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## IMPACT OF HURRICANE MITCH ON CENTRAL AMERICA

During the two-week period from 22 October to 2 November, Central America was battered by Hurricane Mitch, a gale that became a maximum force hurricane with winds of nearly 290 km per hour. Lingering over the region, the hurricane moved at the rate of 8 to 11 kilometers per hour, with several days of continuing rain along the Pacific Coast of Costa Rica. It then moved to the Gulf of Honduras, producing heavy downpours from the Atlantic Coast to the far western reaches of the country and causing major flooding. The rains finally shifted to the Pacific region of Nicaragua, precipitating mudslides on the Casitas Volcano and additional flooding in the eastern areas of El Salvador, Guatemala, and Belize.

Hurricane Mitch struck when Central America was just recovering from the economic effects of El Niño 1997-1998 phenomenon, whose floods, forest fires, and droughts had weakened the countries' productive systems. The images of Central America left by Hurricane Mitch reveal the vulnerability of the region in all its magnitude, a place where violent natural phenomena turn into disasters that affect the bulk of the population.

Table 1 presents a summary of the hurricane's impact on Central America, in absolute terms of its effect on the population, housing, and infrastructure of the countries.

Based on the reports received, Honduras and Nicaragua were the countries most damaged by Hurricane Mitch, followed by Guatemala and El Salvador and, to a lesser extent, Costa Rica and Belize. Beyond the irreparable toll in human lives lost, the impact on the region's production and its sustaining infrastructure represents a severe setback for the development of the region and will increase the already high dependence on external assistance and financing.

Due to the damage in some countries to the health services, water and sanitation networks, to overcrowding in shelters, or to population movements between neighboring countries, the incidence of cholera and other waterborne diseases, leptospirosis, dengue, and malaria has increased, particularly in urban areas and among the more impoverished and marginal groups. Initial health activities have been directed toward the immediate treatment of cases, epidemiological surveillance, solid waste management, water disinfection, food protection, and vector control.

A more detailed assessment of damaged areas and population affected by country is given below:

**HONDURAS:** The hurricane lingered off the Atlantic Coast of Honduras for a three-day period. Its heavy rains

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**Table 1**  
**Impact of Hurricane Mitch on Central America, Country Reports as of 4 December 1998.**

COUNTRY	EFFECTS								
	Dead	Disappeared	Wounded	Victims	Dwellings Affected	Bridges Affected	Education Centers Affected	Water Services Affected	Health Centers Affected
<b>Honduras</b>	6,600	8,052	11,998	1, 393,669	70,000	99	2,624	1,683	68
<b>Nicaragua</b>	2,863	970	388	368,261	41,430	63	328	88	506
<b>El Salvador</b>	239	29	-	28,452	10,372	10	326	10	15
<b>Guatemala</b>	268	121	280	105,055	21,000	121	311	60	-
<b>Belice</b>	-	-	276	-	-	-	-	-	-
<b>Costa Rica</b>	5	4	-	-	965	69	39	-	1
<b>Total</b>	<b>9,975</b>	<b>9,176</b>	<b>12,942</b>	<b>1,895,437</b>	<b>143,767</b>	<b>362</b>	<b>3,628</b>	<b>1,841</b>	<b>590</b>

Source: Office for the Coordination of Humanitarian Affairs (OCHA). Status Report No. 14

caused rivers to overflow, leading to flooding in the 18 departments of the country, particularly along the Atlantic Coast, the Southern departments, and the capital city. It has been estimated that some 50% to 60% of the roads and bridges sustained some type of damage. Crops were also lost, and approximately 1,680 water supply systems serving a population of 2.9 million people were affected.

**NICARAGUA:** According to the National Emergency Committee, the majority of deaths occurred as a result of mudslides from the Casitas Volcano that buried 10 communities. Moreover, it has been estimated that about 867,752 people were affected throughout the country to one degree or another. Based on the information from the Civil Defense System, approximately 370,000 people need assistance for at least two more months. There were also reports that 3 hospitals, 20 health centers, and 58 health posts were affected, that refrigeration systems were damaged, and that equipment and supplies were lost.

**EL SALVADOR:** The hurricane struck this country during the night of 30 October, with high winds and torrential rains that caused flooding and mudslides,

particularly in the lowlands. As of 13 November, the National Emergency Committee reported 240 persons dead and 84,000 affected.

**GUATEMALA:** Hurricane Mitch was downgraded to a tropical storm on 31 October, the day it struck Guatemala. In the northeastern part of the country, heavy rains fell on the departments of Izabal, Petén, Alta and Baja Verapaz, as well as Chiquimula, Zacapa and Jutiapa in the southeast. On 1 November, it was reported that 200 mm of rain had fallen in Guatemala City and 445 mm in Puerto San José in the Pacific Coast. On 2 November, the storm was continuing to lose strength, moving in a southeasterly direction as it encountered a low-pressure system on the Pacific Coast. However, it had an impact on the departments of Escuintla, Suchitepequez, Retaluheu, Quetzaltenango, and San Marcos. The Ministry of Health reported minor damage to the health centers, with losses in medical equipment that, in some cases, have still not been quantified.

**BELIZE:** The damage caused by the heavy rains and winds affected the tourist infrastructure as well as the

roads. Educational facilities were used as temporary shelters. The warning issued permitted the evacuation of approximately 60,000 people to Belmopán. No deaths linked to Hurricane Mitch were reported.

**COSTA RICA:** This country experienced the indirect effects of Hurricane Mitch. According to information from the National Commission on Emergencies, as of 1 November, 38 shelters had been set up and were providing temporary shelter to 1,687 people.

## **SITUATION OF INFECTIOUS DISEASES**

Based on information from the ministries of public health of the Central American countries affected by Hurricane Mitch, the behavior of a number of diseases in 1998 is summarized, both prior to Hurricane Mitch (1 January to 30 October) and during the month of November, the period after the hurricane.

### **Cholera**

**Guatemala** has the worst cholera problem. Throughout 1998, the country reported suspected and confirmed cases of the disease. From 1 January to 30 October, a total of 2,530 cases were reported, 1,174 of which corresponded to the month of October (pre-Mitch). The weekly average during this period was 59 cases.

In November the problem increased markedly with growing weekly notification in the four weeks of that month (395, 530, 456, and 566 cases, respectively). During that month, a total of 1,941 cases were reported, with a weekly average of 485 patients. Of the 1,941 cases reported for November, 383 were confirmed (19.4%). As of 2 December, the Ministry of Public Health reported a total of 38 outbreaks and 33 related deaths. The studies on outbreaks suggest that the source of infection for virtually all the reported outbreaks and cases has been contaminated food.

**Nicaragua** ranks second. Here, as in Guatemala, cases of cholera were reported throughout 1998. The cumulative total, as of 30 October, was 675 cases, with a weekly average of 16. In the post-Mitch period, 387 cases were reported, with a weekly average of 95 cases. As in Guatemala, but less frequently, there was a national increase in cases reported in the post-Mitch period. Here,

contaminated food has been also been implicated as the principal source of infection.

Among the other Central American countries affected by Hurricane Mitch, **Belize** reported isolated cases of cholera in 1998, with a total of 12 cases as of 30 October. Since Mitch, 6 cases and 1 death have been reported, linked to an outbreak in Saint Martin Village, in the Cayo district. The source of infection in this outbreak was the drinking water, which had been contaminated with the cholera vibrio.

In **Honduras**, as of 30 October of last year, no cases of cholera had been reported. In the post-Mitch period, the Ministry of Health reported 18 suspected cases, but only in one was there bacteriological confirmation.

A situation similar to the one described in Honduras occurred in **El Salvador**, where no cases of cholera were reported during the first 10 months of 1998. During the post-Mitch period, a total of 7 confirmed cases have been reported, all of which were imported from Guatemala. The Ministry of Health recently reported that the death of one suspected case was not linked to cholera.

### **Leptospirosis**

During pre-Mitch period, none of the 5 countries affected by the hurricane reported suspected cases of this disease. During the month of November, a number of suspected cases were reported in **Guatemala, Honduras, El Salvador, and Belize**. A very different situation has been observed in **Nicaragua**, where epidemic outbreaks have been reported in several regions, with Chinandega and Estelí being the hardest hit. During the month of November, there was a marked weekly increase in reported cases, with a cumulative total of 540 for the four weeks of that month, with 7 deaths.

### **Dengue**

Up to the end of October 1998, the countries of Central America had reported 38,755 cases of dengue and dengue hemorrhagic fever to PAHO. Some 77% of the cases were reported by Honduras (47%) and Nicaragua (30%), which also had the highest rates per 100,000 population.

During the post-Mitch period (1-28 November), with

the exception of Guatemala and Honduras, which have reported a moderate increase in cases of dengue since 15 November, there has been no evidence of a notable increase in the other countries or of epidemic outbreaks.

### **Malaria**

The reports of the five countries specifically affected by Hurricane Mitch in the four weeks of November indicate that during the post-Mitch period, there have been no major changes in three of them (**Belize, El Salvador, and Honduras**) with regard to the number of cases that were being reported before the hurricane, when a comparison was made of the weekly average of reported cases for the first 10 months of 1998. However, in **Nicaragua and Guatemala** (during the second and third weeks), the number of reported cases was much higher than the weekly average reported during the pre-Mitch period.

It is reasonable to assume that the higher indexes of anopheles infestation and the consequent deterioration in control measures will increase the risk of transmission and the incidence of malaria cases in the months ahead.

In short, at the end of November, thanks to the efforts of the countries to develop immediate responses to control outbreaks, the epidemiological situation has remained fairly under control. However, greater future risk than there is at the moment continues to exist, since conditions that are more favorable to an increase in cases and the emergence of outbreaks of some of diseases with greater epidemic potential are still present. **Active epidemiological surveillance**, coupled with immediate control field activities whenever an abnormal situation is suspected is a priority in all the countries affected by Mitch, for the immediate detection and control of outbreaks of infectious diseases.

### **FOOD AVAILABILITY AND FOOD CONSUMPTION**

Hurricane Mitch has undermined the already deficient food security of the people of Central America and not just the population directly affected by the storm, but the rest of the population as well, mainly of those with limited resources. The hurricane has had an adverse impact on

the factors that determine the availability, access, and consumption of food. Furthermore, it has affected environmental health and the health conditions of the population, influencing in turn the bio-utilization of food.

In the four countries particularly affected by Hurricane Mitch (**Honduras, Nicaragua, Guatemala, and El Salvador**), food availability at the national level was already deficient prior to the storm, with an estimated per capita deficit of more than 200 kcal per day; this meant that large sectors of the population are faced with a situation of severe food insecurity. In these four countries, domestic agriculture has been fundamental to the supply of basic grains, mainly beans. Hurricane Mitch was responsible for losses in agricultural production in every country in Central America, but in particular in Honduras. The total losses are estimated at more than 2.3 billion dollars (Table 2).

In El Salvador, approximately 15.5% of the basic grain harvest for the 1998-1999 period was lost; estimates put the losses in beans at 23.6%. In Nicaragua, approximately 27.3% of the area planted with crops for domestic consumption, mainly rice and beans, was lost; of the 1998-1999 crop, an estimated 50% of the total harvest was destroyed, with basic grains, corn (20%), and beans (50%) the most affected. In Honduras it is estimated that up to 70% of the crops of basic grains and export products were destroyed (coffee and nontraditional exports); the losses in bean production were on the order of more than 75% of the anticipated harvest. One important aspect that should be mentioned is that preliminary satellite reports analyzing the quality of the vegetation in the countries struck by Hurricane Mitch suggest that the storm had a tremendous biological impact on the region that will compromise future agricultural production.

The losses in the bean harvest will lead to national shortages in the short term, mainly in Honduras and Nicaragua. This will have an adverse impact on the groups at the greatest risk of food insecurity, mainly due to the consequent price increases. It should also be mentioned that prior to Hurricane Mitch, Guatemala and Honduras were experiencing severe shortages of this grain, with more than 40% of basic needs in this area unmet.

Added to the damages to basic grains and

**Table 2**  
**Value of Lost Production by Activity, by Central American Country\***  
*(thousands of US\$)*

Activity	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panama	TOTAL
<b>I. Agriculture</b>	23,945	50,539	241,991	642,253	82,570	5,917	1,047,215
<b>A. Trad. exports</b>	15,311	12,863	193,887	388,171	39,485	3,663	653,380
<b>B. Basic Grains</b>	4,263	35,832	10,172	113,301	30,749	524	194,841
<b>C. Fruits and Vegetables</b>	4,233	1,844	21,638	83,152	-	315	111,182
<b>D. Others</b>	138	-	16,294	57,628	12,336	1,414	87,810
<b>II. Livestock</b>	255	971	8,131	107,695	-	507	117,559
<b>III. Fishing and Aquaculture</b>	-	8,783	14,030	46,488	35,762	-	105,063
<b>TOTAL</b>	<b>48,145</b>	<b>110,832</b>	<b>506,143</b>	<b>1,438,688</b>	<b>200,902</b>	<b>12,340</b>	<b>2,317,050</b>

**Source:** Secretariat of CORECA, based on data from the ministries of agriculture of Central America and from PRADEPESCA

\* Includes infrastructure

nontraditional export production is the impact of Mitch on the natural markets in the most affected countries, owing to the destruction of much of their road infrastructure. In Honduras, infrastructure damage left by Hurricane Mitch implies costs that may exceed the level of the country's foreign debt. The damage to roads has interrupted the normal system for the domestic distribution of basic foodstuffs. This is causing problems not only for the population directly affected by the hurricane but the rest of the population as well, since the resulting shortages are driving up the price of food staples.

Moreover, in both rural and urban areas, the loss of human lives has been compounded by the loss of housing and access to basic services (mainly drinking water), as well as the losses and damage to agricultural areas and/or the means of livelihood. This is fueling unemployment and leading to increased migration toward urban centers. All of this has decreased the population's purchasing power, which had already fallen sharply in recent decades due, among other things, to the decline in real wages. The drop in food production and the problems in the domestic market are also leading to a sharp rise in prices and speculation in basic food commodities, reflected in a precipitous drop in the purchasing power of the population directly affected by the disaster and the population with

fewer resources. As a result, food purchases are declining, giving rise to a growing gap between real consumption and the basic market basket (nutritional minimum).

#### **FOOD AID**

Food aid was necessary during the crisis; however, it will also be indispensable during the rehabilitation and recovery period, whether as distribution of food to vulnerable groups or in-kind subsidies for projects to rehabilitate housing, reclaim agricultural lands, promote food production, or the rebuilding of infrastructure. Without food aid the affected population is at high nutritional risk.

In **Honduras**, the World Food Program (WFP) is feeding 700,000 victims of the hurricane in 13 different departments, providing a daily ration of 330 g, consisting of 200 g corn, 100 g of legumes or canned fish, and 30g. of vegetable oil. From the onset of the emergency to the end of November, a total of 2,505 metric tons were distributed in the following manner: 273 MT of corn, 421 MT of legumes, 1,661 MT of rice, 81 MT of canned fish, and 69 MT of vegetable oil. In **Nicaragua**, the WFP distributed 2,329 MT during the month of November, and in the first two weeks of December continued to meet the needs of 400,000 people; food received was also

**Table 3**  
**Food aid (in MT) Provided by the United Nations World Food Program**  
**in the Wake of Hurricane Mitch**  
**Food Distribution**

Supplementary food										
Country	Corn	Rice	Legumes	Canned fish	Vegetable Oil	CSB* Crackers	Wheat Flour	Fortif. Water	TOTAL	
<b>Honduras</b>	273.0	1,661.2	420.59	80.93	69.27	-	-	-	-	2,505
<b>Nicaragua</b>	348	1,288	309	60	117	8	19	180	-	2,329
<b>Guatemala</b>	376.4	-	161.55	107.04	54.3	-	-	-	-	699.3
<b>El Salvador</b>	341	482	90	38	56	-	-	-	108	1,115
<b>Total</b>	<b>1,338.4</b>	<b>3,431.2</b>	<b>981.14</b>	<b>285.97</b>	<b>296.57</b>	<b>8</b>	<b>19</b>	<b>180</b>	<b>108</b>	<b>6,648.3</b>

Source: World Food Program. 14 December 1998

\*CSB = Corn and soy flour blend

airlifted under the auspices of USAID; as of 24 November, 1,237 MT had been distributed in this manner. In **El Salvador**, as of 28 November, 10,000 families had been identified as the most seriously in need, receiving the "solidarity package" developed with the government, consisting of a monthly ration of 29.5 kg of corn, 29.5 kg of rice; 4.5 kg of legumes; 3 kg of vegetable oil; 3.4 kg of meat; 4.5 kg of fortified water; 4.5 kg of sugar, and 0.9 kg of salt. Cooking utensils, bedding, clothing, and building tools were also distributed. In **Guatemala**, a total of 699.29 MT of food were distributed by the WFP during the first month of the emergency. Table 3 summarizes the food aid provided to the countries by the World Food Program, by type of food distributed.

Through a specific project, the WFP will provide food rations to 1,125,000 people for a six-month period; of this population, some 60% are children under the age of 6 and women. The programmed ration is 2,100 kcal per day and consists of 475 g of corn or rice, 60 g of beans or canned fish, and 30 g of vegetable oil. This assistance comes to 116,238 MT, at a cost of US \$31,157,500. According to WFP data, as of 14 December, there was a reserve of approximately 15,000 MT of the various foods for distribution in the four countries (Table 4).

The health situation has obviously deteriorated in the countries most damaged by Hurricane Mitch, which has

had an impact on nutritional status, mainly among the most vulnerable groups. While all the countries have taken steps to reduce the potential nutritional harm, given the magnitude of the disaster, future months are expected to witness an increase in the levels of severe malnutrition and specific nutritional deficiencies.

#### EFFECTS ON BASIC SANITATION

As a result of the damage to the basic sanitation infrastructure, approximately 80% of the population in the most affected countries have faced difficulties associated with the drinking water supply, in rural, urban, and especially peri-urban areas. There has also been a dramatic deterioration in sanitation and waste control conditions in all the countries. The situation that existed prior to the devastation of Hurricane Mitch and the extent of the damages it caused in some of the countries of the Region are presented below:

**EL SALVADOR:** In 1996, only 5% of the national territory was forest area. The deforestation of watersheds is serious and is worsening daily, a situation that is leading to the rapid erosion of the soil. Lower water tables and aquifers have been noted, and around 90% of the surface water is contaminated. The situation in terms of the quantity and quality of water resources is especially troubling. The amount of investment needed by the year

**Table 4**  
**Food aid (in TM) Provided by the United Nations World Food Program**  
**in the Wake of Hurricane Mitch**  
**Reserves**

<b>Supplementary food</b>											
<b>Country</b>	<b>Corn</b>	<b>Rice</b>	<b>Legumes</b>	<b>Canned fish</b>	<b>Vegetable Oil</b>	<b>CSB*</b>	<b>DSM**</b>	<b>Crackers</b>	<b>Wheat Flour</b>	<b>Fortif. Water</b>	<b>TOTAL</b>
<b>Honduras</b>	365,5	1,070.93	128.06	241.81	295.46			34.4			2,136.16
<b>Nicaragua</b>	3,620	183	845	285	0	1,270	0	30	119		6,352
<b>Guatemala</b>	923.04	0	1,112.7	381.23	785.98	0	225	0	367	0	3,794.93
<b>El Salvador</b>	778	304.6	917	412	583	0	0	0	0	60	3,054.6
<b>Total</b>	<b>5,686.5</b>	<b>1,558.5</b>	<b>3,003</b>	<b>1,320</b>	<b>1,664</b>	<b>1,270</b>	<b>225</b>	<b>64.4</b>	<b>486</b>	<b>60</b>	<b>15,337.69</b>

Source: World Food Program. 14 December 1998    \*CSB = Corn and soy flour blend    \*\*DSM = Dehydrated skimmed milk

2005 to reverse this situation has been estimated at US\$ 423 million, US\$ 317 million of which must be invested in urban and rural drinking water, and US\$ 106 million in urban and rural sanitation works.

In 1995, the country's total population was roughly 5.5 million, 53.6% of which had drinking water. Of the population without services, the rural area was the most affected (nearly 2.1 million inhabitants, or 40.05% of the country). Sixty-five percent of the total population had sewerage and sanitation services.

The infrastructure damage caused by Mitch affected, to varying degrees, 155 drinking water systems, 14 sewerage systems, 7,622 water wells (totally destroyed or requiring reconstruction), and 9,193 latrines. The estimated cost of the damage to the environment, direct or indirect, is US\$ 7.2 million; to housing, US\$ 12.5 million; and to drinking water and sanitation services, US\$ 2.3 million.

The response has given priority to activities related to quality assurance for drinking water and the control of solid and liquid waste. The Pan American Health Organization (PAHO) has contributed its own resources for the purchase of emergency equipment to repair the systems and for other inputs to maintain the quality of the water, in addition to publishing specific manuals on this topic. All the work has been carried out jointly with the

National Emergency Committee (COEN), the Ministry of Health, and other United Nations agencies. Furthermore, immediate, medium and long-term reconstruction investment needs have been identified.

**GUATEMALA:** The expansion and improvement of drinking water and environmental sanitation services in Guatemala have been an integral part and were considered pillars of the preventive health strategy and efforts to combat poverty, because of the deficiencies in these services. The 1995 the Sectoral Analysis of Drinking Water and Sanitation in Guatemala estimated that US\$ 200 million in annual investments was needed, approximately 10 times more than the volume confirmed in 1995. Thus, to go from a coverage of 38% of the total population in 1994 (10,322 million inhabitants) to the goal of 73% by the year 2000 (an estimated population of 12.2 million), the estimated investment in drinking water was US\$ 708 million. Insofar as the sewage system and sanitation are concerned, in order to expand coverage from 60% to 68% of the population, the estimated need was US\$ 494 million, totaling US\$ 1.2 billion. The Sectoral Analysis of Solid Waste identified four priority projects with an expected investment of US\$1.3 million.

After Mitch, approximately 328 communities reported damage to their drinking water systems, with at least 60 of them requiring reconstruction. Furthermore, 21,000

latrines and 10 sewerage systems were damaged, and additional needs were identified for monitoring the quality of the water, disinfecting wells and drinking water systems, and health education.

Technical cooperation has focused mainly on the following aspects: 1) obtaining donations and purchasing equipment and reagents, mainly from the United States; 2) development of emergency water and environmental sanitation plans from the Ministry of Health; 3) development of the database at the Institute for Municipal Promotion (INFOM) on the post-hurricane demand for water and environmental sanitation; 4) technical recommendations for water treatment with liquid chlorine and the use of latrines; 5) practical guidance for mayors regarding water, basic sanitation, and environmental health after an emergency.

HONDURAS: In 1995 there was a 9% deficit in drinking water coverage in urban areas with populations of more than 2,000 inhabitants, a deficit that primarily affected the marginalized population. In rural areas, the deficit was 34% and primarily affected scattered localities, which represented 27% of the total population of the country and 45% of the rural population. Similarly, the main shortfall in the building of latrines was found among the marginalized urban and dispersed rural populations. What was most serious with regard to environmental sanitation was the wastewater treatment deficit, since it was estimated that only 3% of these waters were adequately treated, heightening the vulnerability of the populations from the standpoint of sanitation. The Investment Plan and Goals in drinking water and sanitation, projected to the year 2005, set goals of 100% coverage and an investment of US\$ 248 million, 56% of which would concentrate on the rural and marginal urban areas.

The effect of Mitch on Honduras has been devastating. A total of 1,683 water supply systems were damaged (among them, 115 water systems of the country's 130 biggest populations and 1,318 rural water supply systems), 16 deep wells, and 3,130 manual pumps, affecting a population of approximately 4.37 million. That is, 75% of the population lost access to drinking water. Before Mitch, drinking water coverage

was estimated at 85%; this means that after the hurricane, only 10% of the population has access to water through the water supply system. The damage to the sewerage systems is so serious that in some cases, domestic wastewater is spilling out of manholes and flowing in the streets. In Tegucigalpa, the destruction of the sewerage system, together with the mudslide of the Cerro del Berrinche has created a lake downtown that is 2 km long, 72 m wide, 2 m deep, with sedimentation that is 10 m thick. The total volume of the lake is 300,000 m<sup>3</sup>, the concentration of fecal coliforms 1,080,000, and the dissolved oxygen 0.3 mg/l, indicating a great amount of organic matter in the water. The odors released are affecting the neighboring population.

In case of San Pedro Sula, of the 27 cases of leptospirosis reported, 18 could be linked to the sewerage overflow that is occurring around the municipal meat processor or downstream of it. In Health Region No. 7, of the nine water sources sampled, all have been found to be contaminated with *Escherichia coli*.

As to excreta disposal in rural areas, it is estimated that 51,435 latrines have been destroyed. At the national level, approximately US\$ 182 million will be required for the rehabilitation of the water and sanitation systems.

With regards to solid waste management, it is estimated that the majority of dumps have been destroyed or have reached the end of their useful life. In view of the damage to the infrastructure, priority should be given to the collection and final disposal of accumulated waste—for example, near shelters, downtown Tegucigalpa, markets etc. With regards to air pollution, some indicators that were already high moved higher after Mitch, especially around flooded areas.

Activities related to infrastructure recovery, repair, and reconstruction have been conducted in two stages. In the first, technical cooperation has been aimed at ensuring access to safe water and to strengthening assessment activities. In the second stage, it has been aimed at supporting activities related to repairs and the resolution of specific problems in the drinking water

and environmental sanitation systems. PAHO mobilized various international consultants to handle specific requests by the national authorities in critical areas such as the problems resulting from the damage to the sewerage systems of Tegucigalpa and San Pedro Sula. Advisory services were offered to the national authorities in the areas of water quality, management of solid waste, and environmental surveillance. Special emphasis was placed on the matters of basic sanitation in temporary shelters and in markets.

The progress achieved has been impressive, since the majority of the water systems have been partially or totally rehabilitated. This is the true in San Pedro Sula where 90% of the supply has been reestablished. In rural areas, there are health regions where 80% of the systems are working, although there are others where the level of repair has been smaller. In the months ahead, the emphasis will be placed on sanitary sewerage systems and on excreta disposal.

**NICARAGUA:** The analysis conducted in 1996 indicated that more than 50% of the population did not have drinking water on a continuing basis, due to limitations in the installed capacity and to the precarious situation of the water supply systems. The investment needs indicated for the period 1996-2002 were on the order of US\$ 290 million for urban centers, and US\$ 22 million for the rural sector.

After Hurricane Mitch, drinking water and solid waste collection services for 288,600 homes were affected in the country; the catchment system, pipelines, treatment plants, and distribution networks of 79 water systems were damaged; the inspection wells, collectors, outtakes, and stabilization ponds of 9 sewerage systems were damaged; and 37,000 latrines were destroyed.

With regard to the quality of the drinking water in the shelters and affected localities, PAHO offered chlorine, containers for storage, and chlorine-producing equipment for localities, in addition to educational material. Technical assistance was available from the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) for rapid assessment of the damages, the organization of water quality surveillance, and in-service training for health inspectors

on domestic filters and water disinfection. Arrangements were made for the donation of three pieces of equipment for the local production of chlorine and a water treatment plant; and six drinking water project profiles were also prepared for submission to different sources of financing. With respect to latrines and sanitary sewerage systems, work was done to encourage the distribution of latrines and bags of cement for the repair or construction of new pit latrines; also distributed were shovels, pickaxes, bars, and hand wheelbarrows for the construction of temporary latrines. Education material was also provided and four project profiles were prepared, in addition to technical guidelines. In the area of solid waste, support was provided for clean-up days at the local level, and materials for the handling and final disposal of solid waste in shelters were offered. The CEPIS support and advisory services provided assistance with the situation assessment and technical orientation on the solid waste management in emergencies. In general, technical assistance was provided to the Environmental Health Bureau of the Ministry of Health through literature, coordination, and interagency support from United Nations agencies, and the contracting of 12 national and two international consultants for different tasks. Twenty-four technical documents were produced, including the project profiles.

#### **PAHO'S RESPONSE**

PAHO responded to this situation by coordinating its work with the ministries of health, mobilizing all staff in its Representative Offices in each Central American country and at Headquarters (through its Program on Emergency Preparedness and Disaster Relief), by assisting the national authorities with disaster preparedness and the management of emergencies.

Approximately US\$160,000 were immediately provided to cover the cost of mobilizing 60 additional experts, sent to all the countries, in the areas of health administration in disasters, the management of resources arriving from the international community for water and sanitation, vector control, epidemiology and disease control, food and nutrition, assessment of

damages to services and the environment, and food handling and protection. Initially, US\$350,000 was made available to Honduras and Nicaragua to mitigate immediate health problems. Subsequently, based on the damage assessment made by the United Nations, US\$ 1 million in additional resources were provided to the countries of Central America for cholera control, with the hope of containing its spread and avoiding its potential for causing greater damage.

### **MOBILIZATION OF INTERNATIONAL RESOURCES**

Initial assessments of the impact of the hurricane on health were done a few hours after the disaster occurred. This evaluation was shared with agencies of the United Nations and Inter-American Systems and was also made available to the UNDAC teams that arrived a few days later.

A PAHO/WHO team accompanied the two subsequent interagency missions, organized by the Economic Commission for Latin America and the Caribbean (ECLAC), the United Nations Development Program (UNDP), and the Inter-American Development Bank (IDB) to facilitate identification of the damages to the health sector and the environment.

PAHO issued a humanitarian appeal for international solidarity during the emergency phase and in response, the following resources have thus far been received from the international community: Canada, Can\$500,000; USA/OFDA, US\$2,000,000; Sweden, US\$500,000; the Netherlands, US\$25,000; and the United Kingdom, US\$100,000. These funds to address the emergency were used to finance such activities as the provision of drugs and vaccines, epidemiological surveillance, control of outbreaks of vector-borne diseases, immediate assistance to victims, provision of resources for shelters, etc.

Although it occurred at the same time as the emergency, the second appeal was an individual and collective one to the international community to support the efforts to rehabilitate and reconstruct the health sector in Central America. Subregional and national requests have been identified to respond to specific needs noted during the evaluation missions that determined the damages and these needs, the details of which are presented further on.

In addition, ministers of health are receiving assistance with coordination of the international support in health in order to take full advantage of the good will demonstrated by the international community in response to this event. The European Union, USAID, the United Kingdom (DFID), Sweden, Canada, Spain, the Netherlands, Finland, Denmark, and international foundations and nongovernmental organizations have expressed an interest in supporting the health sector, and processes have been launched for the design of programs and projects.

Table 5 on the next page summarizes reconstruction needs for the years ahead and identifies the necessary regional action .

#### **Source:**

United Nations, Office for the Coordination of Humanitarian Affairs. Situation reports (SITREPS 1-16).

Pan American Health Organization. Emergency Preparedness and Disaster Relief Coordination Program.

Pan American Health Organization. Situation reports from PAHO Country Representative Offices in Central America.

#### **Note:**

For more information or updates, if you have Internet access, visit the PAHO Web site at the following address: <http://www.paho.org/spanish/ped/pedmitch.htm>.

**Table 5**  
**Summary of Health Sector Rehabilitation/Reconstruction Needs Resulting from the Damage Caused**  
**by Hurricane Mitch in Central America<sup>1</sup>**  
**(3 to 5 years)**

<b>Health Services</b>		<b>COSTS</b>
Reduction of future risk – Vulnerability	Investment planning system to reduce vulnerability.	3,500,000
Infrastructure	Reconstruction of buildings totally or partially destroyed, repair of those that were damaged.	2,000,000
Strengthening of local management	Strengthening of the local level and decentralization processes to expand health care coverage and strengthen the impact of the health services.	3,500,000
Essential drugs	Establishment and operation of the Central American System for joint procurement of drugs.	1,500,000 <sup>2</sup>
Leadership activities	Sectoral leadership.	1,500,000
<b>Water and Sanitation</b>		
Monitoring of water quality	Ensure the quality of water for human consumption to reduce the rates of morbidity and mortality linked to water-borne diseases.	9,000,000
Reconstruction of water and sanitation supply	Repair and reestablish water and sewerage services in the affected cities.	253,382,000 <sup>3</sup>
Management of wastewater and solid waste	Construction and repair of systems for sanitary disposal of wastewater and solid waste.	20,000,000
<b>Disease Control</b>		
Vector-borne (malaria, dengue, leptospirosis, etc.)	Control and prevention of the increased risks produced by Mitch and rehabilitation of the control programs.	7,000,000 <sup>4</sup>
Cholera and diarrheal diseases in general; acute respiratory	Maintaining active programs for the prevention and control of infectious diseases.	8,000,000 <sup>5</sup>
Vaccine-preventable	Vaccination campaign, Epidemiological surveillance, Purchase of vaccines	8,150,000 <sup>6</sup>
<b>Health Promotion</b>		
Food control	Implementation, follow-up, and monitoring of surveillance standards for the protection and control of food quality and food safety.	5,000,000 <sup>7</sup>
Mental health	Reduction of the impact of the emotional harm caused by Mitch to the victims. Prepare the health services, community agents, and local level to identify and attend cases.	4,407,000 <sup>8</sup>
Education and communication for health	Health promotion and protection through education and mass communication, utilizing the mass media and interaction with health promoters and health educators, giving priority to the communities and populations most affected.	4,000,000 <sup>9</sup>
<b>TOTAL</b>		<b>326,939,000</b>

<sup>1</sup> Estimates by PAHO and United Nations/ECLAC and IDB missions.

<sup>2</sup> The project has already been processed and given priority by RESSCA.

<sup>3</sup> The figure indicated comes from the documents pertaining to the identification of needs and from project proposals developed during the ECLAC and IDB missions to assess damages in November 1998. Breaking down this total, the following amounts correspond to Honduras, Nicaragua, and El Salvador respectively: 181,600,000, 13,015,700 and 58,756,300.

<sup>4</sup> Taken from a project document distributed to the international community.

<sup>5</sup> Taken from a project document distributed to the international community. PAHO has allocated US\$ 1 million to that project.

<sup>6</sup> Taken from a project document oriented toward USAID financing.

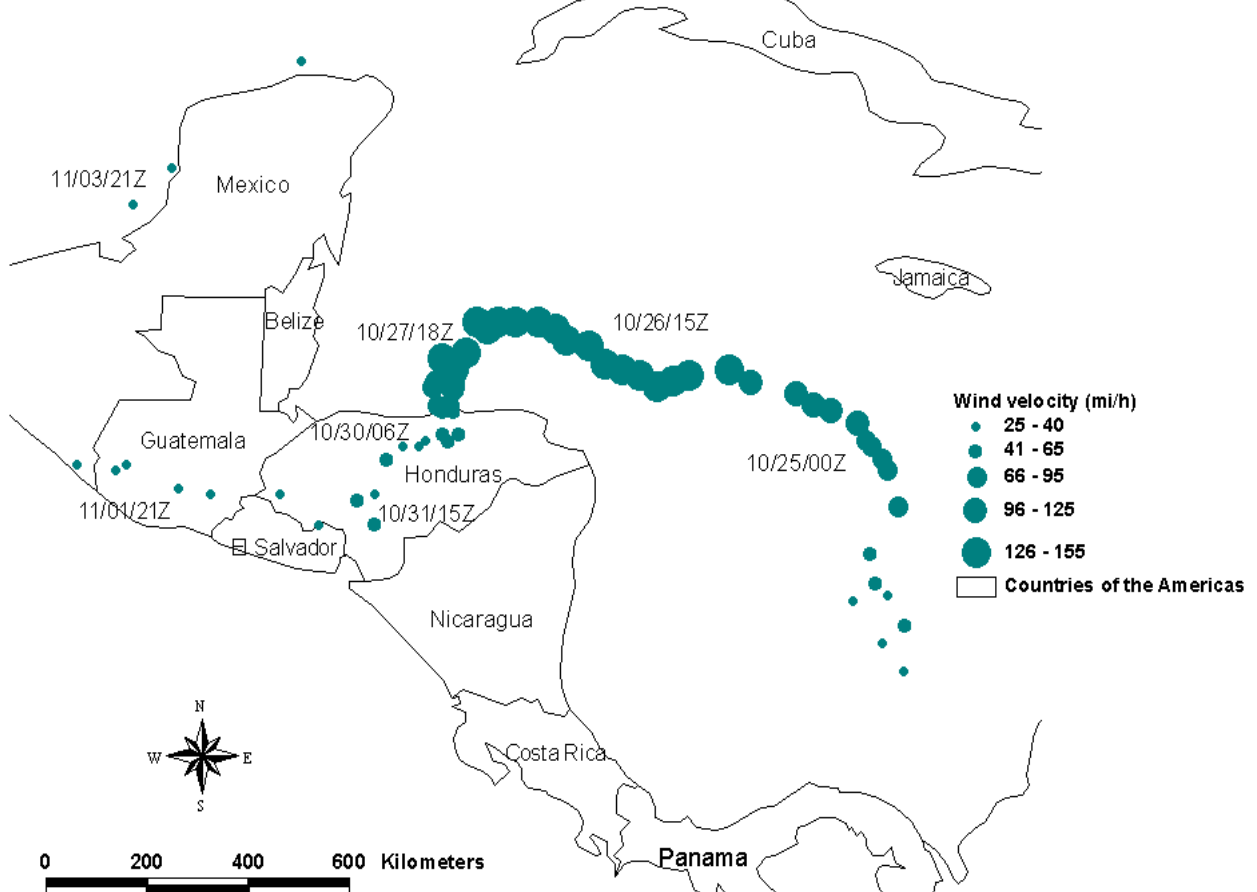
<sup>7</sup> Preliminary figure calculated on the basis of the needs detected during the missions conducted in November 1998 to assess the damage caused by Mitch.

<sup>8</sup> Taken from the project document.

<sup>9</sup> Preliminary figure calculated on the basis of the needs detected during the missions conducted in November 1998 to assess the damage caused by Mitch.

## Path and intensity of Hurricane Mitch in Central America. October-November, 1998

(only records of wind velocity over 25 mi/h are plotted, according to approximate dates and hours)



### Errata

In the article "Blood bank situation in Latin America, 1996: Serological markers for communicable diseases in blood donors", which appeared in the issue number 3 of volume 19 of 1998, there were some errors and omissions with regards to the values in tables 1 and 2, in particular those from Bolivia and Colombia. Also, in the column headings in table 2 regarding donors and specific pathogen markers where it reads "Donors with positive serology (%)" it should be "Donors with serology (%)".

In a coming issue, containing an article on the situation of serological markers of blood banks in the Caribbean, reviewed and updated versions of such tables will be presented.

MEETING OF THE CENTRAL AMERICAN MINISTERS OF HEALTH  
ON HURRICANE MITCH

**THE COSTA DEL SOL DECLARATION**

- The undersigned Ministers of Health from the Central American countries affected by Hurricane Mitch (BELIZE, COSTA RICA, EL SALVADOR, GUATEMALA, HONDURAS and NICARAGUA), gathered on this day, Sunday, 6 December 1998, in Costa del Sol, El Salvador, do declare:
- That this hurricane caused irreparable and permanent damages to the populations, including loss of human life, disruption of families and communities, and destruction of the infrastructure in exceeding proportions.
- That the immediate heroic and generous response, not only from the inhabitants themselves but also from the international community, to confine damages and rapidly reestablish services affecting people and the environment, has been effective and timely.
- That the progress achieved in health during the past decade (decline in infant mortality, increase in life expectancy, eradication of polio and control of measles) is seriously threatened and we cannot allow these attained levels of health to regress.
- That the experience of joint and unified collaboration in health among all Central American countries, opening new roads to the integration process, has been a fundamental element for the organization of the response to this disaster.
- That technical cooperation, coordination and the permanent presence of the Pan American Health Organization (PAHO/WHO) have been enormously important throughout this period.

**Therefore, we are committed to:**

- Immediately implementing an emergency program to control CHOLERA in all the affected countries, given the importance of this disease in the context of economic development.
- Accepting the proposal from PAHO/WHO to avail us of the amount of US\$ 1 million to initiate primary actions and to request PAHO/WHO to urge other agencies to join efforts and accomplish a rapid and effective result.
- Ensuring that the need to reduce vulnerability of drinking water and sanitation systems, and health services is taken into account in the reconstruction stage.
- Making the necessary efforts for health sector considerations to be prominent in all the discussions on the reconstruction of our countries in the national and international fora beginning with the forthcoming Consultative Group.

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# Summer Courses in Epidemiology in 1999

■ *The University of Michigan School of Public Health* announces the thirty-fourth Graduate Summer Session in Epidemiology to be conducted from July 11 to 30, 1999. Three three-week courses will be offered: Fundamentals of Epidemiology, Fundamentals of Biostatistics and Introduction to Epidemiology for Public Health Practitioners.

One-week courses include:

- analyzing longitudinal data;
- Basic Computer Applications in Epidemiology
- Introduction to SAS
- Advanced Computer Applications in Epidemiology
- Update in Infectious Diseases I
- Update in Infectious Diseases II
- Sexually Transmitted Diseases and HIV
- Introduction to Cancer Epidemiology
- Advanced Concepts and Methods in Cancer Epidemiology
- Cancer Prevention
- Epidemiology and Health Policy
- Behavioral Modification
- Basic Concepts of Clinical Epidemiology
- Clinical Trials: Design and Conduct
- Clinical Trials: Analytic Methods
- Analysis of Epidemiologic Measures
- Introduction to Logistic Model
- Analysis of Survival/Follow-up Data
- Epidemiology of Injuries
- Epidemiologic Methods and Injury Control
- Epidemiology of Violence
- Occupational and Environmental Exposure Assessment
- Occupational and Environmental Epidemiology
- Risk Assessment and Environmental and Occupational Epidemiology
- Epidemiologic Methods for Longitudinal Studies
- Integration of Biomarkers and Epidemiology
- Social Epidemiology
- Using SUDAAN to Analyze NHANES-III
- Advanced Topics in Analysis of Sample Survey Data with PC-SUDAAN and PC-WESTVAR
- Pharmacoepidemiology
- Nutritional Epidemiology
- The Law and Public Health Practice
- Epidemiology and the Law
- Introduction to Systematic Reviews and Meta-analysis
- Successful Scientific Writing

- Economic Measures of the Effectiveness of Health Care Services

The Graduate Summer Session welcomes national and international health professionals.

For further information contact: Dr. David Schottenfeld or Jody Gray, Graduate Summer Session in Epidemiology, The University of Michigan, School of Public Health, 109 S. Observatory Street, Ann Arbor, MI 48109-2029 USA, Telephone: (734) 764-5454, Fax: (734) 764 3192 Email: [umichgss@sph.umich.edu](mailto:umichgss@sph.umich.edu); Web site: [www.sph.umich.edu/epid/GSS](http://www.sph.umich.edu/epid/GSS)

■ *The Johns Hopkins University School of Hygiene and Public Health* is sponsoring the Graduate Summer Institute in Epidemiology and Biostatistics as part of its new "The Summer Institutes of 1999" program, to be conducted from 14 June to 2 July 1999. The program offers three-week courses and one-week courses.

Three-week courses include:

- conceptos básicos de epidemiología clínica;
- principles of epidemiology;
- methods in epidemiology-B
- use of microcomputers in epidemiology;
- infectious disease epidemiology;
- nutritional epidemiology;
- applications of the case-control method
- design and analytical methods in cohort studies
- statistical reasoning in public health 1
- statistical computing in public health
- epidemiologic methods for planning and evaluating health services
- design and conduct of clinical trials;
- epidemiologic basis for tuberculosis control; and
- public health genetics

One week-courses include:

- analyzing longitudinal data;
- epidemiology of emerging infections;
- outcomes and effectiveness research;
- epidemiology of AIDS;
- introduction to the Risk Sciences and Public Policy;
- international Research Ethics;
- molecular biology for genetic epidemiology;
- survival analysis;
- perinatal epidemiology; and
- new paradigms/new approaches to management of epidemiological studies.

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## Summer Courses in Epidemiology in 1999 (cont.)

Proficiency in the English language is required. For further information contact: Ayesha Khan, 615 North Wolfe Street, Baltimore, Maryland 21205. Tel. (410) 955-7158; Fax (410) 955-0863; E-mail: akhan@jhsph.edu; Website: www.jhsph.edu/Departments/Epi/summer/html

Other courses offered under "The Summer Institute of 1999" program are in the areas of: Environmental Health Sciences; Principles and Practice of Injury Prevention; Health Policy Management; Tropical Medicine and Public Health, and Strategic Leadership and Management for Population and Reproductive Health. For additional information please contact Helen Walters, Johns Hopkins University, School of Public Health, Suite W1015, 615 N. Wolfe Street, Baltimore, MD 21205, USA. Tel: 410-614-5985, Fax: 410-614-8126. Email: summer@jhsph.edu; Website: www.jhsph.edu/Academics/summer

■ The Ninth Summer Session in Intermediate Epidemiology sponsored by the Health Situation Analysis Program, of the *Pan American Health Organization*, will be conducted from July 19 to August 6, 1999 at the College of Public Health, University of Southern Florida, Tampa, Florida. The courses being offered are: intermediate methods in epidemiology; statistics applied to epidemiology and the use of software packages, and the use of epidemiology in the programming and evaluation of health services. Students are required to have approved basic training in epidemiology. Courses will be conducted in Spanish, but participants must be able to read English.

For more information and application: Dr. Carlos Castillo-Salgado, HDA/HDP, Pan American Health Organization, 525 Twenty-third Street, NW, Washington, DC 20037. Tel. (202) 974-3327, Fax (202) 974-3674.

■ The Seventeenth International Course in Applied Epidemiology, conferring diploma status recognized by the National Autonomous University of Mexico, will take place from 5 to 30 of July 1999 in Mexico, D.F., under the coordination of the *Department of Epidemiology of the Ministry of Health of Mexico*. The course is design to develop two broad subject-matter areas: the first includes theoretical and methodological aspects of epidemiological practice and the second, specific subject areas of applied epidemiology, such as epidemiology of communicable diseases and of chronic diseases, environmental epidemiology and epidemiology of addiction. Other subjects are: basic and intermediate epidemiology; basic and intermediate biostatistics; design of research protocols;

introduction to Epi-Info 6.0 for epidemiologic analysis; multivariate analysis in epidemiology; selected topics in clinical epidemiology and injury epidemiology.

For further information, contact: Dirección General de Epidemiología; Francisco de P. Miranda No. 177; Col. Unidad Lomas de Plateros; Delegación Alvaro Obregón; C.P. 01480, México, D.F.; Tel/Fax: National call (01-5) International call (01-525) 593-36-61 and 651-62-86. E-mail: ealvar@epi.org.mx; Web site: http:// www.epi.org.mx

■ *The Department of Epidemiology, Biostatistics, and Occupational Health, McGill University* will hold its 14th Annual Summer Program in Epidemiology and Biostatistics from May 3 to June 25, 1999. Intended for clinicians, health professionals and for graduate students specializing in epidemiology and/or biostatistics or public health. Students may take courses for academic credit or for professional interest. CME units, fully accredited by CACMS and ACCME, are available.

The May session (May 3-28) includes courses in Epidemiology, Biostatistics, Clinical Epidemiology and Health-Care Technology Assessment (3 credits each) as well as Cancer Epidemiology, Evidence-based Medicine, and a Practicum in Public Health (1 credit each).

The June session (May 31- June 25) includes a series of four consecutive one-week courses in Pharmacoepidemiology (2 credits each) as well as courses in Protocol Development, in Analysis of Multi-variable Data (3 credits each), and in Epidemiology and Environmental Risk Assessment (1 credit).

Topics to covered in Pharmacoepidemiology are:

- Pharmacoepidemiology I: Introduction (May 31- June 4)
- Pharmacoepidemiology II: Methods (June 7- 11)
- Pharmacoepidemiology III: Substantive Epidemiology- Case studies and Review of methods (June 14-18)
- Pharmacoepidemiology IV: Pharmacoeconomics (June 21, 22, 23, and 25)

For more information contact Diane-Lise Legault, Coordinator, Summer Program in Epidemiology and Biostatistics. Department of Epidemiology, Biostatistics and Occupational Health, McGill University, Purvis Hall, 1020 Pine Avenue West, Room 38-B, Montreal, Quebec, Canada, H3A 1A2. Tel: (514) 398-3973; Fax (514) 398-4503 or 398-4266; Email dianel@EPID.Lan.McGill.CA

**IV CHILEAN CONGRESS OF EPIDEMIOLOGY**  
**IV IBEROAMERICAN CONGRESS OF EPIDEMIOLOGY**  
**IV SOUTHERN AND CENTRAL AMERICAN REGIONAL MEETING OF THE**  
**INTERNATIONAL EPIDEMIOLOGICAL ASSOCIATION**

Organized by: Sociedad Chilena de Epidemiología, Sociedad Iberoamericana de Epidemiología and  
International Epidemiological Association

Place and dates: Santiago de Chile, November 2 to 6, 1999. Centro de Convenciones Diego Portales

Registration fees:	Prior to August 13:	Members: US\$180	Non-members: US\$250
	After August 13:	Members: US\$200	Non-members: US\$300
	Students: US\$100		

The official topics of the Congress are:

I. Epidemiology and Health Policies

- Primary and secondary prevention strategy
- Prevention of cardiovascular disease in childhood
- Tuberculosis: current situation
- Health inequities

II. Behavioral Epidemiology

- Health promotion
- Epidemiology of cardiovascular and cerebrovascular diseases
- Psychosocial risk factors
- HIV and AIDS
- Drug addiction: epidemiology and prevention
- Feeding practices and health

III. Environmental and occupational epidemiology

IV. Development of Epidemiology

- Epidemiological research
- Communications for international publications
- Basic epidemiology
- Genetic epidemiology and molecular biology
- Teaching of epidemiology in undergraduate and graduate levels
- Dealing with the new challenges in health
- New vaccines

V. Gender evaluation in Epidemiology

VI. Cardiovascular risk factors: role of lipids

VII. Cancer associated with infectious diseases

For additional information, those interested should contact the following address:

**Deadline for reception of abstracts:**  
**August 13 1999**

**Sociedad Chilena de Epidemiología**  
**Providencia 1017, 5° Piso, entrepiso, Santiago**  
**Providencia, Santiago de Chile**  
**Phone/Fax: 56-2-2362450**

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