WORLD HEALTH ORGANIZATION ORGANISATION MONDIALE DE LA SANTE

WHO CENTRE FOR HEALTH DEVELOPMENT
Kobe, Japan

International Symposium on
Earthquakes and People's Health:
Vulnerability Reduction, Preparedness
and Rehabilitation

Kobe, Japan, 27 - 30 January 1997

ABS/1.1

1.1 The Epidemiology of Earthquakes: Implications for Vulnerability Reduction, Mitigation and Relief

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The Epidemiology of Earthquakes: Implications for Vulnerability Reduction, Mitigation and Relief

By:

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INTRODUCTION

Better epidemiologic knowledge of the causes of death and types of injuries and illnesses caused by earthquakes is clearly essential to determine appropriate relief supplies, equipment and personnel needed to effectively respond to such situations as well as to improve preparedness and reduce vulnerability to the effects of future earthquakes. The overall objective of the epidemiology of disasters is to scientifically measure and describe the health effects of disasters and contributing factors to these effects, with the goals of assessing the needs of disaster-affected populations, efficient matching of resources to needs, further prevention of adverse health effects, evaluation of program effectiveness, and for contingency planning.

This presentation will focus on the medical and public health impact of earthquakes and will outline a number of important areas where the science of epidemiology can reduce overall vulnerability to earthquakes and contribute to improved disaster preparedness and mitigation (illustrated by recent catastrophic earthquakes).

Implications for Vulnerability Reduction, Mitigation and Relief

Until earthquake prevention and control measures are adopted and mitigation actions implemented throughout the world, a single severe earthquake could cause tens of thousands of deaths and serious injuries and economic losses exceeding one hundred billion dollars. Prevention and control efforts need to be multidisciplinary and should include public education programs, as well as better building design and improved quality of construction in those areas most likely to suffer an earthquake. The problem of "earthquake casualties" involves questions of seismology, the engineering of the built environment, the nature of both the physical and the sociological environments, aspects of personal and group psychology and behavior, short- and long-term economic issues, and many planning and preparedness aspects. Public-health and disaster-response officials need to work together in the effort to develop and maintain effective seismic safety-planning and earthquake mitigation programs.

Planning Scenarios for Earthquakes

Relative chaos is likely to prevail immediately after a major earthquake. Area residents, cut off from the outside, will initially have to help themselves and their neighbors. They can best do this if they have already planned their responses to the most likely earthquake scenarios and practiced the necessary skills. Medical preparedness plans can be built around similar earthquake scenario calculations based on the building types likely to be affected, the population densities and settlement patterns, the size and characteristic of earthquakes expected in the region, and the medical facilities available in any study area. Such a regional hazard assessment, including "casualty scenarios," would permit the development of specific training programs for medical and rescue personnel as well as the appropriate deployment of medical and rescue equipment in advance of an earthquake disaster.

Because there never are enough rescuers or medical providers in major disasters, communities vulnerable to earthquakes should establish ongoing programs to teach the public what to do when an earthquake occurs, such as first aid education, basic rescue training, fire drills. Simulation exercises can be carried out jointly by volunteer groups, local fire brigades, and hospitals. This training also might help to improve bystanders' responses during everyday emergencies.

Early Rapid Assessment of the Earthquake's Impact

Because rapid rescue of trapped victims and prompt treatment of those with life-threatening injuries can improve their outcome, early rapid assessment of the extent of damage and injuries is needed to help mobilize resources and direct them to where they are most needed. Unfortunately, the very factors likely to cause large numbers of injuries are also likely to disrupt communications and transportation and to damage medical-care facilities. Public health officials need to establish in advance how the affected areas will be surveyed.

Search and Rescue

People trapped in the rubble will die if they are not rescued and given medical treatment. To maximize trapped victims' chances of survival, search-and-rescue teams must respond rapidly after a building collapses. Studies of the 1980 earthquake in Campania-Irpinia, Italy, the 1976 earthquake in Tangshan, China, the 1988 earthquake in Armenia, and the 1990 earthquake in the Philippines show that the proportion of trapped people found alive declined as the duration of entrapment increased. In the Italian study, a survey of 3,619 survivors showed 1) that 93% of those who were trapped and survived were extricated within the first 24 hours and 2) that 95% of the deaths recorded occurred while the victims were still trapped in rubble. Estimates of the survivability of victims buried under collapsed earthen buildings in Turkey and China indicate that within 2 to 6 hours less than 50% of those buried

are still alive. Although we cannot determine whether a trapped person died immediately or survived for some time under the debris, we can safely assume that more people would be saved if they were extricated sooner. As suggested by these data, teams with specialized expertise in areas such as search and rescue and on-site resuscitation and medical first aid arriving more than a couple of days after an earthquake's impact are unlikely to make much difference in the overall death toll of a large earthquake.

With the exception of personnel from countries in close geographical proximity, foreign assistance usually arrives after the local community has already engaged in much of the rescue activity. For example, in southern Italy, in 1980, 90% of the survivors of an earthquake were extricated by untrained, uninjured survivors who used their bare hands and simple tools such as shovels and axes. Following the 1976 Tangshan earthquake, about 200,000 to 300,000 entrapped people crawled out of the debris on their own and went on to rescue others. They became the backbone of the rescue teams, and it was to their credit that more than 80% of those buried under the debris were rescued. Thus, lifesaving efforts in a stricken community rely heavily on the capabilities of relatively uninjured survivors, including untrained volunteers, as well as those of local firefighters and other relevant professionals. This does not mean that people who were dead when they were extricated could not have been saved by a skilled team with sophisticated resources. However, people from the community clearly play the most important role in rescue efforts, if they are appropriately prepared.

Medical Treatment

Just as speed is required for effective search and extrication, it is also essential for effective emergency medical services: the greatest demand occurs within the first 24 hours. Ideally, "disaster medicine" (medical care for victims of disaster) would include immediate life-supporting first aid (LSFA), advanced trauma life support (ATLS), resuscitative surgery, field analgesia and anesthesia, resuscitative engineering (search and rescue technology), and intensive care. Unconscious patients with either upper airway obstruction or inhalation injury or any patients with correctable hypovolemia resulting from hemorrhage or burns would be especially likely to benefit from early medical intervention. Safar, studying the 1980 earthquake in Italy, concluded that 25% to 50% of victims who were injured and died slowly could have been saved if life-saving first aid had been rendered immediately.

Data from the 1976 earthquake in Guatemala, the 1985 Mexico City earthquake, the 1988 Armenian earthquake, and the 1992 earthquake in Egypt showed that injured people usually seek emergency medical attention only during the first 3 to 5 days following the earthquake, after which hospital case-mix patterns return almost to normal. From Day 6 onward, the need for emergency medical attention declined rapidly and the majority of the wounded required only ambulatory medical attention--indicating that specialized field hospitals that arrive 1 week or more after an earthquake are generally too late to help during the

emergency phase. Following the 1992 earthquake in Egypt, nearly 70% of all patients with earthquake-related injuries were admitted within the first 36 hours after this earthquake.

The medical and public health impact of a severe earthquake may well be compounded by significant damage to medical facilities, hospitals, clinics and supply stores within the affected area. In the worst-case scenario, a hospital building may itself be damaged by the earthquake, and the hospital staff may have to continue emergency treatment without using the buildings. For example, on January 17, 1994, at 4:31 AM Pacific Standard Time, an earthquake registering 6.8 on the Richter scale occurred in a previously unrecognized fault in Los Angeles County's San Fernando Valley, killing at least 60 people. The earthquake caused considerable damage to health facilities and significant health service disruption. Immediately after the shaking stopped, structural and nonstructural damage forced several hospitals to evacuate patients and move operations outside. Structural damage forced several older hospitals and medical buildings to cease or reduce operations. During the 1985 Mexico City earthquake, which killed an estimated 7,000 people, a total of 4,397 hospital beds were lost--about one in four of those available in the metropolitan Mexico City area. Hospital emergency plans in earthquake areas should provide for the contingency of evacuating patients from the wards; safely removing critical equipment from operating theaters, radiology departments, and other parts of the hospital; and re-establishing routine patient-care services.

SUMMARY

A major earthquake in a major urban area ranks as the largest potential natural disaster for highly seismic parts of the world. Most of what can be done to mitigate injuries must be done before an earthquake occurs. Researchers have identified a number of potentially important risk factors for injuries associated (either directly or indirectly) with earthquakes. Because structural collapse is the single greatest risk factor, priority should be given to seismic safety in land-use planning and in the design and construction of safer buildings.

The integration of epidemiologic studies with those of other disciplines such as engineering, architecture, the social sciences and other medical sciences is essential for improved understanding of injuries following earthquakes. Better epidemiologic knowledge of risk factors for death and the type of injuries and illnesses caused by earthquakes is clearly an essential requirement for determining what relief supplies, equipment, and personnel are needed to respond effectively to earthquakes.

Strengthening communities' self-reliance in disaster preparedness is the most fruitful way to improve the effectiveness of relief operations. In disaster-prone areas, training and education in basic first aid and rescue methods should be an integral part of any community preparedness program. Unfortunately, because of the relatively long time periods between major earthquakes, the public health community faces a special challenge in effectively

communicating the hazards posed by potential earthquakes and the necessity to plan and take action before an earthquake occurs.

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1.2 Seismological Forecasting: Prospects within the International Decade for Natural Disaster Reduction

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Abstract of the talk of
Dr Roman L. Kintanar

Introduction

Greetings from the disaster workers in the Philippines.

Greetings also from the STC, IDNDR which met in Paris last week and the wish of the IDNDR secretariat and the members of STC from all over the world that this symposium be a success.

My initiation into the field of Natural Disaster

Let me recall my unforgettable initiation into the field of natural disaster. This was on April 1, 1955, or forty one years ago, when a large magnitude earthquake occurred in Lanao Province, Island of Mindanao in the Philippines.

My experience of seeing hundreds upon hundreds of casualties was an experience never to be forgotten.

The Beginning of the IDNDR

It was the horror of earthquake disaster that first brought about the idea of an IDNDR. In a meeting of the International Earthquake Association Dr Frank Press of the United States Academy of Sciences proposed international action to mitigate earthquake disaster. This was later expanded to include other natural disasters in the proclamation of the International Decade for Natural Disaster Reduction (IDNDR).

Project 'RADIUS' of the IDNDR Secretariat

The IDNDR Secretariat launched the RADIUS project in 1996 to realize the concept of the IDNDR and the "Yokohama Strategy and Plan of Action". It aims to promote worldwide activities for reduction of seismic disaster in urban areas, particularly in developing countries. The project will develop common methodologies for seismic risk assessment of the urban areas in order to raise public awareness and provide directions for disaster mitigation.

A Personal Earthquake Drill

An appeal to every individual to consider and clarify in his own mind what action he should take in case of a strong earthquake to minimize physical injuries.

Looking into the Future

It is now time to consolidate all natural disaster reduction activities and link them firmly with economic and social development and environmental protection to reinforce the goal of sustainable development.

The national and regional groups must prepare to assume all responsibilities on natural disaster mitigation after the end of the IDNDR and into the 21st century.

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1.3 Health Implications of Earthquakes: Physical and Emotional Injuries During and After the Northridge Earthquake

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Health Implications of Earthquakes: Physical and Emotional Injuries During and After the Northridge Earthquake

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BACKGROUND

The number and severity of physical injuries that occur following earthquake have been hypothesized to differ with the magnitude of the earthquake, proximity to the epicenter, soil conditions, characteristics of buildings and other man-made structures, density and distribution of population, environmental conditions, location and behavior of people, level of preparedness, time of day, day of the week, season, opportunity for warning, and socioeconomic resources available in the community. To date, most studies of injury and earthquakes have depended on " . . . crude estimates based on superficial observations of limited technical and statistical validity" (1; p. 260). As a result, the data obtained could over-represent more serious injuries and those that come to the attention of an official or relief worker.

Following the Northridge earthquake of January 17, 1994, a consortium of researchers conducted a comprehensive set of interconnected studies to more accurately count and assess the severity of physical and emotional injuries attributable to the earthquake. Data reported in this paper are drawn from six sources: coroners reports, hospital admission records, hospital emergency room records, and three telephone surveys of Los Angeles County residents.

METHODOLOGY

Casualties and severe injuries

To estimate the casualties and severe injuries related to the Northridge Earthquake, coroners' reports and in-patient medical records were reviewed for the month of January 1994. A case was defined as an individual killed or severely injured due to activity related to the earthquake, such as building collapse, structural damage, injuries caused by moving furniture, equipment failure and clean-up processes.

Fatalities were identified by the Los Angeles County Coroner's Office. Severe injuries were identified by contacting 79 large hospitals and reviewing the records of 17 hospitals that reported having at least one earthquake-related admission . As of September 1996, 1,197 records of nonfatal injuries and 63 autopsies were reviewed.

Injuries presenting to emergency rooms

Emergency Department (ED) logs do not indicate whether an injury is or is not earthquake related. Thus, to estimate whether the number and type of ED injuries increased and changed in the aftermath of the earthquake, the emergency room logs of nine hospitals were abstracted for the months of January 1992, January 1993 and January 1994. To the extent that the number and types of injuries increased after January 17, 1994, differences are attributed to the earthquake.

To estimate the validity of the emergency room logs, 10% of the ED medical records were randomly selected for abstraction. In two hospitals, the medical records for all the injuries occurring after January 17, 1994 were abstracted.

Community surveys

Three probabilities proportionate to size (pps) samples of Los Angeles County residents were selected using random-digit dialing (rdd) procedures: 506 between August and December 1994; 96 between April and June 1995; and 1,247 between September and June 1996. All three interviews were conducted by telephone and all respondents were asked if they were physically or emotionally injured as a result of the earthquake. Two standardized measures of psychological distress were administered as part of the first and third surveys.

RESULTS

Casualties and severe injuries

Of the 63 earthquake-related deaths identified by the coroner, 59% (N = 37) were due to injuries; the others were cardiovascular events that occurred during or in the aftermath of the earthquake. As of September 1996, 92 earthquake-related, injured, hospital admissions, or 15% of all injury admissions between January 17 and 31, 1994, had been identified. The records of four hospitals remain under review. Injuries presenting to emergency rooms Of 66,211 visits to emergency departments, 30,730 occurred between January 17 and January 31, 1994; 11,862 (18%) of 66,211 were categorized as injury visits. Non-specific visits for depression and back pain were categorized as injuries if the emergency department log data was obtained electronically. The number of injuries during the index period (January 17-31, 1994) increased significantly over the two baseline periods: 5,055 in 1994 versus 3,381 in 1993 ($p < .05$) and 3,426 in 1992 ($p < .05$). The number of injury visits increased in all but one managed care facility, but the ratio of injury visits to non-injury visits remained relatively constant over time for all facilities in this study.

Community surveys

A total of 151 (8.2%) persons across the three community samples reported physical injuries with 8.3% (n = 42) in the first sample reporting injuries, 7.3% (n = 7) in the second sample, and 8.2% (n = 102) in the third sample. Eleven percent of those reporting physical injuries sought care,

with the sources of care being equally divided between hospitals, clinics and private physicians, and other sources of care (e.g., Red Cross, friends, etc.).

Substantially more respondents reported being "emotionally injured:" 36% (n = 181) in the first sample, 35% (n = 34) in the second sample, and 32% (n = 403) in the third sample. Ten percent of those reporting emotional injuries sought care but the emotional injuries did not reach clinical levels of psychological disability as measured using standard measures of psychological distress.

CONCLUSIONS

In a densely populated developed area (California) with some of the most seismologically sophisticated building standards in the world, the number of casualties directly attributable to structural failure after a magnitude 6.6 earthquake which occurred at 4:31 AM in the morning was remarkably low. The number of injuries which required hospitalization, while occurring at a ratio of between 3:1 and 4:1 to casualties was similarly low. However, when data on less severe injuries is extrapolated to the entire population of Los Angeles County, we conclude that some 240,000 persons experienced at least a minor injury with 30,000 of those persons seeking formal or informal medical care. While casualties were clearly associated with building or structural failure, it is less clear that the occurrence and severity of injuries is directly correlated with structural damage. The decision to seek care for less severe injuries and emotional distress appears to be correlated with factors other than structural damage.

Had this earthquake occurred during business hours, we hypothesize that the number of casualties and severe injuries would be increased but that the ratio of severe injuries to casualties would remain constant. We suggest that the number of minor injuries experienced would remain constant regardless of the time of day.

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ABS/1.4

1.4 An Overview of the Earthquake Insurance System in Japan

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Mr Masao Miyakawa

An Overview of the Earthquake Insurance System in Japan

Fire insurance in Japan does not cover claims for property damaged, buried, swept away or burned down resulting from earthquakes, tidal waves or volcanic eruptions. It is difficult to forecast losses from earthquakes in any single year. Earthquake losses do not fit well with the law of large numbers, the prerequisite to non-life insurance, since generations separate major earthquakes, the biggest of which have the potential to cause immeasurable losses and wipe out the insurer. Therefore, in order to assure protection, earthquake insurance has to be taken out in conjunction with fire insurance.

<HISTORICAL BACKGROUND>

Japan is one of the world's major countries in terms of earthquake. However, although the necessity of earthquake insurance has long been emphasized and advocated, certain technical barriers have made it difficult for insurance companies to cover earthquake losses. On September 1, 1923, a big earthquake hit the Kanto area, causing tremendous damage. Fires that broke out after the quake destroyed much of Tokyo and Yokohama cities. This earthquake is called "The Great Kanto Earthquake", rekindled heated debate on the issue of earthquake insurance. The government analyzed the situations at home and abroad vis-a-vis state-run insurance, and collected data on earthquake insurance. However, the project again failed to crystalize into legislation. It was not until a strong earthquake devastated Niigata and the surrounding prefectures on June 16, 1964, that opinion was once again galvanized into demanding an earthquake insurance system. The Law concerning Earthquake Insurance was then passed with the aim of "contributing to the stabilization of the immediate life of

sufferers", and an earthquake insurance scheme on dwelling risks went into effect with the government as its reinsurer.

<AN OUTLINE OF EARTHQUAKE INSURANCE>

The subject-matter of earthquake insurance is dwelling houses and contents. This insurance covers loss of property damaged by fire, destruction, being-buried, or being-swept-away, directly or indirectly as a result of earthquakes, volcanic eruptions, or tsunami caused thereby. Losses caused by ensuing fires are also covered. Earthquake insurance can not be contracted by itself; rather, it must be combined with a fire insurance policy. The amount insurable in earthquake policies can be set within a range of 30 to 50 percent of that in the principal fire insurance, but not exceeding 50 million yen for buildings and 10 million yen for contents. Premiums, calculated by the Property and Casualty Insurance Rating Organization of Japan, are based on the "no-loss and no-profit" principle. Premiums are calculated in accordance with the same type of claims conditions for buildings and household property. The method of loss assessment of household property was, until recently, based on the degree of damage to the building; however on January 1, 1996, it was changed to take into account the degree of damage to the household property itself. In other words, loss of household property is now assessed independently of building damage and is subject to the same type of claims conditions as those for buildings. As a result, the same premium rates now apply to buildings and household property. Building claims conditions are divided into two categories: wooden and non-wooden. Areas across the country are classified into four zones according to the degree of risk. Insurance premiums are examined yearly by estimating damages likely to be caused according to the pattern of the 375 major earthquakes that have

hit Japan since 1494. Payment of claims is based on the following: total loss is paid 100 percent of the sum insured, half loss is 50 percent of the sum insured, and partial loss is 5 percent of the sum insured.

<REINSURANCE>

Earthquake insurance on dwelling risks is reinsured by the Japanese government. The aggregate limit of indemnity shared between private insurers and the government per one earthquake was raised from 1,800 billion yen to 3,100 billion yen on October 19, 1995. Therefore, claims stipulated in a policy are paid unless the earthquake is extraordinarily destructive. If the total amount of claims per earthquake exceeds 3,100 billion yen, payments will be made on a pro rata basis. This measure is inevitable in view of the peculiar nature of earthquake insurance, for which it is impossible to predict heavy losses.

<CONCLUSION>

The Great Hanshin-Awaji Earthquake that severely hit Kobe and its vicinities on January 17, 1995, presented various problems relating to disaster management in Japan. It also aroused the public to the necessity of insurance coverage against natural disasters. The earthquake insurance system has undergone considerable changes since its introduction to the market, but improvements could still be made in terms of popularization and extent of coverage. The government and insurance companies are now working on ways to give it some extra teeth.

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ABS/2.1

2.1 Medico-Sanitary Aftermath of the Disastrous Earthquakes in Russia

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Medico-Sanitary Aftermath of the Disastrous Earthquakes in Russia.

Goncharov S. F.

Earthquakes are among the most dangerous natural calamities. Earthquakes' victims make up about 60% of the total amount of natural calamities victims.

Of all the numerous investigations of the earthquakes problems the main laws of forming medical aftereffects and structure of sanitary losses in the earthquake area remained practically unstudied till the present.

We studied medico-sanitary aftermath of earthquakes in 2560 variants of different conditions (an earthquake intensity, character of the towns construction, employment of the population, character of the population location at the moment of an earthquake (outdoors, in the buildings of different types) and the time of relief operations).

Medico-sanitary aftereffects of an earthquake are determined basically by the appearance, practically at the same moment, of the large amount of affected persons with traumatic injuries. The value and structure of the losses among population depend on the earthquake intensity and the character of the population location. Using mentioned methods we got the comprehensive pattern of the losses among population at the moment of an earthquake and revealed the numbers of laws determining the losses value. The indices of the sanitary losses at the location of up to 100% of the population in the buildings are given depending on the earthquake tremors and time of rescue operations. Thus at an earthquake of magnitude 9 and terms of rescue operations of 3, 6 and 10 days, the sanitary losses are decreased by 3, 4 and 6% correspondingly due to the death of the part of injured persons and at an earthquake of magnitude 11 - by 14, 18 and 32%. It is determined that of the whole amount of people found themselves under debris 50 - 55% die during the first three days. This fact must be taken into consideration while improving emergency rescue system. Received calculated data on the losses among population on the main positions coincide with the actual data referring to the recent earthquakes, for example in Spitak and Neftegorsk.

It is ascertained that trauma's localization and character depend little on the types of the settlements, variants of their construction. With the increase of an earthquake intensity the specific weight of the spinal and pelvis traumas is increased. If to compare an earthquake with magnitude 10 with an earthquake with magnitude 6 - the specific weight of the head' s traumas with the bones injuries is increased more than 5 times; chest traumas with the bones injuries - almost 3 times; abdomen traumas with internal organs injuries - 5 times; extremities traumas with bones injuries - almost 3 times and crush syndrome - more than 5 times.

The proposed methods of forecasting medico-sanitary aftermath are recommended for the specialists of other countries at beforehand planning and effective control over medical resourses and manpower during earthquakes.

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ABS/2.2

2.2 Maintenance of Medical Readiness in Reaction to Earthquakes in the Far East of Russia

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Russia
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" Maintenance of readiness medical reactions on medical consequences of earthquakes on Far East "

Far-Easter the region - eastern borderland of Russia is a part the Pacific belt of dangerous earthquakes, as Japan and other countries Asian-Pacific of region. On Far East there are the earthquakes by intensity force 9-12.

The special fisical-geographical and social-economic conditions of Far East influence medical consequences of earthquakes.

In turn medical consequences of earthquakes, each the influence to actions of forces and means of a service of medicine of accidents of region and subjects of federation of Far East renders.

The most complex there are the consequences of earthquake on a peninsula Kamchatka. The size of sanitary losses can reach 10-15 thousands the person, from which 65-73 % will have combined defeats woundeds. Thus quantity both specific weight of sanitary and irrevocable losses will depend on time of days and character застройки of occupied items.

The aggravation of conditions of life-support will cause growth intestinal of infections and natur-aereal of diseases.

For duly medical reaction on consequences of earthquakes in Russia and on Far East is created and All-Russia service of medicine of accidents, called to supply readiness of forces and means of a medical service to actions on liquidation of medical consequences of earthquakes, acts. The service of medicine of diaster (DMS) is functional structure of Uniform Russian system of the prevention and liquidation of extreme situations (RSD). DMS has shown the efficiency at earthquake in Neftegorsk, where was returned to work 72,6% acting on treatment; has died - 11% and have received physical inability - 16,3% from among evacuated in medical establishments.

Construction and the functioning Far-East of a regional level DMS is based to fulfilment of a numbe of principles, major of which are:

- Recognition by a basis of a service of medicine of accidents of its territorial level, i.e. level of the subject of federation;
- Application at organization of medical maintenance of liquidation of consequences of earthquake of system "stagend of treatment struck with them evacuation on purpose";

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ABS/2.3

2.3 Earthquakes in Latin America the Role of Cities in Disaster Management

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Earthquake in Latin America
The role of cities in disaster management

Paper prepared by Jean Luc Poncelet[i]
for the International symposium on Earthquakes and People's Health
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ABSTRACT: Latin American countries and especially large cities have been badly affected by hazards such as earthquakes. The region passed through three major disaster management phases: response, preparedness and mitigation. There are some indications that with the declaration of the International Decade for Natural Disaster Reduction in 1990, the last Hanshin earthquake in 1994, and a better acceptance that it is the humans who increase the vulnerability of society, we are in transition toward a new disaster management period characterized by a more integrated and integral vision of disaster management. However, disaster management is relatively new and has been seen from a national and central point of view, reasons why it has frequently failed to respond to large city requirements. Cities need to be more directly and strongly involved in disaster management.

This paper focuses on Latin America, from Mexico to Chile and Argentina, countries which are the most exposed to earthquakes. Canada and the USA are also at high risk but are not included, as they have a very different disaster management approach.

There are 24 cities in Latin America with more than 1 million inhabitants and eight with more than 8 million. These numbers are growing every year, and its is estimated that by the next century, more than 66 % of Latin America's population will live in urban areas.

Over the last 25 years, it has been estimated that over 3 million people have been affected by natural disasters, billions of dollars have been lost[ii]. Table 1 identifies the principal earthquakes between 1970 and 1992.

YEAR	COUNTRY	NO. OF DEATHS REPORTED	ESTIMATED NO. OF AFFECTED PEOPLE
1970	Peru	67,000	3,139,000
1972	Nicaragua	10,000	400,000
1976	Guatemala	23,000	1,200,000
1982	Mexico	1,770	60,000
1985	Chile	180	1,000,000
1985	Mexico	10,000	60,000
1985	Colombia volc er.	23,000	200,000
1986	El Salvador	1,100	500,000
1987	Ecuador	300	150,000
1990	Peru	21	130,000
1991	Costa Rica	51	19,700
1992	Nicaragua Tsun.	116	13500

[i] Jean Luc Poncelet, MD, MPH. Head of the Disaster Management Program for South America-PAHO/WHO.
[ii] Significant disasters worldwide. From 1900. OFDA

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ABS/2.4

2.4 Acute Diseases During and After the Great Hanshin-Awaji Earthquake

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ORGANIZATIONAL MEASURES IN THE SYSTEM OF EMERGENCY MEDICAL CARE IN DISATERS AND CATASTROPHIES

A.M.Minassyan - Chairman of Emergency Medical Scientific Center, city of Yerevan, Republic of Armenia

Chief of Emergency school, National Institute of Health, Ph.D., Professor.

Summary.

Scientifically founded and efficient organization of emergency medical care in the centers of disasters and catastrophes is considered to be a decisive factor in struggle for lives of victims.

During the first hour of disaster outbreak, the three phase of disaster medicine management must be organized because of diffioulties arising in prognosticating the number of victims and causalities. After carrying out situational evaluation, integration of the second and the third phases of management is possible. The first two phases of disaster medicine management are implemented by the efforts of the Disaster Committee of the Ministry of Health of Armenia.

Currently, organizational structure of disaster medicine service in Armenia can be represented in three levels.

For activation and real functioning of disaster medicine in Armenia it is necessary to take concrete organizational measures.

Scientifically founded and efficient organization of emergency medical care in the centers of disasters and catastrophes is considered to be a decisive factor in struggle for lives of victims. Complex conditions of eliminating consequences of extreme situations, which require special forms and methods of work of medical stuff and rescue teams, give state significance of the present branch of medical science. In all republics of the former USSR provision of emergency medical care during the disasters was the responsibility of the medical of the civil defense which failed in practice. This became particularly clear after Chernobyl Nuclear Power Station accident and Spitak earthquake in Armenia in 1988, shortly after which committees for extreme situations were set up.

With a view to developing an efficient structure of disaster medicine and modeling the activity of the activity of this service in local disaster conditions,

study of archive materials of Spitak earthquake was carried out which allowed to reveal the main directions of disaster medicine in Armenia.

These directions are:

1. provision of qualified medical care and maximum approaching of specialized care to disaster zones;
2. coordinated work of emergency teams with accident-restoration and rescue services;
3. use of specialized auto and air transport in evacuating causalities to multi-typed hospitals;
4. medical institutions planned differentiation which are in a position of deliver specialized medical care indicating those institutions which can be reprofiled into specialized hospitals in the shortest periods.

Currently, organizational structure of disaster medicine service in Armenia can be represented in three levels.

This is federal level/ Government of the Republic of Armenia, State for Extreme Situations, Ministry of defence and Ministry of Health of Armenia/, Disaster Committee of Ministry of Health of Armenia and emergency system.

Management of disaster medicine structure in the system of the Ministry of health of Armenia can have three phase organization:

1. **Organizational-methodological phase.**

In this stage the whole activity of disaster medicine in controlling the sequences of accidents and disasters is systematized.

2. **Regional phase.**

The most actual in territorially spread disasters. It performs control over the process of eliminating consequences of disaster. It functions under the guidance of organizational-methodological phase.

3. **Primary phase** / working bodies who perform definite functions in extreme situations directly in the places of disaster./ It is created in all kind of mass accidents and disasters.

During the first hour of disaster outbreak, the three phase of disaster medicine management must be organized because of difficulties arising in prognosticating the number of victims and causalities. After carrying out situational evaluation, integration of the second and the third phases of management is possible. The first two phases of disaster medicine

management are implemented by the efforts of the Disaster Committee of the Ministry of Health of Armenia.

Let's review the activity of disaster medicine:

1. immediate transportation / automobiles, aircraft/ of victims to specialized centers of disaster medicine.
2. in the center of distraction and nearly situated medical institutions there must be provided qualified medical care from the side of local and arrived medical staff.
3. the most mobile parts - staff of ambulance station of the city of Yerevan and of nearly situated regions of calamity arrive at the place of incident together with medical teams of quick reaction.

The analysis of theoretic investigations carried out by us according to the condition of material and technical basis of the health care of Yerevan and the whole Republic, of data of numerous studies in the field of eliminating medical consequences of disaster/including Spitak earthquake in 1988 in Armenia/, and also taking into account the risk factors characteristic for Armenia, bringing to the conclusion that almost all big catastrophes and

natural disasters will be accompanied by numerous causalities. In this connection the models suggested by us on the structure of disaster medicine are maximum acceptable in the condition of local, territorially limited disasters.

For activation and real functioning of disaster medicine in Armenia it is necessary to take concrete organizational measures.

It is expedient to recommend the leadership of the Ministry of Health of Armenia and the State Disaster Committee:

- to consider the suggested structure and conceptual approaches of disaster medicine, and in case of necessity to submit to the Government of the Republic of Armenia;
- to develop and integrate the emergency services with rescue service, civil defiance services on the basis of Emergency Medical Scientific Center and other ambulance stations of Yerevan and the Republic;
- to carry out special emergency care training courses with the rescue teams, police and military;
- to teach ambulance station staff the main skills of rescue works;

- to organize information technical center of disaster medicine in the Emergency Medical Scientific Center;
- to facilitate the development of the material technical basis and further expansion of leading surgical institutions of Armenia, specialized centers of disaster;
- to create untouchable reserve of equipment, medical instrumentation, apparatus at the planned Disaster Committee of the Ministry of Health of Armenia and in6-8 geographic regions of Armenia with a view to operate beginning of qualified and specialized care on the spots;
- in generalizing the experience of work of Emergency Medical scientific Center to organize evacotriaging medical stations in airports of the Republic with a view to activating in case of necessity;
- analyzing the questions on increase of effectiveness of transportation of causalities, for a full organization of the process of qualified medical care, to recommend corresponding state structures to provide in case of necessity with sanitary equipment of air and railway transport for a quick medical reprofiling of the latter;

- to carry out advanced physicians training in general profile in the leading specialized centers of the Republic on pre-hospital emergency care and trauma emergency medical care.
- further development of scientific-research links with leading medical centers of CIS countries and of the world which are involved in the work on studying the problems of extreme medical care and disasters and catastrophes. Organization of immediate practical and operative contacts between the specialized centers of Yerevan for the cases of disasters and big surgical centers of CIS.

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ABS/2.5

2.5 Urban Earthquake Masterplans, Logistics, Social and Health Aspects

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ACUTE DISEASES DURING AND AFTER THE GREAT HANSHIN EARTHQUAKE

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The Kobe City General Hospital Department of Emergency is the only third class trauma and medical center in Kobe (population of 1.4 million).

Before the earthquake more than 3000 people with trauma or acute diseases had been admitted annually. About 1/3 of all serious cases generated in the whole city were transported to this center.

The hospital has 1,000 beds. It was severely curtailed in its function through destruction of various apparatus, lifeline disconnection and restriction of access to the hospital by the damaged bridge which is the only way to the artificial island where the hospital was built.

Utilising the remaining function, 137 patients were treated including 6 surgeries during the first week and 475 patients were within a month. These 475 patients could be divided into 333 with acute diseases and 142 with trauma.

This paper aims to analyze the acute diseases in the phase during and after the earthquake compared with the data in an ordinary month before the disaster.

1.Classification and incidence

In the phase during and just after the disaster respiratory disease was the most frequent, with 24 patients in the first week , 28 in the second and total 106 within 4 weeks. Cardiac cases were 18 in the first week, 20 in the next and total 68 within 4 weeks. Digestive cases were 0 in the first week, 13 in the next, 17 in the third and 26 in the 4th week, for a total of 56 within 4 weeks.

Early appearance of respiratory disease,followed by cardiac problems and late increase of digestive illness seems a significant tendency.

2. Comparison of incidence before and after the earthquake

Mean monthly number of the cases in each disease from July to November(5 months), 1994 were respiratory 22.4, cardiac 19.8, digestive 27.2 and acute diseases of the central nervous system 17.8 cases.

Compared with previous numbers, each didease after disaster has a larger number; respiratory disease 4.7 times, cardiac 3.6 times and digestive 2.1 times.

Concerning acute disease of the central nervous system, a smaller incidence was noticed during and after the disaster by 5 to 18(0.2).

3. Distribution of the diseases

1) Out of 106 respiratory cases there were pneumonitis in 36(34%), asthma in 18(17%), lung cancer in 12(11%) and others within a month after disaster.

Eleven patients died; 6 pneumonias, 4 lung cancers and 1 old tuberculosis.

2) Cardiac cases, total 74, were congestive heart failure(CHF) 39(53%), angina 11(15%), myocardial infarction 9(12%) and others.

3) Total 67 digestive diseases had liver cirrhosis in 27(40%), gastric ulcer 12(18%), acute hepatitis 4(6%), bacterial enteritis 4(6%), duodenal ulcer 2(3%) and others.

Bleeding from digestive system occurred in 28 cases(42%).

These digestive disorder followed respiratory and cardiac disese a little later, starting in the 3rd week with peak in the 4th week after disaster.

4. Conclusion

1) Of main diseases, after disaster there was a bigger incidence (4.7 to 2,1 times) compared to before, with the exception of the central nervous system (0.2 times).

2) Respiratory disease appears early after the

disaster and continues high incidence.

3) There was a significant tendency that digestive disease appears late in the second week. Acute disease in the central nervous system had smaller incidence.

5. Lessons learned from the Great Hanshin Earthquake

It has been stated in several reports that the most frequent acute disease after the disaster and leading cause of death are respiratory infection.

Coldness, overcrawd and deteriorating sanitary conditions in the shelters are the situation befind it.

The most effective tereatment to acute diseases can be the control of repiratory infection, and the improvement of its background can cover that of cardiac and digestive diseases.

Destroyed access to the hospital by road collapses and damaged bridge and absolute shortage of information by disruption of telecommunication system made the remained faculties of the hospital useless.

The decreased works of hospital were mainly from shutdown of life lines, especially of water supply, and succeeding disfunction of equipments including repirator.

It is also a regretful fact that we did not have disaster management plan and effective command system.

6. Improvements after the experience of disaster

Respiratory diseases will be well controlled by comfortable shelters with enough sanitary spaces, protection from coldness and relief materials.

Introduction of the helicopter as transportation system, strong hospital with anti-quake equipment and elastic lifelines, a tunnel under the sea as another access to the hospital and effective disaster management plan, some are already implemented and some still on a plan, are expected to help the fight against acute diseases in the future.

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ABS/3.1

3.1 Earthquake-Resistance Regulations: Preventive Measures for Seismic Disaster Reduction

Professor H.P. Wölfel
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URBAN EARTHQAUKE MASTERPLANS, LOGISTICS, SOCIAL AND HEALTH ASPECTS

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Past events have shown that urban earthquakes can be highly damaging with the potential of disrupting our lifeline systems and socioeconomic structure. In recent decades earthquake disaster risks in urban centers increased due to: Aging systems and population; Overcrowding; Having more values exposed to risk; and especially for developing countries, , Faulty land-use planning and construction; Inadequate infrastructure and services; and Environmental degradation.

In urban centers the seismic risk best portrayed through "Earthquake Damage and Loss Scenarios". Earthquake hazard, vulnerabilities and the inventories of the elements exposed to risk constitute the essential ingredients of the scenarios. "Earthquake Master-plans" represent the convolution of these scenarios with the appropriate emergency response planning and the risk mitigation strategies.

The assessment of the earthquake hazard entails: Detailed analysis of the past earthquake damage in elation to the building types and population densities. Probabilistic and deterministic assessment of the earthquake hazard in terms of expected accelerations and response spectral levels at the bed-rock. Preparation of microzonation information in the form of GIS data base to provide information on ground motion levels, liquefaction, subsidence and landslide susceptibility.

Assessment of the physical vulnerabilities of the building stock in terms of physical damage, loss of small businesses and loss of life. Compilation and analytical-empirical assessment of vulnerabilities for lifelines and infrastructure in consideration of their physical layout and redundancies. Investigation of dams, power plants, major chemical and fuel storage tanks in terms of their primary safety and secondary hazards. Only limited secondary physical vulnerability models exist for post-earthquake fire, hazardous material release, explosions and water inundation. Current assessment of socio-economic vulnerabilities are associated with large uncertainties. Casualty vulnerabilities depend on several factors such as: Population per building; Occupancy at the time of the earthquake; Occupants trapped by collapse and the particularities of the rescue-first aid services. Social disruption is measured in quantitative (eg. number of displaced families) and qualitative terms.

In urban areas the Elements at Risk are: Population; Structures; Utilities; Systems and Socioeconomic activities. Inventories need to be compiled on: Demographic structure for different times of the day; Building stock and its typification; Lifeline and infrastructure and; Major and critical facilities.

The urban earthquake master-plan should address the pre- and co-earthquake disaster risk mitigation issues. In the pre-disaster phase the risk of urban earthquake disasters can be mitigated by the reduction of the structural vulnerability, imposition of siting and land-use regulations, design and construction regulations, public education-awareness programs are betterment of rescue, first-aid and health services. Specific measures should be considered for secondary hazards. Pre-earthquake measures that should be implemented in urban centers also include: Creation and strengthening of programs and organisations; Hazardous material management;

Legislative and regulatory measures; Response readiness; Logistical support; Resource management and stockpiling; and Mobile command and communication operations.

The emergency activities that should be implemented in urban centers right after an earthquake disaster include: Emergency rescue, evacuation, transportation and communication; Damage assessment and demarcation of dangerous buildings; Recovery and disposal of dead bodies; Emergency provision of health care, shelter, water, food and utilities; Human response and information management and; Law enforcement.

In parallel to the increase in urban earthquake risk, we are also getting better armed in assessing the impact of urban earthquakes and the measures of mitigation. With credible long range loss predictions the societal efforts will be concentrated and prioritized to mitigate the earthquake disasters. What will be needed in the future, is the dissemination of urban earthquake loss scenarios and master-plans in understandable formats, in order to increase the awareness of the public and sensitise the decision makers. Several international institutions, programs and initiatives, in this regard, should act catalysts.

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ABS/3.2

3.2 Financial Aspects After an Earthquake: the Bank's Point of View

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5 Stronger control of erection works

6 Standardization of the regulations to that they can be compared with each other - independent of the safety standard envisaged by the individual countries

7 Elaboration of regulations for simple buildings (low cost housing)

8 Elaboration of regulations for the reinforcement of buildings yet insufficiently designed against earthquake

9 Elaboration of regulations for the repair of buildings damaged by earthquake

10 Definition and publication of recommendations for the people's rules of action during and after earthquake in high seismic regions

Some of the requirements have already been partly or even excellently fulfilled in some countries. However, the goal is to close the specific gaps in order to reach a well-balanced rational standard of safety against earthquake world-wide. Of course, the regulations have to be realized and generally, this does not work without respective control.

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and include high secondary risks (chemical plants, NPPs). For the last-named special regulations exist valid for all safety-related parts of the plant, while for all other parts the standard regulations remain valid.

4. Eurocode 8

With Eurocode 8 (EC8) a voluminous regulation is about to be completed covering buildings, bridges, towers, pylons, silos, tanks as well as foundation and retaining structures which only excludes plants with high secondary risk such as NPPs.

In the future EC8 shall be released for all EC- and EFTA-countries and currently constitutes the most voluminous and complete earthquake regulation. Currently, the date of release cannot be foreseen. In some countries parts of EC8 will be transferred via „National Application Documents (NAD)" during the next few years. The organization of EC8 is briefly described and the proceeding for common building structures is reflected with the standard procedure (cp. (2)).

5. Prospect

Experiences with the application of the regulations and analyses of earthquake damage result in enhancements to the earthquake regulations so that the necessary sprint in the race mentioned at the beginning will be successful. For that purpose 10 items are mentioned below:

1 Elaboration of world-wide uniform earthquake maps describing the intensity of possible earthquakes in dependence on the probability of occurrence

2 Complementation of the regulations for common buildings by those for special structures

3 Complementation of the regulations for buildings by such for mechanical installations of buildings

4 Consequent introduction of controlled energy dissipation (capacity design)

(A) probability of occurrence of an earthquake of certain intensity at a site (seismic hazard analysis)

(B) probability of such intensity initiating a critical course of event (seismic response and fragility evaluation)

(C) volume of loss and damage with such course of event (consequence analysis)

(B) is controlled by means of earthquake design according to earthquake rules. Evaluating the measures taken to limit the amount of losses (C) and summing up the contribution of all intensities, from an accepted risk the intensity of a „design earthquake" can be drawn.

3. Regulations for Building Structures

In general, regulations for common building structures are organized the same way. The centre point is the load bearing capacity for horizontal static loads applied as inertia forces at the so-called lumped masses of a building.

$$F = \alpha_1 \cdot \alpha_2 \ldots\ldots \alpha_8 \cdot \bar{a}_o \cdot m \cdot f(z) \qquad (2)$$

The loads result from a basic value $\bar{a}_o$, of the ground acceleration and mass m per mass point, modified by factors $\alpha_1 \ldots \alpha_8$, taking into account the different influences to be considered. Function f(z) describes the distribution of the acceleration over the structure's height, which can be approximated by a linear or bi-linear curve or more exactly determined by means of dynamic analyses. Factors α_i partly intersect and are not included in all regulations in the same consequence.

At least of equal importance for the earthquake design are construction regulations, which in addition to general requirements control the dissipation of energy so that with

- smaller earthquakes no damage occurs
- medium earthquakes the damage remains limited
- larger earthquakes no collapse occurs

Besides the regulations for common building structures regulations for special structures are necessary in case these structures principally show different behaviour (bridges, lifelines, dams) or /

Earthquake Resistance Regulations- Preventive Measures for Seismic Disaster Reduction

H.P. Wölfel, M.V. Schalk, F.O. Henkel

1. Introduction

For the time being approx. 40 countries dispose of written earthquake regulations.

However, in this century, there has been an increase of loss of human lives and of material goods, despite such regulations and constant earthquake activities on an average. Obviously, in consequence of extended vulnerability of our infra-structure we are in a race between success of design against earthquake and increase of damage potential. In the „International Decade of Natural Desaster Reduction (IDNDR)" all countries world-wide have been called upon by UNO to undertake a sprint in this race.

In this race regulations are of particular importance. Purpose of this paper is to elaborate this importance further, to describe the basic conception of the regulations and their most important influences and to judge the actual status available. With the world-wide economical and political interconnection forming the background preventive measures by means of earthquake design more and more become a common responsibility requiring international co-operation.

2. Seismic Risk and Protection against Earthquake

Earthquake design serves to limit the seismic risk to a socially acceptable extent. There are three „factors" to determine the risk

$$Risk = H * R * C \qquad (1)$$

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ABS/3.3

3.3 Organizational Measures in the System of Emergency Medical Care in Disasters and Catastrophes

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Title:Financial Aspects after an Earthquake

—the Bank's point of view

Name :Yasuyuki Yasuda

General Manager, Kansai Project Development Division

The Sakura Bank,Limited

Sakura Bank is one of Japan's leading financial institutions, which holds $498 billion of total assets,530 domestic branches and 46 overseas offices.

In the Kansai Area,where the Great Hanshin-Awaji Earthquake occurred on January 17,1995,5 out of our bank's 185 branches,were completely collapsed and 20 were seriously damaged.The day when the earthquake struck,119 branches were unable to open for business due to the paralyzed electricity and telecommunication systems.But the bank's computer systems were safe.Two days after,with rapid relief efforts,we had succeeded in putting the bank's electronic banking services fully back on-line. By January 23,all branches had been put back into operation.

In fact,most of our customers had felt much relieved to see the banking facilites restore very quickly,and as the result of that,none of our customers had rushed into our bank offices,since it had restored into normal operation.The fact that the building of Kansai Headquarters in Kobe was completely safe,had also relieved most of the people in the devastated districts.

On Jan.17,our bank had established Emergency Command Centers in the Head Office in Tokyo and in the Kansai Headquarters,and had enacted a series of special measures aimed at the victims of the devastation,in order to assist these people directly.

On the same day,we had set up an account to accept contributions of aid and began to collect donations from other customers and bank employees.The next day,we had decided to provide the victims to be able to access to our special low-interest home loans,our low-interest financing for small sums,our emergency disaster-relief loans for businesses,and debts rescheduling on existing home and business loans.In addition,we had set up special counters in all of the Kansai-area branches to provide loan counselling for these customers in need.Furthermore,it had chosen to exempt customers from various service charges,and to offer certain deposit-related conveniences.Hopefully these [illegible]ions had meshed well with the government's emergency steps and had been helpfull to the earthquake victims.

As a leading bank in the Kansai Area,and especially in Hyogo Prefecture,Sakura Bank has a close relationship with the Hyogo Prefectual Government and the Kobe City Government.It has submitted a special proposal for reconstruction to these local governments in the region.Moreover,in order to provide additional full-scale support for these reconstruction projects,our bank has set up the Reconstruction Promotion Department and the Reconstruction Project Department.As one of the financial institutions which is tied closely to the stricken region,we are devoting our full efforts to help the area achieve recovery promptly from this disaster and future prosperity.

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ABS/3.4

3.4 Safe Hospitals: The Mexican Strategy to Face Natural Hazards

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3.5 Experience from Rehabilitation and Reconstruction of Skopje after the 1963 Earthquake

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Experience from rehabilitation and reconstruction of Skopje after 1963 earthquake

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Abstract

The territory of Macedonia, as well as the Skopje valley, is situated within the Mediterranean seismic belt, characterized by very high seismic activity. The 1963 Skopje earthquake struck the city on the 26th of July, early in the morning and it was one of the strongest quakes of its recent history. It was a shallow earthquake with a hypocentral depth of 5.0 km and a magnitude of 6.2. The epicenter was in the down town area, where the damage was very high.

The Skopje city in 1963 had 220.000 inhabitants, and during the earthquake 1070 people were killed and 3300 were seriously injured. Today, Skopje has 650.000 inhabitants, covering an area of about 300 square kilometers.

Before the earthquake, Skopje was characterized by an intensive residential, industrial and infrastructure construction. In structural designing, the earthquake forces were not considered and all the structures were designed only for gravity and wind loads. During the pre-earthquake intensive construction period, buildings of up to four stories were constructed, mostly in brick masonry systems, and quite often with a flexible first floor. The higher buildings were constructed in reinforced concrete frame systems, mainly with frames in one direction only. The conservative construction technology did not enable reaching the required quality of the built-in materials.

The pre-earthquake period is also characterized by a large number of old buildings, some of which additionally extended by one or two floors without an adequate strengthening. Having in mind these pre-earthquake conditions, and considering the size of the released energy, it was obvious why the city was so seriously damaged. About 76,3 percent of the total number of buildings was either demolished or heavily damaged, and only 23,7 percent remained undamaged or slightly damaged. Presented in the table below is the degree of damages on different types of building structures.

Purpose of building	Total No. of units	Destroyed No.	%	Heavily damaged No.	%	Undamaged No.	%
Residential buildings (Apartments)	36578	15302	41.0	14194	38.8	7082	19.4
Schools	54	19	35.2	35	64.8	-	-
Hospitals	15	5	33.3	10	66.7	-	-
Social welfare and children's protection	49	12	24.5	37	75.5	-	-
Public buildings	34	9	26.5	25	73.5	-	-
University buildings	10	5	50.0	5	50.0	-	-
Cultural heritage	42	23	54.0	19	45.2	-	-

Apart from the damage to the above mentioned building categories, the earthquake caused slight or moderate damage to industrial facilities and equipment, life-line systems, shops, hotels and restaurants, workshops, etc.

The rescue operation of injured commenced half an hour after the event, when the decision was made to establish the first tent camp in the city park, where the emergency headquarters was also located. Considering the situation with very serious damage to all the medical buildings, total breakage of telephone and communication systems, traffic roads, reduced supply with water and food, electric power, etc., and at a temperature of almost 40°C, the organization of all the services for rescue and elimination of secondary consequences took heavy efforts and was carried out with large inadequacy. During the first several days about 140000 inhabitants of Skopje were sheltered in tents

or dislocated from Skopje, all the population was vaccinated against contentious diseases and several tent hospitals were established.

Because of the lack of own experience, in 1 - 2 days, initial international relief arrived in Skopje in terms of medicines, medical equipment and personnel, food, materials, etc., and soon after it arrived assistance in people and mechanization for clearing up of debris. Parallel to the urgent measures, commenced the process for classification of the structures according to damage level with participation of experts from Japan, the USA and the European countries. The process for repair of slightly damaged houses commenced before the beginning of the winter, and one year later the major part of them was re-repaired. The Skopje experience in the reconstruction of the residential buildings stock is very interesting and edifying for many countries exposed to catastrophic earthquake effects.

Having paid a rather high price for this disaster and fully aware of the possible consequences that future earthquakes might cause on the territory of former Yugoslavia, the Gevernment enacted a decision for application of codes for aseismic design and construction of buildings in 1965. These codes were being applied until 1980, when improved codes were enacted, and now the Republic of Macedonia is working on the last version of technical standards which should be correlated with the Eurocodes.

The construction of new buildings after 1970 is characterized by a high quality and safety as a result of the engagement of the Institute of Earthquake Engineering and Engineering Seismology. During this period, a very serious quality control of design and construction has been ensured with a large number of experimental field and laboratory studies and transferring of up to-date achievements of the earthquake engineering even beyond the requirements of the codes. In the period of the eighties, a new dynamic testing laboratory, with sophisticated equipment, has been established at the Institute.

The Skopje earthquake experience is valuable and it will be critically elaborated in the paper after the 30 year time distance.

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Kobe, Japan, 27 - 30 January 1997

ABS/4.1

4.1 Rehabilitation of Earthquake Victims, Social and Health Aspects (The Cairo 1992 experience)

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Rehabilitation of Earthquake Victims, social and health aspects. (The Cairo 1992 experience)

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Background

An earthquake of 5.9 Richter hit greater Cairo on 12 October, 1992, affecting six governorates, killing 560, injuring 2000 and rendering 25000 families homeless; Ministry of Health cared for the injured. More than 100 temporary shelters were erected by the Egyptian Red Crescent (E.R.C) and the government.

Health in temporary shelters

Sanitation: Within three days most camps were supplied with safe running water. E.R.C supplied containers, soap, refuse disposable bags and household basic utensils. Volunteers supervised cleanliness and basic hygienic principles, Ditch latrines were erected to be replaced by deep latrines within two weeks.

Nutrition: Canned food was distributed during the first week. Families were encouraged to cook their food in camp kitchens thereafter to avoid dependency.

Psychological care and social support: Only few families suffered acute psychological trauma. Volunteers and professionals offered psychological and social support.

Control of infectious disease: There were no out breaks of food, water borne or respiratory diseases. Scabies was a problem, topical medication was distributed and self hygiene was emphasized. Anti meningococcal vaccine was given to children 3 - 15 years old.

Other health issues: were also addressed (the chronically ill, handicapped, accidents, violence and occasional sexual assault) through 24 hr. health emergency and referral service.

Resettlement:

The government successfully resettled homeless families in four settlement areas where modest apartment houses were originally built for newly wed couples but lacked basic infrastructure. This was completed within three months.

The urban development project for earthquake victims at El-Nahda:

A comprehensive social and health project was carried by E.R.C. and UNICEF in the largest settlement area "El-Nahda" which housed more than 18000 families that came from four governorates.

Preproject Survey

The National Institute of Sociology survey indicated the severity of the socio-economic problems; 52% of the families had a monthly income less than $60; 25% of the families were female single headed; 44% of the population were illiterate (51.6% females and 36.4% males). The elderly represented 5.4% of the population; 40% of the population was under 18 years old.

Infrastructure: All houses had clean water and sewage disposal. Water supply was doubled after one year. Main roads were paved. Two telephones and four buses started communication and transportation services. These were later increased. A handful- of policemen were responsible for security. A police unit was later established. More than 150 shops were rent to the new inhabitants and three open markets were established. Three primary schools started functioning within six months. Two higher schools were later built. One governmental health unit with 24 hr emergency services and an ambulance was opened. E.R.C. built a new social health complex after one year. Several private clinics and pharmacies were later opened.

Health: Health problems were present in 7.4%, commonest were rheumatic disorders and chest allergy. Handicapped represented 2.4%. Six handicaps were earthquake related.

Social and psychological situation: Inhabitation had several common problems. They were uprooted from their communities, many lost their source on income. They shared similar types of anxieties regarding identity and future. There was little evidence of traumatic stress disorders characteristic of the disaster syndrome. Almost all survivors belonged to a deprived social class that was originally living under chronic stress and who have strong faith in destiny and fate acceptance.

Objective:

Develop a sense of belonging, integration in the society and a productive life. Carry out cultural, recreational and communal activities to bridge the gaps of alienation and anonymity.

Help the people define their problems and find relevant solutions through self efforts in cooperation with government.

Improve the standard of living through: creation of job opportunities, combating illiteracy, promoting better health, nutrition, social and environmental situation.

Implementation:

Community network: community leaders at different levels were elected. Joint government community committees were established.

Education, cultural and sport activities: Youth, women, children, elderly clubs and literacy classes.

Creating job opportunities: Vocational and re-educational programs.

Health and nutritional activities: An elaborate health education campaign including sanitation, nutrition and family planning was carried out through 150 trained community health leaders under the guidance of E.R.C. volunteers and professionals. Primary health care was carried out in E.R.C. health complex, governmental and private clinics. Referral cases including physiotherapy for handicaps were transported to the general hospital six kilometers away. There were few cases requiring specialized psychiatric care. Community consolidation and vigorous social campaigns reduced the prevalence of violence and drug abuse.

Evaluation:

The project is going on for the fourth year. Main difficulties that were solved include: transportation, insufficient water supply, refuse disposal, none paved inner roads, security, lack of higher schools and the need for more food outlets and health services. New job opportunities were created.

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4.2 The Long-term Effects of the Great Hanshin-Awaji Earthquake on Urban Public Health

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The Long-term Effects of the Great Hanshin Earthquake on Urban Public Health

Shigeaki Sato

The long-term effects on public health of the Great Hanshin Earthquake, which affected Kobe and surrounding areas on 17 January 1995, are discussed here under three headings using data kindly provided by Hyogo Prefecture, Kobe City Council and various research groups within Kobe University School of Medicine.

health checks on infants and elderly people after the earthquake

Japan has a system of statutory health checks for infants at the ages of one and a half and three years and these are carried out at health centers administered by Prefectural or city governments. Of the three year olds who visited health centers in the earthquake zone in fiscal year 1995 some 10.8% were diagnosed as abnormal in some way while health centers outside the earthquake zone had a rate of 12.9%. More specifically; those with somatic and psychological problems at the former zone were 6.1 and 4.7%, respectively and at the latter zone, they were 6.9 and 6.4%, respectively. This finding was therefore that no significant difference existed between the two areas. In Japan those of forty years of age or more also have a

statutory right to a health check and in fiscal year 1995 in Hyogo Prefecture about 157,000 received such a check-up at the earthquake zone. In other areas of the same Prefecture the figure was 179,000. Of these 76.7% of the former group had health problems compared with 88.9% of the other group. They were hypertension(12.2 and 13.9% in the former and latter groups, respectively), abnormal ECG(8.6 and 16.0%), anemia(10.7 and 16.4%), hepatic disorders(11.5 and 14.5%), diabetes mellitus(9.2 and 10.9%) and renal disorders(6.1 and 14.6%). These findings may suggest that the effects upon health of the earthquake for that year at least were not as serious as one might think. However, there may exist a bias for those who are healthier in the first place to receive this examination. More long term observation is necessary. For those living in temporary accommodation hypertension, heart disease, respiratory ailments, psychological problems, psychosomatic disorders and tuberculosis are all seemingly higher than in the average population. This may suggest that the detrimental effects of the earthquake on health of the population were rather indirect, i.e., they were mainly due to physically, nutritionally and psychologically poor living conditions after the earthquake. If so the provision and maintenance of good living conditions, as soon as possible after the disaster, would help with long term health.

health and environmental pollution

Reconstruction of buildings and other damaged structures began immediately after the earthquake. A study of air pollution carried out between 4 and 7 months after the earthquake in areas of reconstruction demonstrated that dust contamination was twice the normal level and sometimes exceeded the desired environmental standard. Asbestos pollution remained stable at or less than the desired standard of 10 fibers/1. It was also the case with NO_2 and SO_2.

the earthquake and health problems specific to urban areas

The morbidity rate of tuberculosis is increasing in a number of countries and cities and Kobe is no exception. However, the rates in some areas of Kobe are almost three times the national average. This is due in part to poor housing conditions in some areas. A related problem relevant not only to Kobe but to Hyogo Prefecture in general is a high rate of incidence of liver disease and hepatocellular carcinoma. Hepatitis C virus infection is very high in some areas. Hepatic viral infections now categorized as STD(sexually transmitted diseases) are thus an urban problem. However, it is hoped that recovery from the earthquake will improve those poor environmental or ambient conditions which at present favor the transmission of the

disease. Mainline sewage disposal is available to almost 100% of the Kobe area and other cities in the Prefecture, but in some areas damaged by the earthquake it is less than 80%. In rural areas the figure is lower and the average figure for the prefecture is 66%. There is an obvious need to improve the situation during the period of recovery.

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4.3 Disaster Management Experience in Indonesia

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ABSTRACT

DISASTER MANAGEMENT EXPERIENCE IN INDONESIA

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Indonesia is located in an area prone to both natural and human made disasters. The increasing development has also caused negative impact to the country which sometimes create technological disasters. The injuries, illness and extensive psychological and economic effect will contribute indirectly to impede the national development.

National Coordinating Board for Disasters Management was established in view of the high disasters threat and it has successfully prepared a national strategy and plan of action for disaster management in Indonesia.

Most of national disasters in the world occur in Asia and the Pacific region, including Indonesia. They cause enormous destructions and human suffering among provinces in Indonesia. The greatest number of disasters occur in those countries are affected by ill-health and poor economic conditions. Losses from natural disasters reduce the pace of sustained economic development aim.

Unfortunately, it is virtually impossible to prevent most disasters. Nevertheless, we can forestall or alleviate many of their worse effects by anticipating or preempting beforehand. Our concern is now to reduce the adverse impact of disasters on human life, through preparedness and the utilization of appropriate technology to bear in a timely, coordinated and effective manner, for each phase of operation i.e. mitigation, relief, rehabilitation and reconstruction.

The intersectoral coordinations among involved institutions were developed at all levels.

International aid request particularly in terms of high technology assistance will be conducted under the National Coordinating Body for Disaster Management. The scope of this paper is to illustrate the Disaster Management Experience in Indonesia.

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4.4 Industrial Reconstruction after the Great Hanshin-Awaji Earthquake

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Industrial Reconstruction from the Great Hanshin-Awaji earthquake (Summary)

Haruhiko Kuramochi
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1. Outline of damage

The Great Hanshin-Awaji earthquake, which occurred shortly before dawnon January 17 1995, seriously affected industry in the Hanshin area, one of the major industrial centers of Japan.

The damage caused to the industrial infrastructure, e.g. railways, roads, electricity and gas lines, to company offices and factories and to stocks of goods amounted to some 10 trillion yen, while the losses caused by business closures totaled 2.6 trillion yen.

The effects of the earthquake were not limited to businesses in the stricken area but extended to companies elsewhere in Japan and throughout the world.

The administration had prepared for such emergencies by formulating a regional disaster prevention plan, to be implemented in the event of disasters such as this one. However, since the scale of the earthquake (at Richter scale of 7) far exceeded all predictions, the disaster affected most aspects of the lives of people living and working in the area.

On the day of the earthquake, the Hyogo Prefectural Government took immediate action, establishing a Disaster Headquarters which assumed responsibility for identifying the conditions, requesting support from relevant organizations and securing emergency equipment, transport and other lifelines.

2. Restoration

The Hyogo Prefectural authorities endeavored to help stricken businesses to get back into operation as quickly as possible, and to ensure the speedy restoration of the area's industrial infrastructure.

In order to support the early resumption of business, particularly by small and medium-sized companies, the Prefectural Government, in cooperation with the national and municipal governments, established an advice center for such firms within a week after the disaster occurred. Within about three months, financial assistance, in the form of an emergency restoration fund, subsidies to support the sophistication of the business and exemptions from corporation, land and fixed property taxes had been provided. Temporary factories were erected, and store proprietors cooperated in the building of temporary premises for their mutual use.

A special employment insurance scheme was set up to help those who had lost their jobs because of the earthquake.

Lifelines such as electricity, gas, water, sewage and railway systems, including those of JR, private railways and the Shinkansen bullet train, were restored within three to six months. The highways, which were extensively damaged, were restored within 20 months, while restoration of the port facilities, currently limited to a temporary pier, will be completed within 2 years.

Although manufacturers have been able restore their business activities almost to their pre-earthquake level, some local industries and subcontractors have not succeeded in doing so.

This is particularly true of commercial and service industries, which had accounted for 64% of all local business activity. Department stores and shopping precincts have still not resumed normal business operations, and are struggling because the numbers of visitors have declined.

3. Reconstruction

(1) Planned reconstruction

The Hyogo Prefectural Government believes that the full-scale reconstruction of industry must not be limited to restoring it to pre-earthquake levels. It is convinced that, at a time when the industrial structure is changing, local industry, which has existed since the Meiji area in one of Japan's mostimportant industrial centers, should move away rapidly from its traditional concern with basic material industries, such as steel and shipbuilding.

The Prefectural authorities believe, consequently, that the reconstruction project should focus its attention on building an industrial structure which will continue to develop in parallel with the advance of society in the 21st century. In this way, full employment can be ensured, and the vitality of the region preserved.

To this end, an industrial reconstruction conference, in which the government, university and local industry participated, was held on February 5, two weeks after the earthquake, to discuss proposals and arrange for them to be submitted to the National Government. It also discussed reconstruction strategy and, at the end of June 1995, prepared a ten-year industrial plan whose principal elements were:

1. The introduction of high technology to existing industries
2. The building of a system to create and develop new industries
3. The building of a city which will attract both people and information
4. The encouragement of exchanges over a wider area, mainly with China and the Asian region.

The plan contains major reconstruction promotion projects, such as an

enterprise zone, KIMEC (Kobe International Multimedia and Entertainment City) plan, a mammoth convention center, and an imports mart.

The Hanshin-Awaji Economic Revitalization Organization (HERO), most of whose members come from industry, was established in December 1995 to enable the private sector to promote the plan, and to speed the process of full-scale industrial reconstruction.

HERO conducts surveys of, and research into, industrial reconstruction, invites domestic and overseas businesses to the region, and holds events aimed at attracting customers. HERO also acts for those who wish to do business in the region and who are pressing the administration to bring about greater degree of deregulation.

(2) The role of administration

These reconstruction projects need the support of private companies. However, since the latter have suffered greatly, the completion of such project may take a long time. Much will depend on the basic infrastructure, and on the help received from government and the country.

A trans-organizational reconstruction headquarters was established immediately after the earthquake, and took prompt action, including special budgetary arrangements, to implement the necessary emergency measures.

The National and Prefectural Governments calculated that their total reconstruction budgets would be 3.2 trillion yen and 800 billion yen, respectively. These formed the subject of a supplementary budget for fiscal 1994, and of the first and second supplementary budgets for fiscal 1995.

4. The challenges, and how they are to be met

(1) The industrial reconstruction that is needed in order to revitalize the local economy is a long-term project, and is planned to take place over a period of ten years. Ongoing economic support from sources other than those of the stricken region itself and of the national government is vital to its achievement. Local governments, which should play a central role in the reconstruction of the stricken region, are suffering from financial constraints, due mainly to heavy expenditure on reconstruction and to reduced tax revenues.

It is expected that over the next ten years, there will be a shortfall in tax revenues of 1.6 trillion yen, and that this will imply the need of long-term financial support from the national government.

(2) In general terms, industry has returned to pre-earthquake levels. However, since restoration depends greatly upon the expected demand associated with

reconstruction, such as construction projects, there is a concern about the decline of this demand after the immediate demand is satisfied.

Moreover, the rate at which reconstruction has progressed varies within the stricken region, and efforts must be made to maintain a consensus on the long-term reconstruction within that area.

(3) Another factor giving rise to concern is that, according to figures published last July, the population of the affected area has fallen by 149,000 (4.1%). It is essential that people return to the region if its continuing vitality is to be assured.

We are therefore planning to provide support to those who took shelter in temporary houses both within and outside the stricken region. This will include the construction of permanent housing, and reductions in rent aimed at encouraging people to become tenants.

(4) Renewal of the industrial structure, and long-term employment resulting from the involvement of private industry in the process of reconstruction are also important elements.

With this in mind, the Hyogo Prefectural Government plans to implement special ordinance, in January 1996, which will include low-interest loans, construction subsidies and exemptions from local tax. The aim is to attract new and promising companies (foreign businesses, in particular, are expected to inject new life into the local industrial structure), and to encourage major projects. The city of Kobe is planning similar measures.

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4.5 Cohort Studies on the Health-Effects from the North Armenian Earthquake of 1988

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Cohort studies on health-effects from earthquake

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As part of a special project that collected data about the population in the aftermath of the earthquake that hit Northern Armenia on December 7, 1988, employees of the Ministry of Health working in the earthquake zone on December 7, 1988, and they families, were studied as a cohort to assess the short and long term impact of the disaster. From an unduplicated list of 9,017 employees working in the earthquake zone on December 7, 1988, over a period extending from April 1990 to December 1992 it was possible to contact and interview 7,016 employees or their families, as well as 705 new employees or their families. The current analysis presents the determinants of 642 deaths that were not related to injuries resulting directly from the earthquake in our study population of 35043 employees and their families over a follow-up period of about four years. The determinants of self reported incident of coronary heart disease, hypertension, arthritis, diabetes and stroke was done in a separate analysis.

Results.

The highest number of deaths from all causes and from coronary heart disease was observed within the first five months following the earthquake. Both general and CHD mortality during the follow-up period was not related to any of the exposure and loss variables related to the earthquake including cumulative scores for stressors and loss as a result of the earthquake except for being inside a building and at the first floor during the earthquake. Separate analyses of mortality for deaths during the first year following the disaster did not reveal any specific associations with earthquake related factors. Male gender, older age, lower educational level, cigarette smoking, alcohol use, sedentary lifestyle and obesity were all risk factors for death in the univariate analyses. The findings for deaths from CHD were in the same direction as deaths from all causes. However, multivariate logistic regression analyses, adjusting for a number of potential confounders and using different models, revealed that older age, male gender, lower education and cigarette smoking were predictors for deaths from all causes. Also being inside a building during the earthquake was a risk factor for death during the first year following the earthquake [O.R. 1.8 (95% CI 1.0 - 3.0)]. The multivariate analyses for deaths from CHD gave similar results to general mortality.

For incident morbidity from CHD during the follow-up period the odds ratios were highest with loss, injuries and death in the family as a result of the earthquake. Compared to persons who did not experience any major losses during the earthquake, people with increasing loss score levels of 1, 2, and 3 had significant odds ratios of 1.3, 1.9 and 3.7 following multivariate logistic regression analyses that adjusted for age, gender, education, and body mass index. Similar, but not as strong significant relationships were observed with loss as a result of the earthquake for incident diabetes, hypertension, and arthritis.

Conclusions.

In this first longitudinal follow-up study of a population-based cohort, who were exposed to an earthquake, we observed higher risk of morbidity, in particular for incident coronary heart disease, in persons exposed to more stressors. People with a profile of exposure to such stressors as a result of the disaster should be monitored intensively. Preventive measures should be considered in the post-disaster period for such persons.