Public health impact of disasters

By Kimberley I. Shoaf, DrPH & Steven J. Rottman, MD, FACEP, UCLA Center for Public Health and Disaster Relief

Introduction

Each year millions of people are affected by natural and manmade disasters around the world. 1999 was an example of the devastation that natural hazards can have on humanity. Tornados, hurricanes, heavy rains, and earthquakes resulted in tens of thousands of deaths and many more affected. Close to a million people have found themselves homeless, economically impacted, or injured because of these disasters. Indeed, disasters would not be 'disastrous' if it were not for their effect on the human population. While disasters cause problems that exact a human toll and are amenable to public health interventions, the application of public health principles to disaster management has been minimal. This paper explores the public health effects of natural disasters and some of the public health principles which can be applied to disaster management.

The impact of natural hazards on the public's health can be divided into four categories:

- direct impact on the health of the population
- direct impact on the health care system
- indirect effects on the population's health
- indirect effects on the health care system.

Direct impact on the health of a population

The most obvious impact on the health of a population affected by a disaster is that of injuries and deaths that can be attributed directly to the disaster. Each year, approximately 300 natural disasters occur worldwide, exacting a human toll of approximately 250,000 lives. In the past 20 years, natural disasters have claimed the lives of close to 3 million people and have negatively affected the lives of at least 800 million more (Noji 1997).

Injuries

Different types of disasters result in different patterns of injury and these, in turn, produce variable levels of morbidity and mortality. Generally it is believed that earthquakes and rapid flooding (i.e. tsunamis and flash floods) are capable of producing large numbers of deaths. Earthquakes and high wind events (such as tornados) are capable of producing large numbers of severe injuries requiring intensive care (Noji 1997). These relationships are not linear, however. For example, not all earthquakes result in large numbers of injuries or deaths and hurricanes can, in fact, result in large numbers of fatalities.

Tropical storms and hurricanes

The number of fatalities associated with hurricanes in the western hemisphere have decreased dramatically with the advent of improved storm tracking and the issuance of hurricane warnings. Hurricane Mitch, however, provided a stark reminder that hurricanes remain a significant threat to life in that region of the globe. In October 1998, Hurricane Mitch devastated Central America. Even though the hurricane had been tracked, warnings were not issued to the population (Corrales 1999). In Honduras alone, 8000 people were killed as a result of flooding and landslides. The pattern of the injuries and deaths associated with Hurricane Mitch was also different from other hurricanes. Generally hurricane-related mortality has principally been associated with drowning from storm surges (Noji 1997). But a large number of the Hurricane Mitch fatalities were associated with inland flooding and mudflows resulting from 5 days of torrential storms leaving behind 30 inches of rain (PAHO 1999). The sustained high winds associated with these storms also have the potential of causing blunt trauma from flying debris as well as from structural collapse of buildings. Several deaths in Hurricane Andrew in South Florida in 1992 were attributed to the high winds associated with that storm (Noji 1997).

Earthquakes

Injuries and the resulting fatalities associated with earthquakes vary tremendously from one event to the next. Both the number and severity of injuries are related to a number of factors including the magnitude of the earthquake, its proximity to a populated area, the soil type, building construction, time of day and population characteristics and behaviors. While there are a large number of factors associated with the impact of earthquakes on human health, a key factor associated with fatal injuries in earthquakes is building collapse.

Earthquakes in which a large number of buildings collapse result in many more deaths than those where there is minimal collapse. Building collapse is correlated with the magnitude of the event, its proximity to the building, soil conditions, and the construction practices utilized (Bourque 1998). The combination of a large earthquake, in close proximity to a population center, built upon soft soil, using construction practices which do not employ anti-seismic reinforcements, can result in unimaginably large number of fatalities.

The 1999 earthquake in Turkey is an example of the potential that earthquakes have for death and destruction. A magnitude 7.4 earthquake occurred on the North Anatolian Fault, near the town of Gölcük on August 17, 1999. Hundreds of apartment buildings, constructed out of reinforced concrete collapsed on their sleeping occupants. The results were an estimated 17,000 deaths with an additional 10,000 people missing and presumed dead. Another 24,000 individuals were treated for injuries (MMWR1999). An earthquake of similar magnitude occurred a month later in Taiwan. The 7.6 Mw earthquake also struck in the middle of the night killing approximately 2400 people. While as many as 5000 buildings reportedly collapsed in Taiwan, many of them were non-engineered low-rise buildings as compared to the reinforced concrete buildings in Turkey which were more deadly (Goltz 1999).

Even a relatively small earthquake can have devastating effects. On January 25, 1999 a magnitude 5.9 earthquake occurred in the coffee growing region of Colombia. The relatively moderate earthquake however struck an area that had soil conditions which exacerbated the shaking experienced in the city of Armenia. The construction practices prevalent in building in the region did not include any codes for anti-seismic reinforcement until 1986. As a result of the earthquake, hundreds of reinforced concrete buildings collapsed, killing nearly one out of every 250 people in this community of 250,000 (Shoaf 2000).

The force of the earthquake is not the only cause of death. Secondary hazards such as firestorms and tsunamis can also wreak havoc and a high death toll. It is estimated that as many as 10% of the deaths in the Kobe earthquake were a result of the fires that ignited from ruptured gas lines. Rubble in the narrow streets restricted the fire department's access to the fire, allowing it to spread across large sections of the city.

In 1998 a magnitude 7.0 earthquake struck off the coast of Papua New Guinea. While the quake was felt, it did no damage to the small houses in the villages off the coast. However, 15 minutes later three tsunamis struck the coastal villages. It is estimated that as many as 3000 of the 8000 inhabitants of the region died as a result of the waves, which exceeded 12 meters (USC 1998). Many of these deaths were a result of the force of such a large amount of water surging against the body. For those who survived the force, many drowned, as they were unable to swim.

Non-fatal injuries also vary in severity and number and are dependent on a number of variables. Unlike fatalities the critical factor is not necessarily building collapse or even damage to structures. Non-fatal injuries can range from very minor injuries such as lacerations and injuries to soft tissue to such life-threatening injuries as trauma to internal organs. Whereas fatal injuries are usually caused by building damage, these non-fatal injuries appear to be more directly associated with ground shaking. The Northridge earthquake of 1994 provides an example of this. Whereas a majority of deaths occurred in collapsed buildings, most non-fatal injuries (both those who were hospitalised and those who sought treatment elsewhere) were more associated with non-structural responses to ground shaking. The two major causes of non-fatal injuries were being struck by objects (or running into them) and falls (Peek-Asa et al. 1998, Shoaf et al. 1998).

Communicable diseases

Many believe that the primary role of public health in disasters is to control potential communicable disease outbreaks after a disaster. While it is true that the potential for outbreaks and even epidemics of infectious disease exists after any natural disaster, the actual occurrence of such outbreaks has been rare (Noji 1997). In order for the risk of epidemic to exist, the disease of concern needs to exist in the population prior to the disaster.

Following the earthquake in Turkey in October1999, there was a great deal of speculation that outbreaks of cholera and typhoid would occur as a result of the large number of dead bodies. While there are sporadic cases of typhoid in Turkey it is not a disease that is common there. One individual was treated for typhoid by emergency medical personnel following the earthquake, although the case was not confirmed as typhoid and the source of contagion was not identified. A single case of typhoid in an area where sporadic cases exist is not an outbreak. However, that case fueled a great deal of commotion in the media and the public health community. Dr. Claude deVille de Goyet of the Pan-American Health Organization wrote an op-ed piece for the New York Times, which unfortunately was not carried. In that piece, Dr. de Goyet talked about the myth that disasters result in epidemics of infectious diseases and emphasized instead the need for maintenance and quick restoration of sanitary services and potable water to the affected population, as well as surveillance of its health status. Dr de Goyet also admonished post-diaster efforts aimed both at the quick disposal of bodies as a public health measure, as well as large immunisation campaigns geared to counter epidemics of specific infectious diseases that simply do not occur following these incidents.

A more accurate reflection of how well a community can withstand the adverse health effects caused by a disaster may be found in the strength of the public health system in place prior to the disaster. Consider the occurrence of dengue fever following both Hurricane Mitch in Honduras and the earthquake in Colombia.

Honduras has a public health system which is making great strides in improving the health situation for its population. In the last 10 years, both maternal mortality and infant mortality have decreased steadily in Honduras. However, infectious diseases continue to be the principal reason for medical care and hospital admission and represent six of the top ten causes of death in the country (PAHO 1998). In Colombia, the public health situation also has improved, yet infectious diseases still represent one of the principal reasons for medical care and are one of the top five causes of death (Shoaf 2000).

Both Colombia and Honduras are endemic regions for dengue fever; in 1998 in fact, Armenia, Colombia had an epidemic. Both the Colombian earthquake and the Honduran hurricane produced conditions that could increase the vector, flies, which carry dengue. Since the impacted area in Colombia was smaller the ability to provide vector control in the region was greater. Surveillance in Colombia demonstrated that there was no increase in either classic or hemorrhagic dengue fever. Surveillance in Honduras however, demonstrated a Bimodal increase in cases of dengue: a small increase immediately following the hurricane and a second increase in January, 1999. The destruction of the transportation and health care sectors from massive flooding made it more difficult for the health care sector to respond to a disaster of such magnitude. While Colombia's public health infrastructure was most likely a contributing factor in the absence of post-earthquake disease outbreaks, a disaster may increase the demands on an already weak public health infrastructure in developing countries. This may result in a shift in priorities away from building communicable disease prevention and control programs in non-disaster times, to more urgent efforts to respond to a legitimate increase in cases when a disaster occurs (Richman 1993).

No outbreaks of infectious disease, such as dengue, have been reported following similar disasters in the United States or other developed countries. This is simply because infectious diseases do not represent major causes of illness or death in the United States. While dengue fever is a possibility in parts of the United States, particularly southern Florida, because the occurrence rate is small, any outbreak detected by surveillance would most likely also be small and not expected be a large additional burden on a public health system that is trying to provide basic necessities in response to a disaster.

Acute illnesses

In contrast to infectious diseases, disasters do have the potential for other types of short-term impact on the population's health. Some disasters have the potential for directly or indirectly causing acute illnesses in an exposed population. Earthquakes, for example, can cause the release of soil containing spores, such as coccidioides immitis, causing clinical coccidioidomycosis. This occurred following the Northridge, CA earthquake of 1994 causing a small outbreak of coccidioidomycosis in a community in Southern Ventura County. Other natural hazards that have the potential of causing acute illness include volcanoes and wildfires which can cause both respiratory and ocular problems as a result of ash, smoke, and toxic gases.

Extreme weather conditions are good

examples of natural hazards which have the potential for both direct and indirect acute health consequences. In the United States in the recent past, increases in morbidity and mortality as a direct result from heat waves have been documented. In Chicago in the summer of 1995, 465 people died from heat-related illness when record-breaking temperatures were recorded for 8 consecutive days (MMWR 1995). Those most at risk were those who were elderly and either did not have, or did not turn on, air conditioning in their homes.

At the opposite extreme hypothermia is only one potential acute health problem associated with extreme cold weather. Extreme cold weather events are also accompanied by two secondary hazards which carry their own adverse health effects. Extreme cold events, especially those that result in ice storms, often result in electrical power outages. In response to the lack of electricity, residents commonly resort to using candles for light and kerosene heaters and fireplaces for heating. This use of open-flame sources has been associated with residential fires, and fire-related mortality Power failures also result in residents using gasoline or kerosene powered generators. The misuse of generators in poorly ventilated settings is associated with an increase in carbon monoxide poisoning (MMWR 1998).

Chronic illnesses

The consequences of a disaster on the health of the population are not limited to acute conditions such as physical injuries or acute illness For a long time there has been speculation that disasters result in an increase in adverse consequences of chronic illness such as heart disease. Anecdotal accounts of disasters often include reports of increased heart attack deaths, especially in the event of acute onset disasters such as earthquakes. Certainly heart attack deaths are often included in the official numbers of fatalities in disasters. In the Northridge, Californian earthquake, the official coroner's report of the fatalities directly or indirectly associated with the earthquake was 57. Only 33 of those deaths were as a result of physical injuries (Peek-Asa et al. 1999). The other deaths were attributed to heart attacks or other medical causes. These numbers, however, did not include all individuals who died of heart attacks in Los Angeles County on January 17, 1994, but only those coronary deaths that came to the attention of the coroner and were determined to be somehow caused or hastened because of the earthquake. A study of the fatal coronary events in Los Angeles found that indeed there was an increase in the number of heart attacks on January 17, 1994 however, a decrease of fatal events occurred in the following week (Kloner et al. 1997). Thus, it appears that an acute disaster such as an earthquake may hasten death from heart attack, however, the net effect is not a significant increase in fatal heart attacks

While disasters may not be associated with a large increase in fatal acute coronary events, they do appear to result in greater morbidity from chronic conditions such as heart disease, hypertension and diabetes. Researchers in Japan found that glycemic control was impaired in diabetics following the Kobe earthquake (Inui et al. 1998). Similarly, following Hurricane Iniki on the Island of Kuai in Hawaii, the mortality rate from diabetes doubled compared to prior to the Hurricane (Hendrickson and Vogt 1996) Therefore, conditions for which stress is a risk factor and for which ongoing health care is necessary appear to be affected by disaster situations.

Psychological effects

The health effects of natural disasters are not purely of a physical nature. A great deal of literature deals with the emotional or psychological effects of disasters. Just like the physical effects, the emotional effects of disasters vary greatly from disaster to disaster. They also tend to range from very minor emotional distress to clinically diagnosable psychological pathology. Again there are a number of variables that contribute both to the severity and extent of the psychological effects Generally, natural disasters result in large numbers of individuals suffering from minor emotional distress that tends to be self-limiting in nature (Bravo et al. 1990). Some portion of the population may suffer from more severe forms of distress, especially anxiety and depression, depending on their prior psychological state and the impact of the disaster on them and their families (Siegel 1999). While it has generally been believed that victims of natural disasters suffer from Post-Traumatic Stress disorder (PTSD), it does not appear that this is the case. Symptoms of PTSD may be expressed by victims of natural disasters but community based studies do not reflect an increase in diagnosable PTSD (Siegel 2000)

Direct system effects

Hospitals, clinics, health care centers and the personnel that staff them are subject to the same destructive forces as are other buildings and people in the area of a disaster. This damage occurs at a most inopportune time, just as the need for emergency health care is greatest.

Damage to the physical infrastructure

An example of the direct impact of disasters on the health care system was the damage to hospitals as a result of the Northridge earthquake. Eighteen hospitals suffered varying degrees of structural and/or non-structural damage as a result of the earthquake. Several hospitals had to evacuate patients already there and others were unable to treat individuals seeking emergency care (Cheu 1995).

The earthquake of January 25, 1999 in the coffee region of Colombia had similar devastating impacts on the health care system. The one hospital in the community of Calarca suffered significant damage to the building, causing the evacuation of the 30 in-patients to a building next door. Although the damage did not affect the integrity of the building, stairwells were impassable and significant damage to walls in the operating suite made those areas unusable. The hospital continued to provide emergency care in the portion of the building that had been constructed after a previous damaging earthquake. This section fared much better than the older sections of the hospital, which had significant portions built of unreinforced concrete.

A number of clinics in Armenia also suffered major structural damage. Of the 12 public health clinics in the city, four collapsed in the original earthquake with five others having significant damage to the roof, walls, and equipment. One clinic slowly slipped down the hillside behind it, although it had continued to function in the immediate aftermath of the earthquake.

The effects on the health care system are not only a result of structural damage. A major cause of damage to hospitals in the Northridge, Californian earthquake, was breakage of water lines and sprinkler pipes Many hospitals, although structurally sound were unable to operate because of the damage caused by water pipes rupturing and flooding the facility causing a loss of medical records, medical supplies, computers and other electronic equipment (Cheu 1995). The Sepulveda Veteran's Administration had such extensive damage due to water that they were forced to evacuate their patients to other area hospitals in spite of the fact that they sustained no structural damage to the hospital

Other non-structural damage also

affects the ability of health care agencies to provide services after disasters. Forces from earthquakes, tornados and hurricanes can damage both supplies and equipment as they fall to the ground or have other things thrown on top of them. The destruction of equipment and supplies, especially the loss of laboratory functions and pharmaceuticals, places an additional burden on a health care agency trying to provide services to an increased number of patients. Likewise, the loss of medical records can place an additional burden on the system.

Loss of personnel

In addition to the buildings having the potential to be affected by the disaster, the personnel required to keep the health care system functioning can also be victims of the disaster. When a disaster strikes a region, those who provide health care can be injured, lose family members, or have significant damage to their residences. Even if they are physically able to report for duty there may be significant emotional issues for them to deal with. There is a need for them to know that their family members are alright. They will also need time to return their homes to order as well. This need for time off comes just as the need to provide health care services often exceed the capabilities of a fully functioning health care system.

Indirect impact on the population

In addition to the direct health impacts that disasters have on a population's health there are indirect effects These effects result partly from the loss of routine health care as a result of both damage to the health care system and the overloading of the system with trauma-related care

Loss of primary health care

Damage to the health care system can have a significant impact on the health of the population in the area of a natural disaster. In addition to urgent health care needs generated by the disaster populations have baseline conditions which do not end because a disaster has occurred There are primary health care needs which, if not met, will adversely affect the population. Immunisations, prenatal care, management of chronic medical conditions such as hypertension, diabetes and cardiac disease, as well as other primary health care services need to be maintained and provided to the affected population.

There are also members of each community who have special health care needs In one study of Los Angeles County residents it was found that approximately 21% of households in the County have at least one member who uses prescription medications (Sareen et al. 1998). If pharmaceutical services are interrupted where will these prescriptions be refilled?

Loss of normal living conditions

Disasters have the potential to economically impact both the community as a whole as well as individuals and families. The Northridge earthquake has been the costliest natural disaster in American history. Some estimate that the cost of this earthquake has exceeded 42 billion dollars (Eguchi et al. 1998). This estimate does not include the potential economic impact of business failure because of the inability to recover from the damages of the earthquake This economic loss is borne not only by the government and business, but also by individuals and families. While research seems to indicate that most victims of disasters in the United States eventually recover and return to their original living conditions it also indicates that recovery is neither rapid nor definite. Some sectors of the population seem to be able to recover more quickly and more fully than others (Bolin 1993). Those who have excess resources may be able to invest those resources in recovery

Those who depend on outside assistance may find that the recovery process is longer and more difficult. In addition, those members of society who are marginalised, because of economic status, language barriers, age, infirmity, or belonging to a minority group, may also find it more difficult to access needed services to achieve recovery In the meantime those who have not yet recovered often live in sub-optimal circumstances An example of this was demonstrated following the Kobe earthquake of 1995 A great deal of recovery occurred in that city very rapidly following a devastating earthquake. When one of the authors visited Kobe in 1997, many of those affected by the earthquake had already repaired or rebuilt their homes. Most of the temporary living quarters were shut down as residents returned to a more normal lifestyle. However, there were still a number of people living in temporary settlements far from their neighborhoods These temporary settlements were communities of prefabricated housing that had one small bedroom, cooking facilities and a small bath Laundry facilities were available on the outside of the units. While most Japanese homes are small these residences were even smaller than average. These communities were not inhabited by a cross-section of the population. The majority of the residents were elderly individuals and couples. Most had rented their homes prior to the earthquake and were waiting for the construction of new apartment buildings so they could return to a more normal lifestyle.

Role of disaster assistance

The receipt of disaster assistance has been tied to long-term health outcomes. Melkonian (1997) found, in a prospective study of employees of the Ministry of Health who lived in the area of the 1989 Spitak, Armenia earthquake, that receipt of disaster assistance was related to health care outcomes not normally considered as 'disaster-related' such as the three medical conditions mentioned above: diabetes, cardiovascular heart disease and hypertension. He found that while exposure to disaster-related stressors (ie. damage to home, injury to self, or injury/death of family member) was only weakly related to health care outcomes, receipt of disaster assistance specified the relationship (Melkonian 1997) In other words, those individuals who had high levels of disaster stressors had significantly lower levels of disease in the two years following the earthquake if they received disaster assistance. Disaster assistance however had no effect on the level of disease for those who had low levels of earthquake-induced stressors.

Indirect impacts on the health care system

Disasters also indirectly impact the health care system just as they indirectly affect the population. The indirect impacts result from increased usage of the system and from impacts on the infrastructure upon which the health care system relies.

External infrastructure damage

'Even when they are not impacted directly, individuals and businesses may be affected for an extended period through damage to lifelines such as water supply or roads' (Cole 1995). Certainly the health care sector, like the business sector, must rely on the external infrastructure for normal functioning. On a day to day basis the health care sector depends upon the utilities to provide electricity, water, natural gas, and telecommunications An effective emergency medical system (EMS) is dependent upon a transportation sector that maintains adequate roads and highways

All natural disasters have the potential for inflicting serious damage on the lifelines upon which the health care sector depends. The utilities are at risk for downed power and telecommunication lines, over-turned or cracked transformers, and system overloads from earthquakes, windstorms, hurricanes, ice storms and other natural hazards Underground pipes carrying water, sewage, oil, or natural gas are at risk for breakage from earthquakes. Water treatment systems can be overwhelmed by large amounts of water from hurricanes and other flooding events Without these utilities the health care system cannot function

Large health care agencies, such as hospitals, often maintain back-up systems in case of failure of the infrastructure. Hospitals maintain emergency generators and have some water storage capabilities. However, these back-up systems do not always function as expected and are by their nature limited resources to be used for a short period of time. Also, other essential components of the health care system often do not have such back-up systems. Clinics, pharmacies, doctors' offices rarely have the capability to provide themselves with power or water in the event of a disaster.

The transportation system is also vulnerable to many types of natural disaster. In Honduras alone Hurricane Mitch destroyed more than 9000 meters of bridges isolating many communities. The combination of destruction to the transportation and communications sectors had a grave impact on the public health sector's ability to respond to the disaster. Because of the damage surveillance efforts were hampered Instead of 70% of locations providing surveillance reports on communicable diseases only 30% of locations provided such reports following the disaster. This hampered the ability to respond to any public health emergencies that may have cropped up and probably contributed to the dengue fever outbreak (PAHO 1999)

Conclusion

The public health consequences of natural disasters are complex. Disasters directly impact the health of the population resulting in physical trauma, acute disease, and emotional trauma. In addition, disasters may increase the morbidity and mortality associated with chronic diseases and infectious diseases through the impact on the health care system How are these ramifications best reduced? As the saying goes, an ounce of prevention is worth a pound of cure Possibly the greatest factor which would lead to reduced morbidity and mortality as a result of disasters is a strong public health system.

A public health sector which conducts routine surveillance, has good immunisation coverage, maintains adequate environmental control, etc. will be better able to withstand the increase in need following a disaster. The health system, including the medical care system, however must itself be prepared to resist the disaster Buildings and their contents must protect the health care professionals inside and they must be able to continue to function in the aftermath of a disaster This necessitates that the health sector undertake major efforts to mitigate damages to itself from potential hazards and prepare to function at increased capacity following the impact of a disaster.

References

Bolin Robert 1993, *Household and Community Recovery after Earthquakes*, Boulder, University of Colorado.

Bourque L.B., Peek-Asa C., Mahue M., Nguyen L.H., Shoaf K.I., Kraus J.F., Weis B., Davenport D., Saruwatari M. 1998, 'Health Implications of Earthquakes: Physical and Emotional Injuries During and After the Northridge Earthquake', *Proceedings of the International Symposium on Earthquakes and People's Health: Vulnerability Reduction, Preparedness and Rehabilitation*, WHO Centre for Health Development, Jan. 1997, Kobe, Japan, pp. 22-31.

Bravo M., Rubio-Stipec M., Caninio G.J., Woodbury M.A., & Ribera J.C. 1990, 'The Psychological Sequelae of Disaster Stress Prospectively and Retrospectively Evaluated', *American Journal of Community Psychology*, No 18, pp. 661-680.

Centers for Disease Control and Prevention 1995, 'Heat-Related Mortality -- Chicago, July 1995', *Morbidity and Mortality Weekly Review*, August 11, 1995, Vol. 44, No. 31, pp. 577-579.

Centers for Disease Control and Prevention 1998, 'Community Needs Assessment and Morbidity Surveillance Following an Ice Storm -- Maine, January 1998', *Morbidity and Mortality Review Weekly*, May 08, Vol. 47, No. 17, pp. 351-354.

Centers for Disease Control and Prevention 1999, 'Community Needs Assessment and Morbidity Following an Earthquake-Turkey, August 1999', *Morbidity and Mortality Weekly Review*, Vol. 48, No. 50, pp. 1147-1150.

Cheu Donald 1995, 'Northridge Earthquake-January 17, 1994: The Hospital Response', FEMA, 17 January 1995, pp 1-15. *Northridge Earthquake: One Year Later*, Universal City, CA.

Cole Sam 1995, 'Lifelines and Livelihood: A Social Accounting Matrix Approach to Calamity Preparedness', *Journal of Contingencies and Crisis Management*, Vol. 3, No 4, pp. 228-246.

Corrales Arturo 1999, 'Hurricane Mitch: A Central American Disaster', Presented at *Natural Hazards Workshop*, July 1999, Boulder, CO.

Eguchi R.T, Goltz J D., Taylor C.E, Chang S E., Flores P.J., Johnson L.A., Seligson H.A., & Blais N.C. 1998, 'Direct Economic Losses in the Northridge Earthquake A Three-Year Post-Event Perspective', *Earthquake Spectra*, Vol. 14, No. 2, pp. 245-264

Goltz James 1999, 'The '921' Chi-Chi, Taiwan Earthquake of September', www eeri.org/Reconn/TaiwanG/TaiwanG.html

Hendrickson L.A. & Vogt R.L. 1996, 'Mortality of Kauai residents in the 12-month period following Hurricane Iniki', *American Journal of Epidemiology*, Vol. 144, No. 2, pp. 188-91.

Inui A., Kitaoka H., Majima M, Takamiya S, Uemoto M., Yonenaga C., Honda M., Shirakawa K., Ueno N., Amano K., et al. 1998, 'Effect of the Kobe earthquake on stress and glycemic control in patients with diabetes mellitus', *Archives of Internal Medicine*, 1998 Feb 9, Vol. 158, No. 3, pp. 274-8.

Kloner R.A., Leor J., Poole W.K., & Perritt R 1997, 'Population-Based Analysis of the Effect of the Northridge Earthquake on Cardiac Death in Los Angeles County, California', *Journal of the American College of Cardiology*, Vol. 30, No. 5, pp. 1174-1180.

Melkonian Arthur 1997, 'Long-term Health Implications of Disaster', *Proceedings of the International Symposium on Earthquakes and People's Health: Vulnerability Reduction, Preparedness and Rehabilitation*, World Health Organization Centre for Health Development, January 27-30, 1997, Kobe, Japan.

Noji Eric 1997, *The Public Health Consequences of Disaster*, Oxford University Press, NewYork, NY.

Pan-American Health Organization 1999, *Disaster Chronicle: Hurricanes Georges and Mitch.*

Peek-Asa C, Kraus J.F., Bourque L.B., Vimalachandra D., Yu J., Abrams J.1998, 'Fatal and hospitalized injuries resulting from the 1994 Northridge earthquake', *International Journal of Epidemiology*, Vol 27, No. 3, pp. 459-65.

Peek-Asa C., Ramirez M R., Shoaf K.I., Seligson H.A., Kraus J F 2000, 'GIS Mapping of Earthquake-Related Deaths and Hospital Admissions from the 1994 Northridge, California, Earthquake', *Annals of Epidemiology*, Vol. 10, No. 1, pp. 5-13.

Richman N. 1993, 'Editorial - After the Flood', *American Journal of Public Health*, Vol. 83, No. 11, pp. 1522-24.

Sareen H.R., Shoaf K.I., & Bourque L.B. 1998, 'Use and Difficulties Associated with Prescription Medication and Health Aids after the 1994 Northridge Earthquake', *American Public Health Association Annual Conference*, Washington, DC.

Shoaf K.I., Sareen H.S., Nguyen L.H. and Bourque L.B. 1998, 'Injuries as a Result of California Earthquakes in the Past Decade', *Disasters*. Vol. 22, No. 3, pp. 218-235.

Shoaf Kimberley I. 2000, 'The Health Consequences' in *Reconnaisance Report on the Quindio, Colombia Earthquake, January 25, 1999*. Earthquake Engineering Research Institute, Oakland, CA.

Siegel J.M. 1999, *'Emotional Injury and the Northridge, California Earthquake'*, Unpublished Manuscript.

Siegel J.M., Shoaf K.I., Bourque L.B. 2000, 'Post-Traumatic Stress Disorder in Urban Earthquakes', *International Journal of Mass Emergencies and Disasters* (In Press).

University of Southern California 1998, www.usc.edu/dept/tsunamis/PNG.

Authors contact details
Kimberley I. Shoaf, Dr PH
UCLA Center for Public Health and Disaster Relief
Box 951772
Los Angeles, CA 90095-1772
phone: 310 794-6646
fax: 310 794-1805
email: kshoaf@ucla.edu

Steven J. Rottman, MD, FACEP
UCLA School of Public Health
924 Westwood Boulevard
Suite 300, University of California at Los Angeles
Los Angeles, CA 90024
email: rottman@ucla.edu

Refereed

Announcement

Proposed sessions of the 'Disaster and Social Crisis Research Network' for the 5th European Sociological Association Conference

The 5th European Sociological Association Conference, 'Visions and Divisions: Challenges to European Sociology', will be held in Helsinki, August 28th - September 1st 2001.

The newly recognized by the ESA, 'Disaster and Social Crisis Research Network', plans to organise five regular sessions during the Conference. Sociologists and other Social Scientists who are interested in making a presentation in one of these sessions should submit an abstract of not more than 250 words, no later than January 31, 2001, to the respective session coordinators.

I. Disasters and Social Crises: Visions and Divisions in American and European Approaches.

II. Deconstructing Disaster Management: Beyond the Command and Control Model.

III. The Contributions of Sociology to Disaster Research and Vice Versa.

IV. Global Accumulation of Capital as a Factor in Social Crises and Complex Disasters.

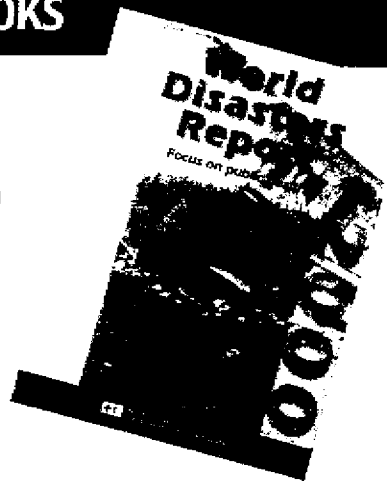
V. Disaster and Sociocultural Changes: Changes other than those in the Organization of Civil Protection.

A full version of the conference details can be found on the Disaster and Social Crisis Research Network page:

www.anglia.ac.uk/geography/d&scrn/

(then go to the Helsinki Conference page)

New Books



World Disasters Report 2000
International Federation of Red Cross and Red Crescent Societies

The World Disasters Report is an annual publication of the International Federation of Red Cross and Red Crescent Societies, that analyses trends in natural and man-made disasters around the world, and their effects on the environment and populations. The Report 2000 concentrates on the devastating consequences of disease. While natural disasters like earthquakes attract media attention and donor funds, the so-called silent disasters such as malaria, HIV/AIDS, tuberculosis and many other communicable diseases kill ten times more people. The Report 2000 reveals the following: in 1999 some 80,000 people were killed in natural disaster—on the other hand, infectious diseases killed a staggering 13 million. From AIDS alone 300 people die every single hour. The Report also explains that, while they claim the most lives, infectious diseases are also the most preventable disasters.

Providing comprehensive, up to date and expert analysis of disaster and emergency trends, the World Disasters Report 2000 is an essential tool for all researchers, aid workers, journalists and academics interested in aid and humanitarian action.

Price: $ 39.95 plus postage (GST included)
Available from the **Australian Red Cross**
155 Pelham St Carlton VIC 3053
fax: 03 9348 2513 Attn: Sharon Pimm
email: spimm@nat.redcross.org.au

Letter to the Editor

Efforts to reduce the stress exposure risks to emergency personnel in operational situations are no longer optional. Legal requirements and proactive risk management initiatives have insisted on approaches which recognise the duty of care required. John Lunn's article (AJEM, Winter 2000) provides a good overview of factors such as emergency worker selection, appropriate management policies and the issues relating to work schedules and fatigue factors.

This article has also queried the usefulness of stress debriefing. I was pleased to note the author discussed the importance of not having stress debriefing as a stand alone initiative. Many critics fail to hear this message and isolate the debriefing protocol from other support activities, when key recommendations relating to this area advocate that stress debriefing be used as a part of an overall Critical Incident Stress Management initiative.

The author cites a study by Bisson et al, as being critical of stress debriefing as an effective post trauma technique. I believe this research has no relevance to the needs of emergency personnel post incident. The Bisson study used a technique, originally intended as a group support strategy with individuals. I question just how much we can infer from the individual debriefing of accident victims to the group debriefings of trained emergency workers? Are we comparing apples with oranges?

Criticisms of stress debriefing continually fail to address a number of questions. What was the debriefing protocol used? How were the facilitator's trained? Were the facilitators matched for experience, methodology and consistency of approach? How much control did the study have over when a debriefing took place? This is important because the timing factor seems to be a major issue.

Another major issue is the use of the generic term 'debriefing'. Most of the critical research has ignored definitions of the methodology, and provided results which have led to the criticism of all forms of debriefing. If all references to the protocols and procedures followed were avoided, one could also use the same approach to demonstrate that counselling doesn't work, then extend the results to all forms of counselling in all circumstances. Having facilitated many stress debriefings following critical incidents, for emergency workers, security guards, bank employees, miners and offshore rig workers, I believe strongly in their value when the following conditions apply:

- they are used appropriately
- they are part of an overall support initiative
- they are facilitated by someone who knows what they're doing
- they follow an appropriate protocol
- they are sanctioned and endorsed by the organisation.

Michael Tunnecliffe
Clinical Psychologist

Disaster Events Calendar

January 2–5, 2001
Plymouth, U.K

Coping with Catastrophe: Innovation and Integration

Royal Geographical Society/Institute of British Geographers

'This session of the annual RGS/IBG conference will explore contemporary issues in the construction and distribution of risk and vulnerability in urban and rural contexts. Papers draw from physical as well as human geographical traditions and especially from interdisciplinary approaches and address issues of integration and innovation in methods or in the presentation of findings.'

Contact:
Mark Pelling
Department of Geography
University of Liverpool
email: pelling@liverpool.ac.uk
or Stephan Harrison
Department of Geography
Coventry University
email: s.harrison@coventry.ac.uk

February 12 – 16, 2001
Auckland, New Zealand

Cities on Volcanoes 2

Organisers:
Institute of Geological and Nuclear Sciences, Auckland Regional Council, Massey University, University of Auckland, and the International Association of Volcanology and Chemistry of the Earth's Interior.

Contact:
Secretary
Cities on Volcanoes 2
Wairakei Research Centre
Private Bag 2000
Aupo, New Zealand
phone: 64 7 374 8211
fax: 64-7-374 8199
email: citiesonvolc2@gns.cri.nz
www.gns.cri.nz/news/conferences/cities.html

March 19–April 6, 2001
Melbourne, Australia

HELP 2000 — Health Emergencies in Large Populations Course

Sponsors:
International Committee of the Red Cross (ICRC), American Red Cross, and Pan American Health Organization.

Contact:
International Committee of the Red Cross
GEN_SAN Help Courses, 19, avenue de la Paix
1202 Geneva, Switzerland
phone: 41 22 730 28 10
fax: 41 22 733 96 74
email: pperrin.gva@icrc.org
email: azogopou@nat.redcross.org.au
www.icrc.org

April 24–25, 2001
Boston, Massachusetts

CPM (Contingency Planning and Management) 2001.

Sponsor:
Contingency Planning and Management' Magazine
Contact Alicia LoVerso
Conference Coordinator
WPC Expositions
84 Park Avenue
Flemington, NJ 08822
phone: 908 788 0343 (ext. 154)
Fax: 908 788 9381
www.ContingencyPlanExpo.com

May 9–12, 2001
Lyon, France

12th World Congress on Disaster Medicine.

Organiser:
World Association for Disaster and Emergency Medicine

Disaster Events Calendar

Contact:
WDCEM 2001
1 rue de la Banniere
69003 Lyon, France
Fax: 33 04 72 60 92 89
email: wcdem2001@aol.com
www.wcdem2001.org, or
http://pdm.medicine.wisc.edu/pdmcalendar.html

May 21–24, 2001
San Diego, California

2001 Technology Partnerships for Emergency Management Workshop and Exhibition

Sponsors:
Federal Emergency Management Agency and others.

Contact:
Dr. Brenda-Lee Karasik
phone: 619 553 2101
email: brenda@spawar.navy.mil

Mr. Dale Gurley
phone: 619 553-5630
email: gurley@spawar.navy.mil
www.foundation.sdsu.edu/technologysolutions.

June 3–8, 2001
Charlotte, North Carolina, USA

Association of State Floodplain Managers (ASFPM) 25th National Conference

The Association of State Floodplain Managers is an organisation of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery. The group has become a respected voice in floodplain management practice and policy in the United States because it represents the flood hazard specialists of local, state and federal government, the research community, the insurance industry, and the fields of engineering, hydrologic forecasting, emergency response, water resources, and others.

Contact:
ASFPM
2809 Fish Hatchery Road
Suite 204
Madison, WI 53713-3120, USA
phone: 608 274 0123
fax: 608 274 0696
email: asfpm@floods.org
www.floods.org/conf-aus.htm

June 17–22, 2001
Newport Beach, California

Eighth International Conference on Structural Safety and Reliability (ICOSSAR '01)
(Includes sessions on hazards analysis, earthquake engineering, wind engineering, and other hazards-related issues.)

Organised by:
International Association for Structural Safety and Reliability.

Contact:
ICOSSAR '01 Secretariat
University of Colorado
College of Engineering and Applied Science
Campus Box 422
Boulder, CO, 80309-0422 USA
phone: 303 492 7006
fax: 303 492 0353
email: corotis@colorado.edu -or- icossar@usc.edu
www.colorado.edu/engineering/ICOSSAR

Mid–2001
Washington, DC

Second World Congress on Natural Disaster Reduction

Sponsor:
American Society of Civil Engineers (ASCE)

This meeting is in the formative stages

Contact:
Walter Hays
ASCE
1801 Alexander Bell Drive
Reston, VA 20191
phone: 703 295 6054
email: whays@asce.org

July 2–6, 2001
Eindhoven, The Netherlands

Third European and African Conference on Wind Engineering

Contact:
3EACWE Congress Office
Eindhoven University of Technology
P.O. Box 513
5600 MB Eindhoven
The Netherlands
fax: 31 40-2458195
email: congressoffice@tue.nl
www.bwk.tue.nl/bwk/events/3eacwe

August 7-10, 2001
Seattle, Washington

International Tsunami Symposium 2001 (ITS 2001)

Submit abstracts on-line or by e-mail not later than September 1, 2000.
See www.pmel.noaa.gov/its2001 for complete instructions and additional information, or contact E.N. Bernard
NOAA/PMEL
7600 Sand Point Way N.E.
Seattle, WA 98115-6349
phone: 206 526-6800
fax: 206 526-4576
email: bernard@pmel.noaa.gov

August 19-24, 2001
Washington, D.C.

First World Congress on Disaster Reduction

Sponsors:
American Society of Civil Engineers (ASCE) and others.

Contact:
Walter Hays ASCE
1801 Alexander Bell Drive
Reston, VA 20191
phone: 703 295-6054
email: whays@asce.org; or
Michael Cassaro ASCE
e-mail: macass@aye.net

August 28-September 1, 2001
Helsinki, Finland

Fifth European Sociological Association Conference

This meeting will incorporate several proposed sessions of the 'Disaster and Social Crisis Research Network' (see announcement p. 63). Sociologists and other social scientists who are interested in making a presentation in one of these sessions should submit an abstract of not more than 250 words, no later than January 31, 2001, to the respective session coordinators. Further information available at:
www.anglia.ac.uk/geography/d&scrn/

September 4-6, 2001
Malaga, Spain

Third International Symposium on Earthquake Resistant Engineering Structures (ERES 2001)

Contact:
Susan Hanley
Conference Secretariat
Wessex Institute of Technology
Ashurst Lodge
Ashurst, Southampton, SO40 7AA, U.K.
phone: 44 0 238 029 3223
fax: 44 0 238 029 2853
email: shanley@wessex.ac.uk
www.wessex.ac.uk/conferences

September 9-12, 2001
Philadelphia, Pennsylvania

International Public Works Congress and Exposition

Includes educational sessions on emergency management issues.

Contact:
American Public Works Association
2345 Grand Boulevard
Suite 500
Kansas City, MO 64108-2641
phone: 816 472 6100
fax: 816 472 1610

September 10-14, 2001
Brno, Czechia

Fourth Moravian Geographical Conference on Nature and Society in Regional Context

Organisers:
Institute of Geonics, Czech Academy of Sciences

'Disasters and Their Natural and Social Consequences' is one of the conference topics.

Contact:
Antonin Vaishar
Institute of Geonics
P.O. Box 23
613 00 Brno, Czechia
fax: 4205 578031
email: vaishar@geonika.cz
or visit the website at: www.geonika.cz, password CONGEO Conference