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**1985 MEXICO CITY EARTHQUAKE  
MEDICAL AND HEALTH CONSEQUENCES AND RESPONSE  
PRELIMINARY REPORT**

**Introduction**

This report addresses the medical and health consequences of the Great Earthquake which struck Mexico City at 7:20 AM on September 19, 1985, and the lessons learned from examining the medical and health response of the Mexican government and people. The information presented was gathered during a four day visit to the capital of Mexico from October 15 - 19, 1985, as one of a team of representatives of departments of the State of California. Additional information was provided by news media and by researchers who visited Mexico earlier.

Although the team's ability to gather information was somewhat limited by language barriers, political sensitivity, and the briefness of the visit, the experience provided many valuable lessons for California's earthquake response planning.

**Medical Research Goals**

The purpose of the visit was to gather information to improve California's preparedness rather than to evaluate the Mexican government medical and health response to the earthquake. Furthermore, it was important for California planners to view the consequences of a Great Earthquake first hand and to convey the impact of that catastrophe to state policy makers and staff.

In particular, from the medical and health perspective, we wished to examine types of injuries created by the earthquake, how those injuries originated and were treated, and the impact of the earthquake on the city's medical care delivery system. Also, we wished to gather information on the public and environmental health consequences of the earthquake and how responders addressed those problems.

### Methodology

While in Mexico City, we used four principal sources of information. Most important was with interviews Mexican medical and health professionals who played roles in the response to the earthquake. These included the administrators of the Juarez and General Hospitals, the Director of Health Services for the Mexico City District, and the administrator and staff of the Balbuena Emergency Hospital which treated more than five hundred casualties. The officials we interviewed spoke candidly, freely answering our most difficult questions.

Second, we walked the grounds of the Juarez and General Hospitals examining the remains of the collapsed buildings as well as those that survived. We also toured the damaged areas of the city examining the patterns of damage to buildings. Third, both the English and Spanish language press carried articles of interest on the earthquake.

Last, and of considerable importance, we talked to team members who gathered information from other sources. These daily debriefings and informal conversations allowed us to verify our findings and provided leads to follow. It is also important to note the contributions made by consultants who were in Mexico City at the same time to study the earthquake, as well as embassy staff who provided contacts with key public figures as well as their insights.

## Major Findings

### Caveats

There are significant differences between the Mexico City earthquake and the earthquake projected to occur on the Southern San Andreas Fault. For example, the vast majority of injuries and deaths seemed to be caused by building failures with relatively few serious injuries caused by flying glass, falling cornices, and unsecured building fixtures and furnitures. In addition, building height coupled with soil composition seemed to be the principal determinate of building failure and concomitant injuries. This created a spotted pattern of damage. There was very little damage among shorter buildings, even those of unreinforced masonry, or in the very tallest skyscrapers.

There was also less damage to hospitals than projected for the Southern San Andreas although the three largest government hospitals in the city were closed because of building failures. Few other hospital buildings suffered severe structural damage. Reports indicated there was relatively little damage to essential hospital equipment in undamaged buildings.

The response environment was also different. Although telephone service was limited immediately following the quake, there were phone lines available that proved invaluable in the medical response effort. Transportation route recovery was achieved very quickly and electrical power was restored to most areas within hours.

There were, however, important similarities. The large numbers of casualties, loss of 5000 hospital beds, extensive search and rescue operations, and the need to mobilize, organize, and coordinate the medical resources of the district all provided useful information for California planners.

#### Search and Rescue

Search and Rescue (SAR) was the most significant response problem generated by the earthquake. With the vast majority of serious injuries created by building collapse and the great number of people trapped in failed structures, the rapid extrication of victims became the top response priority.

SAR activities, however, moved slowly. There were shortages of cranes and other equipment needed to move the heavy slabs of concrete. There was also some question about how soon such heavy equipment could be employed. If used too soon, they could cause the collapse of pockets sheltering trapped victims. The initial work was performed by untrained citizens using their hands, picks and shovels to locate friends, family members and relatives.

Research on earthquake mortality has shown that entrapment in failed buildings and length of time before rescue are significantly related to mortality. Although data on the survival rates of trapped Mexico City victims were not available, anecdotal information supported this observation.

## Medical Impact

Official estimates place the death toll from the earthquake at about 5400 with another 30,000 reported injured. Unofficial estimates of deaths ran as high as 70,000 with 40,000 appearing to be the upper plausible limit. The actual count will probably never be known. Of the 30,000 injured, 10,000 were judged serious although only 1700 were hospitalized. Health officials reported that many patients refused hospitalization because of fear of buildings.

The three largest government hospitals in Mexico City were closed due to building failures. At Juarez Hospital (578 beds) the collapse of the building housing all the inpatient beds and 1000 staff and patients, killed about 4-600 and rendered the facility unusable. At General Hospital (1900 beds), the collapse of the OB/Gynecology Ward (including its nursery) and the quarters of the medical residents also accounted for about 400 dead. About 600 - 800 patients were discharged and another 250 - 400 were transferred to operating facilities. Damage to Central Medical (about 2000 beds) did not result in many casualties but did require the facility to close. Despite the loss of 5000 beds in these three facilities and damage to approximately 19 others, the hospital system was able to absorb earthquake victims as well as hospital evacuees.

Although General Hospital was a teaching hospital and Central Medical a major tertiary care center, the system was also able to continue acceptable levels of specialized care through the private hospitals and the nearby National Institutes of Health.

The District Health Services had 89 ambulances at its disposal augmented by military transport and vehicles of volunteer civilians used for non-emergency transportation. The ambulances were dispatched almost immediately to the District's four Emergency Hospitals (totalling about 800 beds) and then to the sites of collapsed buildings where search and rescue operations were ongoing. The four Emergency Hospitals treated about 2000 casualties within a 72 hour period with the vast majority seen within the first 24 hours.

Although additional study is required to reach definitive conclusions, preliminary data indicate three general phases of casualty treatment in hospitals. In the first 24 hours, the vast majority treated had relatively minor injuries. Beginning about 24 hours into the response, more of the seriously injured were being extricated from collapsed structures and referred to hospitals. In the third phase, patients with psychological disorders caused by the earthquake presented themselves to medical facilities. Of interest, the large aftershock that occurred 36 hours after the initial earthquake did not create nearly as many casualties as officials were prepared for.

No official data have yet been released on the patterns of injury. Unofficial descriptions of serious injuries indicate a large number of cranial injuries and crushes fractures of extremities. The crush injuries and entrapment in failed structures resulted in many casualties with gangrene who required amputation of limbs in the field. Also a number of casualties suffered kidney damage as a result of dehydration and crush injuries.

Overall the medical response worked well. Its success was based in part on the richness of the medical resources and skills of the medical personnel of the city, in part on the nature of the disaster and in part on luck. There were no shortages of medical personnel, disposable supplies, medical transportation, or hospital resources. Medical personnel also seemed to usually make the correct decisions even when not guided by plans. There was also an abundance of non-medical volunteers willing to assist the medical response including many citizens who provided non-emergency medical transport thus freeing up ambulances for emergency cases.

The fact that most of the severely injured were trapped and required time consuming extrication meant that medical facilities were not immediately inundated with the most seriously injured patients. In the Balbuena Emergency Hospital, 88% of the total number treated were seen within the first 24 hours. Although this experience may not have represented all the medical facilities involved in the response, it is consistent with the relatively low survival rate for victims trapped in buildings for more than 24 hours.

Finally, the recent completion of new buildings at each of the Emergency Hospitals provided additional capacity for the treatment of earthquake victims. The District had also only completed an Emergency Response Plan for its facilities in June of 1985.

Public Health

The only major public health problem was the water supply. The earthquake cut water lines leaving approximately 11 million people without potable water. (Prior to the earthquake, about 3 million people did not have potable water). Water service was restored to all but 3.5 million people within a month of the earthquake. In addition to damage to pumps used to bring the water up to Mexico City's high plateau, there was some cross connection of water and sewage lines resulting in very high levels of contamination of water supplies to some sections of the city. Water was provided and the public was advised to boil all water even if it was labeled potable.

There was some increase in fly and rat populations due to the large number of dead bodies. Fumigation of the sites of collapsed buildings tended to control the problem. The alleged problem of rat bites was not confirmed by health officials. Animal control officials captured stray dogs and held them in animal shelters.

According to health officials, there was no threat of disease either from the contaminated water supply or from dead bodies. Inoculations were given to rescue workers and some of the general public for typhoid and tetanus but only because of the public demand for those medications; not because they were needed or effective.

The tendency of earthquake victims to remain in relatively uncrowded open air temporary dwellings reduces the opportunity for endemic infectious diseases to reach epidemic proportions. In Mexico City, the low utilization rate of enclosed emergency shelters and the city's relatively high public health standards greatly reduced public health risks.

Finally, the long seismic wave motion of the earthquake tended to not disturb even poorly mounted petroleum and chemical storage tanks. Therefore the earthquake did not generate hazardous materials releases anywhere in the area.

#### Conclusions and Recommendations

1. Effective urban search and rescue is essential to lifesaving. Victims who have not been trapped will, in most cases, be able to find and receive medical care for their injuries, even if the medical system has sustained damage. However, the condition of trapped victims will only deteriorate. An effective search and rescue effort requires rapid damage assessment, a coordinated response, and, most important, rapid availability of rescuers and heavy equipment.
2. The most critical medical decisions are made at the scene and/or institutional levels immediately following the earthquake's occurrence. It will take considerable time to organize direction and control, assess damage, locate casualties, and apply resources from a central authority. This is also the time period in which most casualties will be presented for care. Plans and training efforts need to take this situation into consideration.
3. Plans should take into account the massive citizen volunteer effort. In Mexico City, thousands of citizens immediately began search efforts. Some of were motivated by their desire to find friends, neighbors and family, but many felt a need to something positive when faced with such a catastrophe.

Volunteerism was not limited to ad hoc search and rescue. Citizens provided non-emergency transportation for patients, directed traffic, and helped in anyway they could. Trained personnel also contributed their skills. Private medical personnel volunteered at hospitals and clinics. Medical students managed inventories of medications and supplies. Engineering students surveyed buildings. Colleges opened shelters. And, radio amateurs provided the principal immediate communication links to outside areas.

Although planners probably could not obtain commitments to assist from these individuals and institutions prior to an event, they all selflessly contributed where they were needed. Government officials need to remain sufficiently flexible to tap these ad hoc response resources.

- A. Prevention is more effective than response in saving lives. Seismically safe buildings, fixtures, and secured furniture will prevent more injuries than a medical response can effectively treat. The principal lesson of the Mexico City earthquake is the deadly consequences of building failures.