The most devastating natural phenomena were El Niño, with continent-wide repercussions; the earthquake in Aiquile and Totora, Bolivia; Hurricane Georges in the Caribbean; and Huricane Mitch that damaged vast portion of Central America.

The following disasters occurred in 1998:

Central America and Mexico:

- the El Niño phenomenon and its resulting droughts, floods, and forest fires;
- Hurricane Mitch in Central America;
- hurricanes and flooding in Mexico; and
- volcanic eruption in Mexico (uninterrupted).

The Caribbean:

- volcanic activity in Montserrat and Dominica;
- hurricanes Georges and Mitch in Antigua and Barbuda, Belize, and Saint Kitts and Nevis.

Andean Area:

- El Niño, with consequences throughout the subregion;
- earthquake in Bolivia and Peru; and
- earthquake and volcanic activity in Ecuador.

The natural phenomena with the most devastating effects were El Niño, with repercussions for all of the continent; the earthquake in Aiquile and Totora in Bolivia; Hurricane Georges in the Caribbean; and Hurricane Mitch, which damaged vast portions of Central America. These highlights in no way diminish the seriousness of the volcanic activity in countries such as Dominica, Ecuador, Mexico, and Montserrat; the seismic shifts in Ecuador and Peru; or the tropical storms and flooding in Mexico and elsewhere.

The above-mentioned natural disasters, with the exception of the earthquake in Bolivia, shared particular characteristics, causing damage across several countries and creating multi-country emergencies. Although the earthquake in Bolivia was extremely localized, the country had not seen a seismic event in its recent history, which brought on special problems.

EL NIÑO

The climatological phenomenon known as the El Niño/Southern Oscillation (ENSO) is the product of a complex interrelationship between, on the one hand, fluctuations in atmospheric pressure over the Pacific Ocean meridian and changes in the direction and velocity of winds over the surface of the water, and, on the other, a periodically strong and abnormally warm ocean current that gradually shifts eastward, reaching the coasts of Ecuador and Peru. In 1998, the phenomenon's main consequences were widespread flooding and drought in several South and Central American countries, as well as forest fires in Brazil, Central America, and Mexico. In Bolivia and Peru, both drought and flooding conditions affected various regions.

This most recent manifestation of El Niño began to be observed in November 1996. It intensified during 1997 and continued up until

mid-1998. The 1997–1998 El Niño is considered to be the worst of the regional natural phenomena and has left extensive damage in several countries (see Table 2).

The number of deaths caused by the 1997–1998 El Niño did not increase in comparison with those of the 1982–1983 El Niño, another particularly intense manifestation of the phenomenon. This seems attributable to the effective use of information from previous years, which allowed for early warning and improvements in prevention, preparedness, and mitigation.

The damage to the health infrastructure was considerable. Peru reported that 437 (9.5%) of its 4,576 health establishments were affected, including hospitals and other complex installations. For Ecuador, ECLAC calculated approximately US$ 94 million in losses in the health sector alone; 10 hospitals, 2 health centers, 15 subcenters, and a significant number of health posts were affected.

EARTHQUAKE IN BOLIVIA

Although Bolivia is not considered a country with high seismic risk, on May 22, 1998, an earthquake measuring 6.8 on the Richter scale hit the Department of Cochabamba, destroying the towns Aiquile and Totora and a wide swatch of small rural populations. Because most housing in the area is built with adobe walls and tile roofs, the damage was considerable, and many homes and historical buildings were destroyed. Local health centers also sustained damage. More than 100 deaths were reported and more than 7,000 persons were affected. In addition, 65% of Aiquile's water distribution system was damaged and Totora's was totally destroyed; 90% of homes were destroyed in both locations.

HURRICANE GEORGES

Hurricane Georges began its sweep on September 20 over the British Virgin Islands, later affecting Anguilla, Antigua and Barbuda, Cuba, the

TABLE 2
Dead, injured, and missing as a result of El Niño 1982-1983 and El Niño 1997-1998, selected countries.

Country	Deaths		Injured	Missing
	1982–1983	1997–1998[a]	1997–1998	1997–1998
Argentina	—	16	—	—
Bolivia	50	43	400	40
Colombia	—	3	—	10
Chile	2	2	—	—
Ecuador	220	208	116	42
Peru	380	354	337	112
Paraguay	65	65	—	—

[a] Cumulative as of 30 April 1998.
Source: Emergency Preparedness and Disaster Relief Coordination Program PAHO/Ecuador.
Source: http://www.disaster.info.desastres.net/PED-Ecuador/desastre/index.htm

Dominican Republic, Haiti, Montserrat, Puerto Rico, and Saint Kitts and Nevis. The hurricane was one of the worst natural disasters in recent decades, leaving in its wake numerous dead, injured, and missing in Haiti and the Dominican Republic (see Table 3). It also caused serious damage to health facilities, as in the case of the Joseph N. France Hospital on Saint Kitts.

HURRICANE MITCH

This hurricane is considered the worst disaster to have occurred in Central America in the 20th century, worse even than the earthquakes in Nicaragua (1972) and Guatemala (1976) or Hurricane Fifi (1974). Hurricane Mitch seriously jeopardized the progress that had been made in public health in this subregion, besides causing major damage to productive infrastructure (see Table 4).

The high toll of deaths, injuries, and missing persons underlines the high degree of vulnerability of the populations affected by this disaster, which, in turn, prompts concern for the immediate future. Damage to health facilities was unparalleled. In Honduras, water systems in 23 of 28 hospitals were damaged or destroyed; 123 of 213 health centers were seriously damaged, and, of those, 68 could not function when more than 100,000 people needed medical attention. In Nicaragua, one hospital, 90 health centers, and 400 health posts were damaged, as were 50 health centers in Guatemala and 16 in El Salvador.

INEQUITIES IN THE FACE OF NATURAL DISASTERS

As has been the case in the past, the most vulnerable population segments were most harmed by these natural disasters. Poverty was the most common denominator among the victims. Those who suffered disproportionately were populations residing in large marginal areas and without access to well-constructed and safe housing, basic health services, education, and information.

TABLE 3
Damage caused by Hurricane Georges.

Damage	Dominican Republic	Haiti	Cuba	Eastern Caribbean	Puerto Rico[a]
Deaths	283	200	6	5	8
Injuries	596	42		2	
Missing	64	30			
Destroyed or damaged homes	171,000	9,924	40,000		82,685[b]
Affected population	500	343,833	200,000	12,000	1,728,000

Source: United Nations Office for the Coordination of Humanitarian Affairs (OCHA).
[a]Centers for Disease Control and Prevention, *Morbidity and Mortality Weekly Report*, Vol. 476, No. 42, 1998.
[b]Federal Emergency Management Agency (FEMA), Information on Hurricane Georges in Puerto Rico.

TABLE 4
Damage caused by Hurricane Mitch.

Damage	Honduras	Nicaragua	Guatemala	El Salvador
Deaths	6,600	2,447	263	240
Missing	8,000	885	121	235
Destroyed or damaged homes	70,000	36,368	21,111	10,372
Affected population	2,100,000	885,000	105,700	84,000

Source: United Nations Office for the Coordination of Humanitarian Affairs (OCHA).

The following factors accentuate the vulnerability of these population groups:

- The population's density and distribution in 1997–1998, which was very different from that of 1970 and 1980; the countries' accelerated urbanization gave rise to high-risk areas, particularly poverty belts around large cities, that were not present in the past.
- The mobility of the population, sanitary conditions, types of construction, and demographic concentration in areas with little access to basic services such as potable water and disposal of excreta and solid waste.
- The unequal development that prevails in the Region and generates poverty and marginality, which are the determining factors of vulnerability, particularly in the face of disasters, either natural or man-made.
- The low level of development of emergency warning systems. In some cases, national emergency institutions have not established the coordination mechanisms with meteorological or seismological services that would improve emergency systems and enable them to reach larger numbers of people. Although warnings regarding the advance of El Niño lasted for weeks and those for Hurricane Georges for several days, marginal population groups did not receive the information necessary for them to make contingency plans in the face of a certain disaster.

According to studies, the capabilities for recovery of these highly-vulnerable population groups will be reduced even further than their levels prior to this disaster, unless integrated social measures are adopted, including relocation of settlements, construction of appropriate homes, land titling, access to basic health and education services, generation of productive activities and employment, access to low interest loans, and promotion of new forms of social participation and organization.

INFORMATION AS A MEANS FOR OFFSETTING INEQUITIES

The added vulnerability of certain population groups to natural disasters, and the resulting harm to health, underlines the prevailing inequity

in the Region that has resulted from unequal social, economic, and political development.

Concerned about this situation, the Pan American Health Organization is supporting policies that promote the use of timely and widely-available information to deal with disasters equitably and to improve preparedness and response capabilities. To this end, PAHO has undertaken several activities that strategically employ information and its dissemination:

- Working with the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and similar organizations, PAHO supported rapid needs assessments following a disaster.
- Through a network of disaster focal points located in all PAHO/WHO Country Offices, and through subregional advisors from its specialized disaster prevention program, PAHO helped health authorities carry out rapid needs assessments in terms of health in the face of an impending disaster. Assessments mainly focused on needs in terms of emergency medical attention, including medicines, medical and surgical supplies, and specialized personnel.
- PAHO collaborated with ECLAC on post-disaster assessments of direct and indirect damage specific to the health sector, which enabled national authorities to establish priorities for rehabilitation and reconstruction programs.
- The dissemination of information regarding the El Niño phenomenon was one of the principal factors in attracting unusually high levels of interest in disaster prevention. Prior to the phenomenon, regional and international banks had not made investments significant enough to reduce the effects of natural disasters. But as a result of El Niño, cooperation among UNDP, ECLAC, and the World Bank intensified in Ecuador, and the regional discussion on disaster mitigation culminated in a meeting at World Bank headquarters. Since then, financial institutions that work on development have responded more rapidly and vigorously, supporting the affected countries during rehabilitation.
- The United Nations proclamation of an International Decade for Natural Disaster Reduction (IDNDR) sparked the creation of a Regional Disaster Information Center (CRID). PAHO collaborated on a seminar and a technical publication on the use of social communication in disaster prevention, and participated in an inter-governmental meeting of experts on the El Niño phenomenon that was held in Guayaquil, Ecuador.
- Special attention was given to printed documentation on lessons learned following each major disaster in 1998. The Disaster Report series featured reports on disasters caused by El Niño in Bolivia, Ecuador, Peru, and Venezuela; the earthquake in Bolivia; and the

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damage caused by Hurricanes Georges and Mitch in the Caribbean and Central America.

- Other documents on priority issues published by PAHO included "Mitigation of Disasters in Potable Water and Sewerage Systems," and "Chemical Accidents: Aspects Related to Health." Two new documents were prepared on mental health in disaster situations, and a slide show was produced on disaster mitigation.
- PAHO made considerable progress in introducing information on disaster preparation into both the undergraduate and postgraduate levels of Central American universities, including schools of medicine, nursing, public health, engineering, and architecture.

THE INTERNET

The disasters that occurred in 1998 had unprecedented coverage on the Internet. The information generated by governments and international and nongovernmental organizations was available worldwide to all with access to the network. For PAHO, this represented a historic milestone that highlighted the importance of the dissemination and use of information, allowing for a certain degree of decentralization in its use and for more democratic access to it.

Much remains to be done to ensure that all the information needed for decision-making is available on the Internet. The most recent disasters did serve, however, to initiate a profusion of links among disaster-related Internet sites, to which practically the entire international community has access. Both at Headquarters and in each of the countries, PAHO has generated information on disaster needs and damage. It also has developed technical manuals on the use of insecticides, vaccinations, and medicines; manuals on disease diagnosis, potable water and sanitation activities, and adequate management of donations; and new guidelines on nutrition in disaster situations and on maternal and infant care, which are available on the Internet.

PAHO now faces the challenge of ensuring that this vast amount of information gets to the local levels that can most benefit from it. The goal is to incorporate these local levels into warning systems and enable them to send needs assessments practically immediately. PAHO aims to continue improving this network, with the participation of all the countries of the Region.

Much remains to be done to ensure that all the information needed for decision-making is available on the Internet.

PAHO'S RESPONSE

An electronic network that receives daily information from PAHO was established with more than 3,000 people from different institutions worldwide. The information is available in English and Spanish. The

Working with national and international agencies, PAHO cooperated with the countries to restore and ensure the quality of safe drinking water and the safe disposal of wastes.

Headquarters Working Group for Emergencies worked in cooperation with the Emergency Preparedness and Disaster Relief Coordination Program to provide consultations on emergencies for Member Governments.

Improvements were gradually made to epidemiological surveillance and reporting systems, to the point where daily epidemiological summaries were being produced.

PAHO devoted special efforts to the epidemiological surveillance of diseases that, although they varied by country and type of disaster, centered around water and food-borne illnesses, including cholera and vector-borne illnesses such as malaria and dengue; leptospirosis in Central America; the plague in Peru; and Chagas' disease in Bolivia.

Surveillance was complemented by disease control measures. Although no outbreaks were reported during the immediate emergency period, the risk of epidemics increased in the weeks following the disaster.

PAHO's and CEPIS' response to climatic disasters followed a strategy designed to mitigate the emergency. Underscoring the importance of gathering information during an emergency and then using it well, the Organization and CEPIS helped to diagnose the situation, define plans, and develop short- and long-term rehabilitation projects. The three events damaged the sanitary infrastructure, and PAHO responded with all its resources. In the case of Hurricane Mitch, the Organization pledged US$ 1 million toward cholera prevention in Central America, focusing on information, epidemiological surveillance, environmental clean-up, water chlorination, and safe food handling practices; it provided assistance according to each country's particular needs.

In environmental health, PAHO, working with other national and international agencies, cooperated with ministries of health to restore and ensure the quality of safe drinking water and the safe disposal of wastes. The technical cooperation responded to each country's needs: in El Salvador, equipment was provided to repair the water supply systems; in Guatemala, emergency water and environmental sanitation plans were developed and funds were raised for the restoration and improvement of drinking water; in Honduras, various international consultants were mobilized to deal with sewage problems; and in Nicaragua, support and advisory services in situation assessment and technical orientation of solid waste management in emergencies were provided through CEPIS. Technical literature and training also was provided in all problem areas.

Comprehensive projects for long-term rehabilitation, improvement, and/or reconstruction were prepared for submission to international, bilateral, or financing agencies.

During El Niño, PAHO, in cooperation with national authorities in Peru, carried out a specialized risk analysis on zoonosis and veterinary public health in the country's northern and southern border areas.

The Organization also participated in developing technical documents on problems caused by the disasters in almost all of the countries. These documents have been finalized in the case of the El Niño phenomenon in Bolivia, Ecuador, Peru, and Venezuela. Bolivia prepared several technical documents on the construction of sanitary modules for 300 and 600 persons following the earthquake in Aiquile and Totora, and this methodology was distributed in several countries in the Region. The English-speaking Caribbean countries, Cuba, the Dominican Republic, and Haiti produced documents on damage from Hurricane Georges, and Belize, El Salvador, Guatemala, Honduras, and Nicaragua did the same following Hurricane Mitch.

The activities developed and carried out to counteract the effects of these natural disasters took shape as an effective effort that became part of the healthy communities initiative. In some countries, simple guidebooks were developed for municipal leaders who added emergency plans at the local level.

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