release of the notice. However, subsequent update notices indicated that as time passed, the likelihood of occurrence diminished. By Thursday morning, newspaper articles and update notices indicated that the likelihood of occurrence had decreased to about five percent. The A alert expired at about 10:30 p.m. Thursday, October 22, 1992, and its likelihood of occurrence reverted to less than 2.8%. However, a series of small quakes were detected the following Sunday evening. This led the USGS to issue a "B" level alert which was announced to broadcast media and to the State OES almost simultaneously. Although it required no public warning, it did indicate that the USGS considered the likelihood of occurrence for the Parkfield quake had increased to about 11% to 37% during a 72-hour period. This alert expired without being upgraded to a level A alert.

Research Purpose

This A-level alert presented a unique opportunity to investigate public and organizational response to the first NEPEC/CEPEC short-term earthquake prediction issued in the United States. To best take advantage of such an opportunity it was important that the alert situation be investigated in real-time. This meant that data needed to be collected before it decayed and, therefore, during the ongoing warning process. We thus requested the Natural Hazards Research and Application Information Center at the University of Colorado in Boulder to activate a pre-approved quick response grant to investigate the alert.

The primary purpose of this research was to examine social response to the alert. Social response was conceptualized as involving two basic units of analysis—local organizations responsible for public safety and/or the provision of lifeline services, and the general public. We sought to answer the following set of broad, unoperationalized, research questions:

(1) How did the public respond to the 72-hour warning? Was it something that people believed and took seriously enough to engage in protective actions? If so, what did people do differently in lieu of the warning? What kind of actions were taken?

(2) How did local emergency response organizations handle the warning? What was the perceived usefulness of the alert from an organizational point-of-view? What did organizations do differently from routine operating procedures?

(3) To what degree were channels of communication effective in terms of getting the warning out to the public? To what degree were channels of communication effective in terms of getting the warning disseminated to local emergency response agencies?

These questions were constructed to provide general guidelines and parameters of focus for this case study on perception and response to the alert in a real life context.

Methods

The methods used for conducting this qualitative field research were straightforward. Unstructured interviews and directed conversations were the principle tools of data collection. We also engaged in quasi-participant observation. This could not be considered a true participant observation study since we were in the area for only seven days, did not take up residence and it was probably obvious to local citizens that we were outsiders. We also closely monitored news programs and collected newspaper articles as another means of acquiring as much information as possible during our short stay in the area.

The alert was issued to the residents of seven counties in central California. Therefore, representatives of organizations vested with responsibility for providing emergency and lifeline support, and residents in the at-risk counties were targeted for interview. Cities of county seats of government were selected as principal locations to collect data. It was also important that smaller towns located throughout the region be investigated.

In addition, three of the larger cities in the region—Paso Robles, Coalinga and Taft—had already been studied in social research on the Parkfield Earthquake Prediction Experiment. These cities had been selected for study based on the criteria of distance from the predicted epicenter and experience with a damaging earthquake. Paso Robles represented a city that was relatively close to Parkfield but lacked recent experience with damaging earthquakes. Coalinga, on the other hand, represented a city that was equally close to Parkfield but had experienced a damaging earthquake in 1983. Taft represented a city within the area of risk yet considerably distant from the epicenter and without recent damaging earthquake experience. It seemed prudent that, at a minimum, this quick research should investigate the alert in these same cities. To do so would enable us to make a more meaningful contribution to the growing body of social scientific knowledge on this unique and ongoing earthquake prediction experiment.

We arrived in the area mid-day of the second full day of the three day alert period. We left the area seven days later or five days after the alert expired. During this time we documented more than 27 interviews and engaged in directed conversations with numerous citizens. We collected data in 13 towns located in six of the seven targeted

counties (San Benito County was not visited due to distance and lack of time). We also visited the county seats of Fresno, Kings and San Luis Obispo. The other county seats were located considerably outside of the alert region and we chose to expend our resources only within the region depicted as at-risk. We also collected more than 25 articles specifically about the alert and about general earthquake readiness circulating in newspapers serving the region. Table 1 depicts the counties and towns wherein interviews and observations were conducted.

Data were collected by conducting unstructured interviews with organizational spokespersons and operations personnel, with ordinary citizens, and with owners or managers of retail stores where earthquake readiness supplies were likely to be sold. Organizational interviews provided data on both public and private agencies that play vital roles in communities during disaster situations. Citizens were interviewed, in an unstructured and inobtrusive manner, to acquire data which would contribute to giving a sense of the public's perceptions of and response to the alert.

Table 1. Counties and Towns Wherein Interviews and Observations were Conducted

County	*Town*	*Mercalli Risk*
Monterey	Parkfield	VII - VIII
San Luis Obispo	San Luis Obispo	V - VI
	Paso Robles	VII - VIII
	San Miguel	VII - VIII
	Templeton	VII - VIII
Santa Barbara	Buellton	V - VI
	Solvang-Santa Ynez	V - VI
Kern	Taft	VI - VII
	Old River	II - IV
Fresno	Coalinga	VII - VIII
	Fresno	II - IV
Kings	Hanford	II - IV
	Avenal	VII - VIII

Questions asked of organizations and citizens were not standardized and were used only as a means to gain entre to interviews, to facilitate conversations and to keep discussions focused on our research interests. The length of interviews ranged from as short as a few minutes to more than an hour depending on the person being interviewed and the context of the interview situation. Citizen participation was elicited by engaging in casual conversations in a variety of situations, for example, in restaurants, stores, and other such public places.

Organizations

Organizations specifically targeted for interview were county offices of emergency services, city and county fire departments, and state highway patrol, county sheriff, and city police departments. Public utility, American Red Cross, public school district, and hospital organizations were also targeted for interview. Interviewing spokespersons and other personnel from such organizations would likely provide us with ample information necessary to depicting organizational response to the alert.

Questions we sought to have answered by organizations were how and when they heard about the alert, if they believed what the alert depicted, what they did in response, to what extent it altered routine activities, the amount and quality of public inquiries about the alert, if response to future alerts would be altered in any way if the earthquake didn't happen, the usefulness (or lack thereof) of the alert, and what would they have done differently if given the opportunity.

Spokespersons for organizations were contacted by walking into offices, introducing our purpose, and asking to talk about the alert. Other organization personnel were interviewed in essentially the same manner but instead of going to an office, we simply made contact with them in their working environment, for example, police officers on the street, firefighters working on their equipment, and so forth.

Citizens

Residents were generally queried on whether they believed the predicted quake was imminent, what they were doing to get ready, and about their general impressions concerning government issuing earthquake alerts. People who work in retail stores occupy a key position in society which involves daily contact with the public. Since such people are well aware of a public's purchasing behavior, the assumption was that if stores which carry preparedness items such as bottled water and batteries experienced a marked increase in the purchase of such items and had to order additional loads to keep the store adequately stocked, then by inference, at least some members of the public engaged in a minimal degree of readiness response as a result of the alert. Therefore,

owners and managers of hardware and grocery stores were interviewed as public informants. Store managers/owners were interviewed by going into a store and asking to speak with whoever was in charge.

Limitations of the Research

Given the qualitative nature of this research and the limited numbers and kinds of interviews conducted, the data collected in this effort cannot be considered to be representative of either organizations or citizens in the region. Furthermore, findings cannot be generalized beyond the limited geographic scope of the alert area. Findings, therefore, can only be interpreted as meaningful to the extent that what people related to us is real and true for them as individuals or as spokespersons for organizations.

The Parkfield situation is very unique and likely very different from other prediction efforts in California. The Parkfield prediction experiment has been ongoing for more than seven years, and a great deal of information on the prediction itself and on earthquake readiness in general has been circulated throughout the region in a multitude of ways during this time. Because of this, the Parkfield region must be viewed as different from any other area in California. In addition, this region of intense earthquake study is sparsely populated, relative to other regions of California, and population density differences severely limit any reasonable comparisons. These caveats are meant to convey the generalizability and inference making limitations of this field research on social response to the first official short-term earthquake prediction to be issued in the United States. This is not to say, however, that some findings and lessons learned as a result of the alert cannot be usefully applied to other situations.

Results From Interviews and Observations

Organizations responded to the alert for different reasons than did the public. This would be expected since organizations have responsibility for public welfare that is distinct from the public itself. Differences would also be expected since organizations possess emergency plans which require a Parkfield alert response. The public does not possess Parkfield plans, per se, and have no pre-scripted scenarios to direct behavior. The following subsections on organizations and the public depict the data derived from interviews and observations on these two distinct units of analysis.

Organizations

Organizations throughout the region heard about the alert from official organizational sources. The Parkfield Plan worked very well in terms of its predesignated mode of communication during the A alert period. The Parkfield Plan calls for the USGS to communicate the alert to the State OES who then notifies county offices of emergency services who in turn notifies local agencies important to a potential emergency response situation. The State OES, after about a 30 minute wait, then provides a news release to media agencies throughout the state. This pre-determined system of communication was implemented and, for the most part, operated according to plan.

Virtually all county offices of emergency services heard about the alert within a matter of a couple of hours after the USGS issued it. Local agencies responsible for emergency response and the provision of life support services (i.e., county fire and sheriff departments, city fire and police departments, American Red Cross chapters, county departments of education and utility companies) also became aware of the alert within a few short hours of its issuance.

All counties of emergency services and city agencies with responsibilities during emergencies had response plans to serve as guidelines for what to do in various emergency situations. Some counties had sections in their plans which specifically addressed the Parkfield situation, including alerts, while others had only general earthquake response sections. All organizations recognized that they were responsible, at some level, for responding to the alert.

Without exception, organizations responsible for emergency services did something in response to the alert. At a minimum, police and fire departments, offices of emergency services, city mayor's/manager's offices, Red Cross chapters and utility companies in the entire region, briefed personnel about the alert and placed them on stand-by status. The extensiveness of response varied considerably across organizations depending on the type of organization and its geographical location and experience with damaging earthquakes. Within organizations, perceptions about the seriousness of the alert and the potential for the earthquake to occur varied according to the position of personnel in the hierarchy of authority. Media response to the alert, while driven by factors other than those which induce response by government or private service organizations, was very active and could not be neglected.

County offices of emergency services. All county offices of emergency services (OES) recognized the alert as serious enough to implement appropriate response plans and to engage in activities outside of their normal mode of operation. County OESs were the most active of all organizations in the region. This was largely due to these agencies being the primary organizations for setting up emergency operations centers and coordinating response to emergency situations for an entire county. The responsibility of county OESs to notify other public service oriented agencies, such as city police and fire departments, hospitals and schools, also necessitated a great deal of activity. In

addition, it was the county OESs to which the public turned for more information about the alert.

During the first few hours of the alert, all county OESs opened up emergency operations centers (EOCs). This activity primarily involved on-call personnel arriving at predesignated locations where they began to enact a call-down procedure to notify local response jurisdictions and local media of the alert. Notification of the alert also included reminders to review emergency plans and to engage in appropriate protective actions for personnel and equipment.

More than anything else, activating the EOCs for this alert simply meant waiting by a fax machine and other communication devices for updates from the State OES. It also meant briefing local media of the situation and making decisions on actions to be taken by fire departments under county responsibility. After a few hours of such activity, county EOCs, throughout the region, staffed-down to minimal operations. This meant that personnel went on rotating shifts so that at least one person was in the EOC at all times.

Within the first 24 to 36 hours of this 72-hour alert, most county OESs actually closed down their EOCs. The exception to this was San Luis Obispo County which has a single dedicated EOC facility built with monies provided by the nearby Diablo Canyon nuclear energy plant. In addition, San Luis Obispo County receives special financial support for engaging in drills and alerts because of the nuclear facility. This support provides the county with the ability to off-set personnel expenses whenever its EOC is activated. No other county in the region has such a facility nor do other counties receive similar financial support for emergency operations.

Even though most of the counties closed their EOCs, they remained in a quasi-alert status. Personnel were briefed daily about the alert and were reminded that they were on stand-by status and expected to respond immediately if the earthquake occurred. In addition, the county OESs were kept quite busy with inquiries from the public.

Most public inquiries involved questions about what an A alert meant, what areas were affected, and what to do. Advise consisted of telling callers to stock food and water, to know how to shut-off the gas if necessary, to remove objects which might fall during an earthquake, to look in the phone book at the section on earthquake preparedness, and so on. Many county OESs also experienced an increase in requests for materials on earthquake readiness. Most OESs, with the exception of Fresno County, where Coalinga is located, reported that they were able to adequately handle public inquiries about the alert. A spokesperson for the Fresno County OES indicated that they were deluged with phone calls the day following the alert. Some callers were so concerned as to ask if they needed to keep children out of school. This experience was unique to Fresno County and must be attributed to the ordeal that many of the residents in the area had with the devastating Coalinga earthquake in 1983.

Instead of calling county OESs, many citizens used the State's (800) earthquake hotline number which was instituted after the Landers and Big Bear quakes in June of

this year. The availability of this service helped to keep inquiries to county jurisdictions at manageable levels during this alert period.

County OESs farthest away from Parkfield made staffing-down and closure decisions sooner than those closer to Parkfield. In addition, the number of public phone inquiries and requests for materials diminished the farther one traveled from Parkfield.

More than anything else, county OESs used this alert situation as a good opportunity to engage in an unplanned and unannounced drill. When asked if they would do anything differently, all said that, for the most part, if another alert was called they would do exactly what they did during this alert. The alert also provided some OESs with the opportunity to discover glitches in their information dissemination procedures. These glitches involved flaws in call-down procedures where some agencies had been inadvertently left out of the information loop. All offices reporting such flaws also indicated that steps were being taken to correct the problem. Furthermore, the alert induced activity to update emergency plans.

While the alert was almost exclusively viewed as something useful and positive, some spokespersons expressed concern that if too many A alerts are called the public may begin to outright ignore them. When asked how their own organization would handle multiple A alerts, these same spokespersons indicated that they would continue to take them seriously and to engage in actions appropriate to the situation as outlined in their emergency manuals.

The fact that the Parkfield Experiment has been prolonged over so many years was not of concern to County OESs. County representatives consistently reported that the drills and various other forms of assistance provided by the State has enabled all emergency response organizations to develop good working relationships with one another. All of which has helped them to become better prepared for earthquakes than they might have otherwise become without the extended Parkfield experience.

Fire departments. Fire departments in the central California area are of four types—city paid, city volunteer, county, and state forestry service. Response to the alert by fire departments throughout the region was strikingly similar for all types except city volunteer departments. Regardless of type, all firefighting agencies implemented their previously developed Parkfield alert plans. But implementation of an alert plan did not mean much out of the ordinary for fire departments since they are always on an alert status. The only unusual activity recognized as necessary for response to the alert was to take extraordinary actions to protect equipment.

Response by city fire departments varied by type of staffing and by past experience with damaging earthquakes. Not all city fire departments are staffed by paid firefighters. Some cities have only a volunteer force.

Response to the alert was consistent across all cities with paid staffs. For these fire departments the immediate response was to remove all critical firefighting equipment from buildings. This meant that all trucks had to be moved from within the firehouse to the driveway or onto the street. This activity was continued for the entire 72-hour

alert period for firehouses considered structurally unsafe during earthquakes. However, in some cities, equipment was taken back inside after the first 24-hour period in areas where firehouses had been recently constructed and for those which had been earthquake retrofitted. The Coalinga Fire Department removed equipment for both the A and B alerts. Coalinga's experience with earthquakes made a definite impression on the firefighters of this community. Upon receipt of the alert, Coalinga's fire chief authorized the use of the civil defense siren system. The siren was sounded for several minutes to alert residents to the impending earthquake threat. No organizations in any other community sounded a siren alarm as a way to warn citizens.

Volunteer fire departments responded in a uniform manner. All such departments kept equipment inside regardless of the condition of the firehouse. This decision was based on the rationale that such departments do not have people on duty 24-hours a day and that fire equipment is left unattended for lengthy periods of time thereby making it necessary to keep equipment housed regardless of the structural condition of the facility or the natural hazard faced. Nevertheless, all volunteers were briefed daily and reminded of the alert status.

County and state forestry service fire departments also engaged in response activities. Throughout the region all such fire departments, located in the expected area of impact, took steps to regularly brief personnel on the alert, protect equipment, and maintain an active liaison with the county OESs.

Removal of equipment from firehouses sparked an interesting debate among firefighters. The question raised was whether or not the firefighters should sleep outside with their equipment. In one case, firefighters did sleep outside during the first night of the alert because of concern with theft and vandalism. But during the following nights they slept inside since their equipment had been moved to an enclosed parking lot where it was considered safe. In other cases, however, those in charge made a command decision that it was okay for on-duty personnel to sleep inside even in those buildings not considered to be earthquake safe.

While all fire departments, at all levels of government, actively responded to the alert in ways thought appropriate to their organizational make-up, not all personnel perceived the alert alike. Opinions about the alert differed according to position in the organizational hierarchy. Personnel in command and decision-making positions viewed the alert as credible and as a good opportunity to review their Parkfield response plans and to engage in an unanticipated drill. However, "ground-level" personnel tended to view the alert as a nuisance. Even though such personnel followed the orders of their commanders, as would be expected, the alert was generally considered to have provoked an unnecessary drill which required them to expend energy best reserved for a real emergency.

Police, sheriff, and highway patrol. Policing agencies throughout the region took the alert seriously enough to daily brief personnel on all shifts about the alert and to remind them to be mentally prepared to respond to an earthquake at a moments notice.

Officers were also reminded that they could be prevailed upon to provide mutual aid support to jurisdictions which might be more adversely impacted by the Parkfield quake. Some city police departments were also responsible for notifying local political officials about the alert.

As with fire departments, police response did not require much activity above and beyond normal operating procedures. More than anything, it induced police, sheriff, and highway patrol departments to take stock of their disaster level emergency response capabilities. Since vehicles in most police stations are parked outside, it was not necessary to move them. Response essentially meant that officers performed additional checks on emergency generators, kept vehicles fully fueled at all times, and inspected emergency supply caches for fresh batteries and adequate amounts of food, water and other miscellaneous supplies.

Several city police departments received a few phone calls from concerned citizens. Such calls were referred to county OESs. Some of these departments also used the alert as an opportunity to publish announcements in local newspapers about the availability of earthquake related literature at their stations.

When speaking as department representatives, officers expressed that the alert was a good thing if for no other reason than to remind them and the community that they are at risk to earthquakes. On the other hand, when talking to police officers on the "beat", attitudes about the alert were quite different. As with fire departments, ground-level personnel dutifully followed command orders. But on a personal level these officers tended to question the necessity of issuing an alert and raised general doubts as to the credibility of scientists being able to predict earthquakes in the first place. However, while expressing these dubious thoughts, they also said that one of the first things they did in their own homes was to make sure that valuable glassware was secured, that pictures, mirrors and plants that could be thrown around were taken off walls, and so on. Some officers were rather amused that people should come all the way from Colorado to investigate the alert and suggested that Universal Studios might be a better place to go for an earthquake.

Support service organizations. Organizations responsible for support services are very important during earthquake disasters. For example, utility companies are important for furnishing vital power to an earthquake stricken area, it is important that hospitals be able to provide ongoing and extra medical services, agencies like the Red Cross are important for offering shelter and sustenance services, and schools have responsibility for ensuring the health and safety of children. Even though these responsibilities are unique to each type of organization, they are all critically important during times of disaster. However, while each organization may play a critical role during a disaster, this did not mean that all such organizations responded to the alert in similar fashion nor did they similarly take the alert seriously.

Observed differences in how these support organizations viewed and responded to the alert lies in their perceived roles of responsibility. Some organizations, such as

utility companies, have roles that are indirectly linked to the public in terms of emergency response. For example, utilities respond to emergencies by restoring lost power by repairing and maintaining equipment not people. Other organizations, like the Red Cross and hospitals, have roles that are directly linked to the public. For example, providing shelter and emergency medical services which necessitates direct involvement with people.

The utility company providing electric service to the region perceives that its role during any disaster is to restore energy as quickly as possible, and that providing this much needed service is dependent on the extent of damage the utility company itself sustains during an earthquake. But, since there is no way of knowing ahead of time what that damage might be, the reasoning is that there is no need to do anything in advance. This major utility did check to make sure that relay switches in substations were all okay and that there were no cracked insulators, but this action was done in response to the precursor quake, not in response to the alert. In general, there was simply no expressed interest in the alert on the part of the major utility company serving the Parkfield region. Drills were not conducted, emergency plans went unreviewed, vehicles were not kept completely fueled, and any need to step outside a "business as usual" mode of operation was not given consideration.

While the Diablo Canyon Nuclear Power Plant may not have a specifically defined emergency response role to residents of the area, it is responsible for ensuring that it remains safe during disasters and that the public is not exposed to risk from a nuclear accident of some sort. As per legal requirements, the Diablo Canyon nuclear power plant notified the Los Padres Division of the Pacific Gas and Electric Company that fuel was not being transferred and that all nuclear fuel was safely contained. Diablo Canyon engaged in full alert procedures for the entire 72-hour period. This meant that no equipment could be sent out for repair in the event that it would be needed, fuel transfer operations were halted, and all pieces of equipment that could possibly fall were placed in secured positions.

Organizations such as the American Red Cross and hospitals have responsibility for providing health and welfare services during a disaster period. These response roles require a direct involvement with the public.

American Red Cross chapters and hospitals, serving the region, got ready to respond to an earthquake as soon as notice of the alert was received. Red Cross chapters alerted volunteers that they might be needed to staff shelters, representatives kept tabs of update notices on the alert and attended county briefing sessions, and most offices generally prepared for an onslaught of public inquiries. Many chapters used the alert as an opportunity to get readiness information featured in local newspapers. Some chapters also used it as a way to encourage volunteers to attend training classes. However, the public generally did not turn to Red Cross offices for additional information on the alert.

Even though hospitals are generally considered always ready for emergencies, the alert induced reviews of earthquake plans, additional inspections on emergency

generators, and taking stock of emergency supply caches in hospitals throughout the region. A major hospital serving the northern San Luis Obispo area, and one which is a triage facility for disasters, reviewed its triage plans and specifically placed triage teams on stand-by status.

Public school districts also have responsibilities directly linked to the public. If an earthquake occurs during school hours, school officials are responsible for the health and safety of children. Schools are also viewed as possessing responsibility for teaching children about earthquake readiness and about safe response to actual earthquake events. Throughout the region, schools were especially active during the alert. At a minimum, virtually all schools conducted at least one duck and cover drill with students, staff and faculty. Some schools conducted several drills during the alert period. And some even conducted evacuation drills. Many schools also took precautionary actions such as keeping drapes drawn and inspecting facilities to make sure that objects which could be thrown around during an earthquake were adequately secured.

While all schools conducted drills and reviewed emergency plans, the Coalinga-Huron School District initiated this process well before receiving word about the alert from its Fresno County Education Department. Most residents, including school officials, in and around Coalinga had felt the 4.7 magnitude precursor quake. This event combined with the school districts experience of great loss from the 1983 quake, induced officials to engage in early response. School officials simply called a drill based on the quake felt the night before, they did not wait for official word of an alert.

The media. Media response turned the alert into quite the event. The role of both broadcast and print media organizations in providing information to the public is undeniably necessary. While this role is certainly taken seriously, the tendency of the media to sensationalize and exhaustively report on the alert, to the point of repetition, gave it a character and life it likely would have not created on its own.

Television and newspaper press agents from all points of the state began arriving in the Parkfield area early the morning following its announcement. Mobile broadcast units from San Francisco, Bakersfield and Los Angeles were visible, not only in Parkfield, but in Paso Robles and Coalinga as well. The presence of the media gave the alert a party-like quality. Radio broadcasters were also very visible. One southern California radio personality went so far as to broadcast a live morning show from a cafe in Paso Robles by using a cellular phone. Some radio broadcasters trivialized the alert and tended to joke about it. For example, one broadcaster would initiate an hourly update by saying ". . . well, we've survived one more hour."

In the midst of national election campaigns, the alert made headline news in virtually all regional newspapers for the three days of the alert. Some stories addressed the reaction of people in cities close to Parkfield, but most presented interviews with seismologists, state officials, and residents in Parkfield. While waiting for the earthquake to happen, the primary role of USGS and state representatives was to sit around and give interviews to the press.

In a way, the press directed the alert. For example, the original plan was for the State OES to set-up its mobile command unit in Cholame, located just south of Parkfield in an area less vulnerable to electronic communication impediments. But since the press converged on Parkfield, it was necessary to move the command post into Parkfield. The presence of such a great number of people dependent on electronic telecommunication capabilities, in the small canyon-like environment of Parkfield, created a communications black-out. While state representatives made a special request of Pacific Bell to install additional telephone lines, it wasn't until the week after the alert was over that this request was met.

Print and television media covered the event, for the most part, in a thorough and responsible fashion. Newspaper articles reported the specifics of the alert, as well as more general information about what to do to get ready for earthquakes. Almost all articles were followed with details about preparedness actions the public should take to get ready. Television coverage also presented such information. For example, one morning news show made a quiz game about what to do to get ready. The local television station, KSBY, offered a free *Earthquake Survival Guide* booklet to those willing and able to go to the station to pick it up. About 25 of these booklets had been given away by the final day of the alert.

The public was kept well informed of the parameters of the alert, of its scientific caveats, and of the usefulness of the Parkfield prediction experiment. However, the tendency to depict the details of this short-term prediction, specifically in terms of its likelihood of occurrence (37% or greater chance), may have impeded people's ability to personally define the quake as potentially happening to them. More than anything else, it likely provided the public with the message that scientists were unsure of their ability to predict earthquakes. Media coverage also tended to focus obsessively on the $19 million spent by the USGS on the prediction experiment.

The Public

The public heard about the alert almost exclusively from media sources. As a matter-of-fact, the public could hardly escape hearing about it. Radio and television news agencies began broadcasting scripted news releases almost immediately upon receipt. By early in the morning following its official announcement, the alert was being detailed extensively on local, regional and statewide news programs. It also appeared as headline news in virtually all local and regional newspapers. And for the most part, it remained headline news until it expired three days later.

Residents of the area were also hard put not to notice the presence of many more outsiders than would normally be expected at this time of year. Many media reporters, state officials, USGS personnel, and researchers frequented the region for several days.

At the very least, this event provided the local motel and restaurant industry with a mini-boon to their cash registers.

Important questions to answer from this alert were, how would the public perceive an A alert and what would citizens do in response? For example, it might be anticipated that the public would ignore the alert or, at the other extreme, take the alert so seriously that it would engage in panic like behavior. Another concern was that if the quake, which the alert predicted, didn't happen, as was the case, would the public perceive it as an alarmist or "cry wolf" situation?

Neither the extreme reaction nor the "cry wolf" perception was observed. Instead, the public perceived the alert as a sincere and honest effort on the part of scientists to predict an imminent earthquake and to share concerns about potential danger with the public at-large. There seemed to be a general knowledge that earthquake prediction is an imprecise science which implicitly meant that certainty in the prediction coming true was impossible. The public likewise took the middle ground in terms of response to the alert. While the alert was not ignored and was taken seriously enough to warrant some protective measures, the public did not engage in extreme behaviors.

Hearing about the alert, in all of its detail, did not necessarily mean that the public perceived the alert as defining an imminent earthquake threat. Nor did it mean that the public engaged in substantial amounts of readiness behaviors. This is not to say that the public did not take the alert seriously enough to engage in some readiness behaviors in a rational way. But, members of the public who felt the precursor quake were much more likely to engage in readiness activities than those who did not feel it.

For the most part, the public perceived the alert as real and credible, but people did not allow their perceptions of the alert to disrupt daily routines. And the extent of public response varied by proximity to Parkfield and experience with damaging earthquakes. Another factor variably affected response to the alert—feeling the 4.7 precursor quake on Monday night. For example, people in Paso Robles and Coalinga took the alert more seriously and engaged in more readiness behaviors than did people in Avenal, Hanford, San Luis Obispo, and Taft. The residents of Coalinga and Paso Robles also more frequently reported having felt the precursor quake.

The occurrence of the precursor quake which was strong enough to be felt not only acted as a precursor for calling an alert, it also appears to have acted as a precursor to readiness activity. Merchants in the area seem to implicitly understand this phenomenon. For example, retailers related that they could predict purchasing behavior based on earthquake activity. When people feel an earthquake they tend to buy more water, batteries, and other readiness supplies. But what really increases buying is if one earthquake is followed-up by another. The follow-up quake acts as a reinforcement of concern raised by the first quake.

Coalinga was by far the most active and alert of all communities visited. This was no doubt due, in large part, to Coalinga's experience with a devastating earthquake in 1983. Virtually everyone interviewed in Coalinga brought up the 1983 quake. In

addition, nearly everyone felt the 4.7 precursor quake which led to the alert. Coalinga's experience with a damaging earthquake, which has become a significant event in its cultural history, combined with feeling the precursor to make the alert a very salient issue.

Overall, the public engaged in readiness activities which could be forthrightly accomplished and which were easily affordable. Purchasing bottled water and fresh batteries were the most noted actions in which the public engaged. Some people reported removing pictures and mirrors from walls and placing breakable items such as glassware and crystal in safer areas. However, behavior such as removing pictures and mirrors more demonstrates that the public may not take its general earthquake vulnerability very seriously in the first place. If such actions had been accomplished on a more permanent basis prior to the alert, it would not have been necessary to do so during the alert.

Coalinga is probably the best prepared and most vigilant of all communities in the Parkfield region. Ironically, it is also likely the most able community to structurally withstand earthquakes. However, this ability to survive future quakes came at a dear price when the majority of structures were severely damaged in the 1983 earthquake. But it is that event which led to the rebuilding of Coalinga in an earthquake sound fashion. The earthquake experience of 1983 made an indelible impression on the people of Coalinga.The alert also made residents of Coalinga more "edgy", there was a sense of tension in the air and stores ran out of water, batteries, and other such supplies.

Findings

The 4.7 magnitude precursor quake, which led to issuing the first A-level alert of the Parkfield Earthquake Prediction Experiment, was Mother Nature's way of communicating to her inhabitants that they live in earthquake country. And the official A alert provided a direct means for the USGS and State OES to communicate Mother Nature's warning to other organizations and to the public. More than anything else, the alert served as a reminder, to the public and to organizations serving the public, that they occupy earthquake territory. More importantly, it provided an opportunity for organizations and residents alike to take stock of their earthquake readiness capabilities.

An Earthquake Culture?

Impressions derived from this case study suggest that most of central California possesses, at best, only a cursory earthquake culture. People throughout the central California region are aware, at one level or another, that they live in earthquake country. However, keeping this awareness at such a level so that appropriate readiness becomes

a part of the cultural fabric of this society is yet another matter. Perhaps it is to be expected that when a public constantly lives under the threat of natural events, which are largely unpredictable and without season, that it would become complacent and fatalistic. Such an understanding, however, must not allow us to dismiss the need for an earthquake threatened society to develop ways to sew readiness behaviors into its cultural fabric. This alert provided a good opportunity to sew one more thread of earthquake salience into the social fabric of central California.

While information about the Parkfield Experiment, beginning in 1985, induced a measurable increase in public readiness behaviors (Mileti, Fitzpatrick and Farhar 1990), this A alert revealed that there is much more to be accomplished before the Parkfield region can be considered truly ready for a damaging earthquake. There is ample evidence to suggest that central California has not yet developed an earthquake culture, especially if such a culture entails a routine sense of permanent readiness behaviors. For example, when people said that they had taken pictures off the walls over their children's beds in response to the alert, by inference they indicated that they have not yet developed an earthquake culture. If they had, such behaviors would not have been necessary since bolting of pictures to walls would be routine in an earthquake culture.

What the Alert Meant

What the alert meant for emergency response agencies was to "hurry up and wait." The initial decision facing these organizations was what to do immediately and then whether to maintain that decision.

News organizations, as would be expected, were the principle medium of communication for getting word of the alert to the public. Response by media was immediate and thorough, and the presence of journalists could not go unnoticed. As with the initial Parkfield prediction announcement in 1985, this alert became quite the media event. In some ways media response was the most visible of all organizational response and in part actually determined response by other organizations.

Local and state agencies all did something in response to the alert. The standard "company-line" was that all alerts must be taken seriously and plans implemented. However, such statements may be due more to recognition that plans exist and must therefore be followed than due to perceiving and believing the actual risk an alert is intended to convey.

The degree of local organizational response to the alert varied depending on available resources, proximity to Parkfield, and past experience with damaging earthquakes. If nothing else, the alert caused organizations to take their emergency response manuals off of shelves, dust them off, review them, and update them at a time other than when fiscal bureaucratic procedures call for it to be done.

What the alert meant for citizens essentially amounted to a reminder that they are at continued risk to earthquake activity. Beyond such a reminder, the alert, and the media coverage surrounding it, brought to the attention of citizens the concerted efforts on the part of government, at all levels, to address the myriad problems facing earthquake-prone California. But perhaps more than anything else, it reminded all involved that Mother Nature can be a tease at times and that successful short-term prediction of earthquakes continues to reside in the future.

Usefulness of Planning

The widespread implementation of earthquake plans by organizations demonstrates the usefulness of developing emergency response plans. The use of developed plans facilitates organizational response and constrains tendencies by individuals to rely upon personal perceptions of risk in deciding what to do. This usefulness is apparent when looking at individual versus organizational perceptions of the alert. Personnel in all organizations did something in response, regardless of the predisposition by individuals in those organizations to dismiss the alert as meaningless. Even though many operations personnel may have personally viewed the alert as a nuisance, the organization's response plans took precedence, and were unquestionably implemented.

Important Influential Factors

Two factors, more than any others, appear to influence the development of perceptions about short-term predictions which then lead to readiness behaviors—feeling precursor earthquake activity and prior experience with damaging quakes. Precursor quakes, large enough to be felt but not so large as to cause damage, would likely enhance taking short-term earthquake predictions seriously enough to engage in rational readiness activities. In communities with damaging earthquake experience, the precursor quake provided an especially good reminder to be earthquake ready while simultaneously acting as reinforcement for the short-term prediction.

Effectively communicating warnings about increased earthquake risks is undeniably important. An important phase in the process of communication is the forming and shaping of risk perceptions. And the manner in which the risk is depicted can significantly influence how perceptions are developed (Fitzpatrick and Mileti 1991; Mileti and Fitzpatrick 1991). Social research on the Parkfield Experiment (Mileti, Fitzpatrick and Farhar 1992) revealed that people prefer to deal with earthquake risk in a dichotomous fashion. They attach meaning about future earthquakes as either something germane to them or as something that does not apply to them. In other words, they have

no need to attach probability of occurrence definitions in as refined a manner as do scientists.

As in developing perceptions of risk in the long-term Parkfield prediction, in this short-term situation, members of the public simply decided whether they were or were not at increased risk to a damaging earthquake. And this decision was primarily based on past experience with damaging earthquakes, feeling the precursor quake, and the influence of organizations such as schools. People were more likely to use the probability statements issued in the A alert more as a way to define the scientists' sense of inaccuracy and uncertainty than as a way to define their own personal risk.

Offering probability statements may very well have been confusing to the public and may have helped some people decide that they were not at risk when indeed they were. Perhaps it would be best to simply state to people that they are at increased risk rather than providing them with unnecessary excessive probability data. In the future, therefore, it might be more wise to adhere to the "KISS" ("keep it simple stupid") philosophy when attempting to effectively communicate to the public about increased vulnerability to a specific earthquake event.

References

California Office of Emergency Services. 1992. "Parkfield 'Level A' Alert." Situation report. Sacramento, CA:20 October.

Governor's Office of Emergency Services. 1988. *Parkfield Earthquake Prediction Response Plan.* Sacramento, CA: State of California Office of Emergency Services.

Fitzpatrick, Colleen. 1992. *Constructing Lines-of-Conduct: Theoretical Explanations with Empirical Evidence.* Unpublished Ph.D. dissertation. Fort Collins, CO: Department of Sociology, Colorado State University.

Fitzpatrick, Colleen and Dennis S. Mileti. 1991. "Motivating Public Evacuation." *International Journal of Mass Emergencies and Disasters* 9(2):137-152.

Mileti, Dennis S. and Colleen Fitzpatrick. 1991. "Communication of Public Risk: The Theory and its Application." *Sociological Practice Review* 1(3):20-28.

Mileti, Dennis S. and Colleen Fitzpatrick. 1992. "The Causal Sequence of Risk Communication in the Parkfield Earthquake Prediction Experiment." *Risk Analysis* 12(3):393-400.

Mileti, Dennis S., Colleen Fitzpatrick and Barbara C. Farhar. 1990. *Risk Communication and Public Response to the Parkfield Earthquake Prediction Experiment.* Final report to the National Science Foundation. Fort Collins, CO: Hazards Assessment Laboratory, Colorado State University.

Mileti, Dennis S., Colleen Fitzpatrick and Barbara C. Farhar. 1992. "Fostering Public Preparations for Natural Hazards: Lessons From the Parkfield Earthquake Prediction." *Environment* 34(3):16-20,36-39.

Mileti, Dennis S. and Janice R. Hutton. 1987. "Initial Public Response to the 5 April 1985 Parkfield Earthquake Prediction." Boulder, CO: the Natural Hazards Research Applications and Information Center, University of Colorado.

Southern California Earthquake Preparedness Project. 1988. "The Parkfield Earthquake Prediction." Mailed brochure prepared by the Governor's Office of Emergency Services in cooperation with the California Department of Conservation, Division of Mines and Geology and the United States Geological Survey. Pasadena, CA: Southern California Earthquake Preparedness Project.