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Natural Disasters: Coping with the Health Impact

Disasters, such as earthquakes or hurricanes, carry a substantial health burden for affected populations and compromise the capacity of local health services to address priority health care needs. Experts writing in *Disease Control Priorities in Developing Countries*, 2nd edition *(DCP2)*, suggest several cost-effective interventions to ease the health burden disasters impose.

Disasters Pose a Public Health Challenge

According to the International Federation of the Red Cross and Red Crescent Societies, in 2002, international disasters affected 608 million people and killed more than 24,000. Disasters are unusual public health events that overwhelm the coping capacity of the affected community. They are generally classified according to the immediate trigger of the event:

- **Natural disasters,** where the trigger is a natural phenomenon or hazard (biological, geological, or climatic);
- **Technological disasters,** such as chemical spills; or
- **Complex emergencies,** such as civil wars and conflicts.

A public health approach to disaster risk management should focus on decreasing the vulnerability of communities through prevention and mitigation measures and increasing the coping capacity and preparedness of the health sector and community. This fact sheet will focus on cost-effective solutions to address natural disasters.

The Nature of Disasters

Health and economic losses from natural disasters disproportionately affect developing countries—which account for more than 90 percent of natural disaster-related deaths—and predominantly affect the poor within those countries. Although the total economic loss in dollars is greater in developed countries, the percentage of losses relative to the gross national product in developing countries far exceeds that of developed nations.

Natural disasters are not random. Earthquakes and volcanic eruptions occur along the fault lines between two tectonic plates on land or the ocean floor. And the areas subject to seasonal floods, droughts, or tropical storms (cyclones, hurricanes, or typhoons) are well known, although global warming is redrawing the map of climatic disasters. Local populations, however, may not recognize the risks in these areas.

Technological disasters and complex emergencies are less predictable. Few countries are immune to the public health risks from hazardous chemical substances (from insecticides to industrial by-products) or discarded radioactive material. Technological hazards increase rapidly with the largely unregulated industrialization of developing countries and the globalization of the chemical industry, suggesting that chemical emergencies may become a major source of disasters in the 21st century.

A population's vulnerability to all types of disasters depends on demographic growth, the pace of urbanization, settlement in unsafe areas, environmental degradation, climate change, and unplanned development. Poverty also increases vulnerability due to lack of access to healthy and safe environments, poor education and risk awareness, and limited coping capacity.

Immediate Health Impact

Short-term losses fall under three categories that have both direct and indirect effects:

- illness, disability, and death;
- direct losses in infrastructure; and
- loss or disruption in health care delivery.

The immediate health burden depends on the nature of the hazard. In the aftermath of a major disaster, authorities must meet extraordinary demands with resources that cannot begin to meet even basic health needs and that often have been drained by the immediate emergency response.

Disasters related to natural events may affect the transmission of preexisting infectious disease, but the imminent risk of large outbreaks in the aftermath of natural disasters is often overstated. In the short-term, an increased number of hospital visits due to diarrheal diseases, acute respiratory infections, dermatitis, and other causes should be expected following most disasters. In the medium term, heavy rainfalls may affect the transmission of vector-borne diseases, for example, from residual water that may contribute to an explosive rise in mosquitoes.

Earthquakes can cause a large number of injuries. While most are not life-threatening, the injured do require immediate medical care from health facilities that are often unprepared, damaged, or totally destroyed. Authorities must provide services to a displaced population, rehabilitate health facilities, restore normal services, and strengthen communicable disease surveillance and control. They must also attend to the long-term consequences, such as permanent disabilities, mental health problems, and possibly increases in rates of heart disease and chronic disease.

Tsunamis are catastrophic tidal waves caused by earthquakes on the ocean floor. Waves can travel several hundred kilometers per hour and can be as much as 10 meters high when they reach shore. Damage on shore can be extensive, and usually the number of deaths far exceeds the number of survivors with severe injuries.

Volcanoes cause serious problems, yet are often overlooked because of long periods of inactivity. Eruptions are preceded by a period of volcanic activity, which gives people time for scientific monitoring, warning, and preparation. Some issues, such as ash fall, lethal gases, lava flow, and projectiles, although of public concern, are of minimal health significance. Falling ash affects transportation, communications, water sources, treatment plants, and reservoirs. Volcanic ash and gases can irritate the eye membranes and upper respiratory tract and can exacerbate chronic lung conditions, but usually cause little sickness in the general population. The most important risk is posed by pyroclastic flows (hot gas, ash, and rock traveling with intense speed from the blast) and *lahars*, or gas, ash, rock, and/or mud flows mixed with water, caused by the rapid melting of a volcano's snowcap or by heavy rains on unstable accumulations of ash. Historically, pyroclastic explosions or *lahars* have caused about 90 percent of the casualties from volcanic eruptions. Other concerns are potential contamination of water supplies by minerals from ash; displacement of large populations for an undetermined time; related sanitation problems; and mental health needs.

Climate disasters include seasonal floods, hurricanes, and typhoons. Seasonal floods cause increased incidence of diarrheal diseases, respiratory infections, dermatitis, and snake bites. The risk of compromised water supplies depends on the condition of the community's water supply before the disaster. Saline contamination is a long-term issue following sea surges and tsunamis. Prolonged flooding endangers local agriculture and sometimes means large-scale food assistance will be needed. The primary health concerns are overcrowded living conditions and poor water and sanitation in temporary settlements and other areas where services have deteriorated or are suspended. Sickness and death result from high winds, heavy rainfall, and storm surges caused by tropical storms, such as hurricanes and typhoons. Survivors of such disasters require psychosocial services.

Long-Term Impacts

The health sector bears a significant share of the long-term economic burden from disasters. The value of direct damage and indirect losses together make up the total cost of disasters. Direct damage refers to the material losses that occur as an immediate consequence of disaster: hospital beds lost, equipment and medicines destroyed, health service facilities damaged or affected, and pipes and water plants destroyed. Indirect losses refer to the production of goods and services that are lost as an outcome of the disaster, and to the resulting reduced income.

The health burden of disasters includes damage to housing, schools, channels of communication, and industry. Damage to hospitals, health facilities, and water and sewage systems have the biggest impact on health. The long-term health burden includes loss of medical care, interruptions in the control of communicable disease and other public health programs, and loss of laboratory support and diagnostic capabilities of hospitals. A common misperception is that the damage to critical health facilities is promptly repaired, but experience shows that damaged health infrastructure recovers at a slower pace than other service sectors, such as trade, roads, bridges, telecommunications, and housing.

Damage to water and sewage systems can also have a great impact on health. In severe flooding, the sudden interruption of these services coincides with the direct effect on the transmission of water-borne or vector-borne diseases. In the case of earthquakes, the number of people adversely affected by water shortage may far exceed those injured or suffering direct material loss. As in the case of health care facilities, the rehabilitation of public water systems is usually slow.

Disaster Response and Prevention

Disaster preparedness prevents an uptick in the local problems that health services normally handle. The immediate emergency response is provided under a highly political and emotional climate, and the responsibilities of the national or local health authorities are significant:

- Assessment of the health situation must be rapid, simple, transparent, technically credible, and done in collaboration with nongovernmental actors, donors, and the World Health Organization.
- Effective treatment of mass casualties depends on local preparedness and requires triage of patients to treat those most likely to benefit first.
- Surveillance, prevention, and control of communicable diseases during disasters should be strengthened by quickly and opportunistically resuming and monitoring the routine control programs, rather than resorting to new and expensive measures.
- Prioritizing environmental health—water quality, vector control, excreta disposal, solid waste management, health education, and food safety—is essential, especially in temporary settlements.
- Donations and supplies must be transparently managed to improve the flow of assistance to intended beneficiaries.
- Strong coordination of the humanitarian health efforts maximizes the benefit of the response and ensures it is compatible with the public health development priorities of the affected country.

The need for preparedness cannot be overemphasized. Building local capacity is one of the most cost-effective ways to improve the quality of the national response. Disaster preparedness is primarily a matter of building institutional capacity and human resources, and includes:

- Identifying vulnerability to natural or other hazards;
- Building simple and realistic health scenarios of a possible and probable occurrence;
- Initiating a participatory process among the main actors to develop a basic plan that outlines the responsibilities of each actor in the health sector, identifying possible overlaps or gaps and building a consensus;
- Maintaining close collaboration with these main actors; and
- Sensitizing and training the first health responders and managers to face the special challenges of responding to disasters.

Preventing and mitigating the damage to health facilities is important. Reducing the physical vulnerability of the infrastructure can take place when reconstructing the infrastructure destroyed by a disaster, when planning new infrastructure, or when strengthening existing facilities. Mitigation of damage to hospitals aims to ensure the continuing operation of the health facility, so that some basic services will continue uninterrupted in the event of a disaster. Reducing the damage to water supplies is also important, and requires cross-sectoral coordination.

The Best Buys in Disaster Scenarios

Natural disasters are emergency situations. However, with planning, costly and ineffective interventions can be avoided. Improvisation and rush inevitably come with a high price, and there are many things health officials ought to avoid—preferential use of expatriate health professionals; emergency procurement and airlifting of food, water, and supplies that often are available locally or that remain in storage for long periods of time; the tendency to adopt dramatic measures—all contribute to making disaster relief one of the least cost-effective health activities.

But, cost-effective interventions can be adopted:

- As an alternative to expensive search and rescue teams (SAR) dispatched by developed nations, the resources invested should instead go toward building the capacity of local or regional SAR teams—the only ones able to be effective within hours—and training local hospitals to dispatch their emergency medical services to disasters sites.
- Rather than investing in foreign field (mobile) hospitals, funds would be more effective in the construction and equipping of simple, but sturdy temporary facilities, and instead using the mobile hospitals for the medium-term to handle nontrauma needs.
- Recipient countries should clearly prepare a list of the supplies and equipment they need, rather than allowing unsolicited in-kind donations of inappropriate medical supplies that are of limited use and often cause serious logistic, economic, and political problems.
- Improvised mass immunization or vector control programs should be eliminated, in favor of post-disaster interventions in surveillance and control of communicable diseases that focus on strengthening existing programs,
- Construction material, or preferably cash subsidies, should be distributed, rather than constructing massive tent cities, which should be a last resort.
- The distribution of in-kind relief goods, such as food or blankets, should be abandoned, in favor of direct financial assistance in the form of subsidies, grants, or tax relief, wherein the individual is free to determine priorities and to seek the most cost-effective sources of shelter, medical, food, or other.

By far the best thing that countries can do is be better prepared for disasters. To do this, they must secure funding for preparedness activities. The capacity of ministries of health or other responsible authorities to secure funds depends on the existence of an established disaster program, ongoing dialogue with donors, realistic projections of activities, and technical endorsement and support of WHO and other UN agencies. Those countries with established disaster preparedness programs advocate a multihazard program covering the entire health sector as the most effective approach. The occurrence of a major disaster can be the initial catalyst that helps health authorities recognize that disasters are a public health risk that must be addressed in an organized manner. Yet, preparedness cannot wait. There needs to be a continuum between normal development, preparedness, and disaster response activities.

Disasters are not likely to decrease in the foreseeable future. A sustained effort is needed to minimize risk, by reducing vulnerability through prevention and mitigation and by increasing capacity through preparedness measures. Disasters, like any public health program, need to be addressed on a long-term and institutionalized basis through an established ministry of health program or department for prevention, mitigation, preparedness, and response for all types of disasters. And the economic and political dimensions of disasters should not be allowed to overshadow the fact that disasters are a human tragedy which requires an international initiative to identify the best practices and the inadequacies of responses to date.

References

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