Chapter 3
SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL HEALTH

Among the principal remits of the health sector is to safeguard the public's well-being by ensuring a sound, healthy physical and social environment, one that enables sustainable human development—understood to mean improvement of material conditions to respond to the needs of the present generation without jeopardizing the ability to respond to those of future generations—and that protects the most vulnerable members of society. Towards that end, the health sector collaborates with other sectors—the environment, labor, agriculture, and education, among others. Moreover, it behooves local communities, countries, and the international alliances, each on its own and all together, to both monitor and counter the many causes of environmental degradation. Inequities—in education, employment, health, and political rights—affect individuals' susceptibility to environmental impacts and can result in significant disease and death. Other influences include globalization, governmental reforms, the privatization of services, the vagaries of the labor market, and uncontrolled urbanization. A consensus prevails that sustainable human development depends on reducing poverty while protecting and promoting health.

In Latin America and the Caribbean, the challenge is to conciliate the objectives of development, health, and the environment with those of social equity, which will require, among other means, the elaboration of effective urban development policies. A case in point is water and sanitation: as urban populations increase, so too does the demand for drinking water and sewage and solid waste disposal services. Disparities between urban-center and urban-periphery populations and between urban and rural populations in access to those services and in exposure to environmental risks compound the vulnerability of the poor.

Accelerated, unplanned growth of the industrial sector is a direct cause of biological, chemical, and physical contamination; it increases transportation and energy consumption, produces more wastes, and renders their disposal inadequate. Industrialization, coupled with the untoward effects attributed in recent years

to climate change, is resulting in the deterioration of the environment and of people's quality of life and health. Production processes—the extraction of raw materials, their transformation into products, the consumption of those products, the elimination of industrial wastes, and the use of pesticides in agriculture and forestry—pose direct and indirect physical and chemical risks to populations. Mining, petroleum exploration, agrochemical farming, hospitals, health centers and laboratories, energy plants, and industrial manufacturers are among the biggest producers of dangerous chemical and solid wastes. The consumption of goods and services poses a major challenge to environmental management in terms of controlling risks and promoting health.

Since the home and the workplace are people's primary environments, adequate housing and working conditions are as important to ensure their good health as is the larger environment. A major problem is that of rural communities where the poor are particularly exposed to health risks, especially those living in endemic areas plagued by vector-borne diseases—Chagas', malaria, dengue, and yellow fever. Another set of problems relates to changes in the work profile and in the working population wrought by globalization, regional integration, trade liberalization, structural adjustments and privatization, and social policies—all of which greatly impact the living conditions and health of the working population and lead to increased inequities. Most worrisome in this respect are the increasing proportions of children and elderly in the workforce.

Along with greater poverty, social inequity, and urbanization, the breaking up of family and community structures fosters unhealthy environments that can lead to likewise unhealthy lifestyles and risky behaviors at every stage of life. Aggravating those conditions are the persistence of mortality among mothers and children due to poor nutrition, infections, and lack of access to goods and services. A direct link has been drawn between poor diet and chronic diseases: together, nutritional deficiencies and excesses contribute to a double burden of diseases that affect the population at every age. The increase in risky lifestyles and behaviors—smoking, the consumption of alcohol and drugs, and various forms of violence and accidents—underscore the critical need for health promotion strategies.

The countries of the Region recognize the inextricable relationship between health and the environment. To enhance that relationship—in effect, to prevent and control the adverse effects of the environment on health—they have agreed to concentrate on five main areas: intersectoral collaboration, decentralization of responsibilities, information systems, social participation, and compliance with commitments struck at international conferences. Efforts are under way to monitor and evaluate environmental health, develop healthy policies that can be sustained over the long term, seek alliances, prepare human resources, establish

appropriate legislation regarding the consumption of goods and services, and carry out direct interventions. The focus is on strengthening the normative, regulatory, and response capacities of national health authorities; on reinforcing existing environmental institutions and redefining their functions and organizational arrangements; and on setting aside funds to protect the environment and mitigate the adverse effects on health resulting from environmental disturbances. Two major health promotion responses to the population's needs in this area are the regional health-promoting schools initiative and the healthy communities strategy.

HEALTH AND THE ENVIRONMENT

Over the last several decades, inequalities in living and health conditions in the Region of the Americas have become more pronounced, and inequalities in environmental health are no exception to this pattern. Marked inequalities are seen not only in effects on health and access to services, but also in exposure to environmental risks in all of the Region's countries and territories, within each of these, and among the different population groups. It is estimated that 24% of the global burden of disease and 23% of all deaths can be attributed to factors related to the environment (*1*). In developing countries 25% of mortality is attributable to environmental causes, and in developed countries this percentage reaches 17%.

Environmental health is the result of an interaction of factors operating on different levels of aggregation within a framework of complex processes, which go beyond the environment's traditional biological, physical, and chemical components. In order to gain a better understanding of environmental health, it may be put into context using as a frame of reference determining health factors (Figure 1). According to this framework, a series of determining structural factors of a social, economic, political, environmental, technological, and human biological nature—some of which are interrelated—interact in a significant manner with the health system. These relationships give rise in turn to intermediate determining factors that create inadequate living conditions, environmental risks and hazards, and modifications in lifestyles and behavior whose consequences impact life expectancy; cause disease, injuries, disabilities, and deaths; and affect the population's overall well-being.

The Region's socioeconomic decline, particularly the increase in poverty and inequity, rapid urbanization, and fragmentation and disintegration of family and community structures, help create unhealthy environments that in turn lead to high-risk lifestyles and behaviors lasting throughout the life cycle. These conditions coexist with the long-standing problems of maternal and infant mortality from malnutrition, infections, and lack of access to basic goods and services, as well as problems related to smoking, alcoholism, violence, HIV/AIDS infection, and road safety issues (*2*).

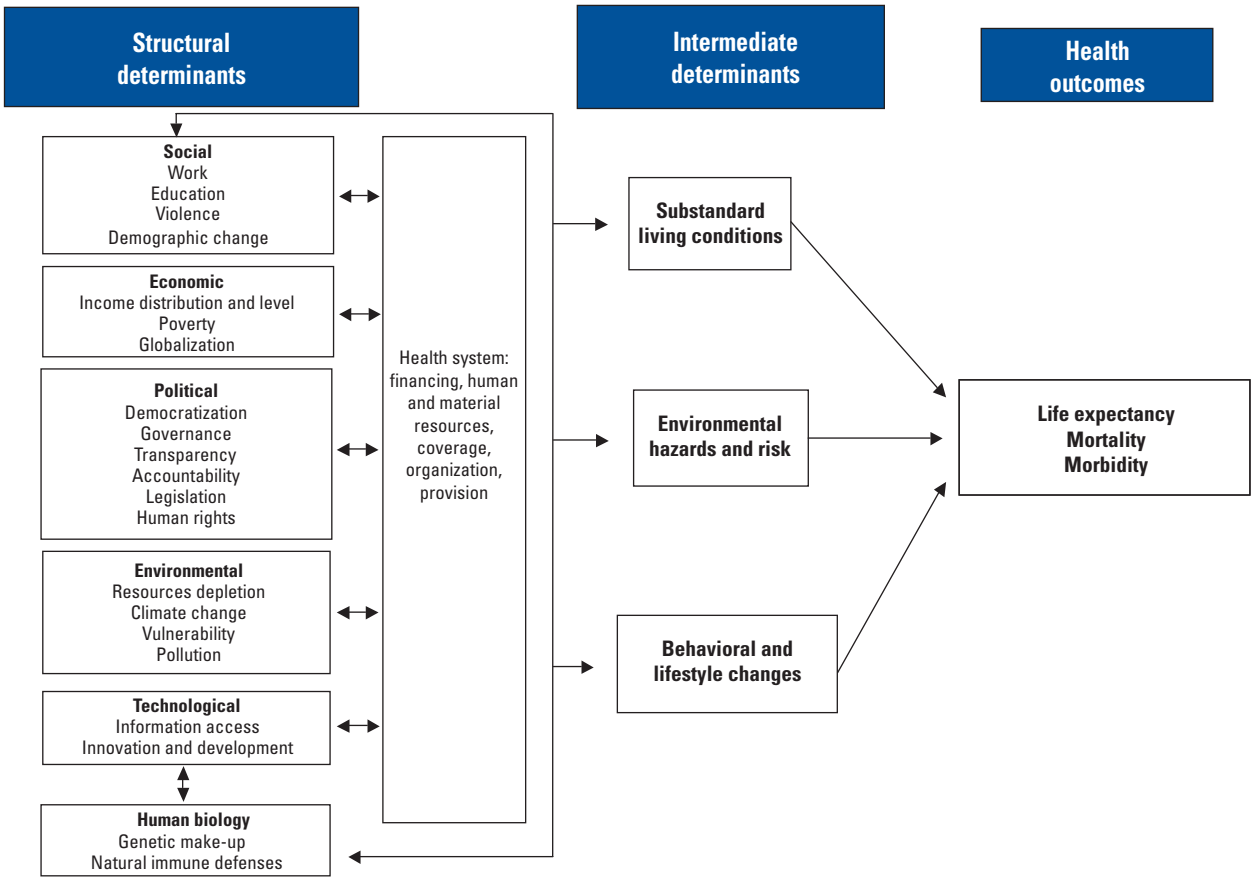
In the Region of the Americas, inequalities in environmental health have been described at different stages of development, which allows specific groups who are most vulnerable to be identified. Some of these inequalities are seen in rural areas and relatively well-preserved ecosystems where traditional populations reside (for example, indigenous groups, Afro-descendants, gold panners, or fisherman) or in more developed areas populated by agricultural workers. Other inequalities exist in urban areas populated by the poorest and most marginalized groups (e.g., the Brazilian *favelas*), who are generally in closest geographical proximity to the production of hazardous wastes and thus at risk of contamination by such products, as well as among occupational groups employed in industries involving environmental pollutants.

Many health problems will continue worsening due to the degradation of living conditions caused by inadequate road safety, noise pollution, limited drinking water coverage, inadequate sanitation, deficient waste disposal, chemical pollution, smoking, and physical hazards associated with urban overcrowding. Problems that emerge in urban settlements and overcrowded housing facilitate the spread of infectious diseases and contribute to a large extent to an increase in violence and illicit drug use. Urban growth has weakened the capacity of many municipalities and local government to provide basic health services.

Urban growth also means greater reliance on transportation systems, which in turn create more pollution and greater risk of injuries. Both outdoor and indoor air pollution (including in the work environment) will remain the leading cause of respiratory infections, asthma, and acute respiratory infections—especially in children—and of chronic respiratory diseases among women and the elderly. In Latin America, more than 300 million people live in large cities, where exposure to particulate matter and other air pollutants places their lives at risk.

Trade globalization, human displacements, and cultural factors may have both positive and negative effects on health. There is a brisk trade in goods and services that are harmful to the en-

FIGURE 1. Health and its determinants: the interplay between health and the environment.



Source: Loyola E. Progress on Children's Environmental Health in the Americas. International Conference for the Evaluation of Global Health Strategies. Florence, Italy; 2006.

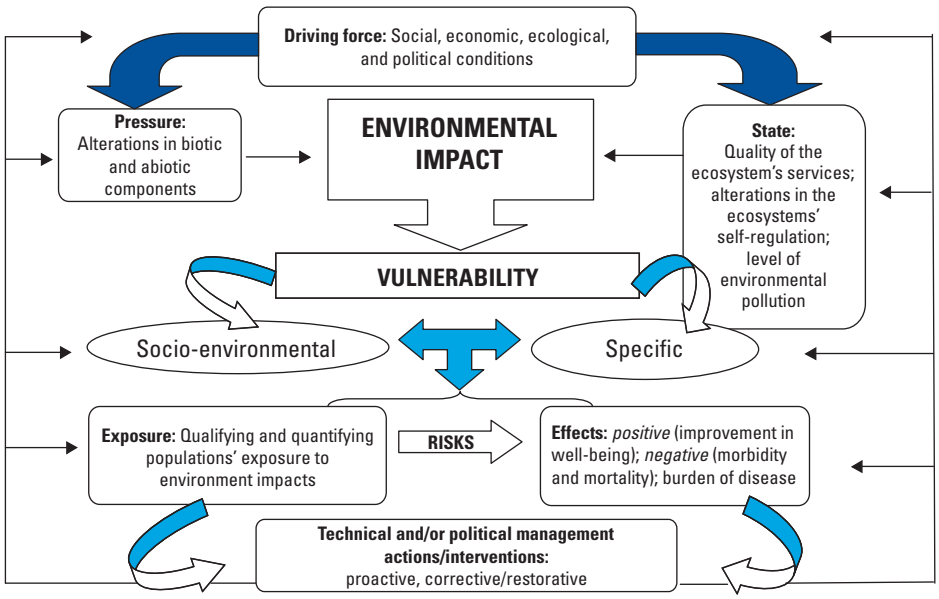
vironment and human health, and massive population migrations create additional global threats to health. Communicable diseases such as tuberculosis are increasingly spreading to other developed nations, where they affect the poorest and most vulnerable segments of the population.

There is growing concern about food safety, both in terms of chemical substances and microorganisms. In many parts of the world, the growing incidence of foodborne diseases has become evident over the last decade. The direct and indirect health consequences of biotechnological applications in food production are also of concern. The increase in trade in food has the benefit of ensuring secure and nutritional diets, but at the same time could contribute to a greater spread of food infections and poisoning. Promoting food safety standards and international guidelines can promote health and trade. The World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) are working together to improve food surveillance, monitoring, and the risk-assessment methodologies.

In response to the current situation, and bearing in mind the socio-environmental diversity that exists in Latin America and the Caribbean, the Sustainable Development and Environmental Health Area of the Pan American Health Organization (PAHO), the United Nations Environment Program (UNEP), and the Oswaldo Cruz Foundation (FIOCRUZ) of Brazil have designed a methodological strategy called GEO-Salud that is based on the DPSEEA model (the acronym stands for "driving forces-pressures-state-exposure-effects-action"), facilitates environmental health assessment and monitoring, and enables the development of long-term sustainable health policies and the resolution or prevention of problems (*3*). This strategy provides a multi-causal analysis model for the biophysical, temporal-spatial, and social dimensions of the ecosystem to which the assessment is applied.

Breaking the problem down into different stages gives the proposed analysis framework the flexibility to be adapted to the information needs of different management levels. Regardless of the level to which it is applied, this methodological approach should

FIGURE 2. Environmental health management interaction flowchart.



Source: Organización Panamericana de la Salud; Programa de las Naciones Unidas para el Medio Ambiente; Fundación Oswaldo Cruz. Proyecto GEO-Salud. En búsqueda de herramientas y soluciones integrales a los problemas de medio ambiente y salud an América Latina y el Caribe. Mexico City: OPS; PNUMA; FIOCRUZ; 2005.

allow for the identification of environmental changes that are harmful to human health and the mapping of risks and assessment of vulnerabilities in terms of environmental impacts. The information obtained will assist in defining control actions needed to stop the effects of such impacts and reverse them. Finally, if possible, the integral assessment should also envisage what the consequences would be of not taking short- and medium-term measures, so as to make political decision-makers aware of the need to act in an intersectoral fashion, not only in evaluating the problem, but also in seeking solutions to it (Figure 2).

Environmental issues can be addressed by reducing specific risks, such as improving water quality or encouraging alternatives to pesticide use, or by modifying intermediate and structural determinants that impact health (the latter through health promotion strategies, and poverty reduction and sustainable development, aimed at meeting the Millennium Development Goals [MDGs]). Among the specific contributions of the health sector, the Healthy Municipalities Initiative and the Health-Promoting Schools Regional Initiative are noteworthy regional strategies.

Environmental justice is a tool that can be used for addressing inequalities. This term is understood as "a set of principles and practices that ensure that no social group endures a disproportionate burden from negative environmental consequences stemming from economic transactions; political decisions; and federal, state, and local programs, as well as from the lack or absence of such policies, allowing fair and equitable access to national resources and relevant information for affected communities and vulnerable groups, and favoring construction of alternative and democratic development models" (*4*, *5*).

In keeping with these concepts, PAHO and its Member States propose dealing with all environmental and health-related issues through actions guided by this definition of environmental justice, and through public and institutional health and environmental policies that embrace broad intersectoral approaches. Examples of the former include drawing up socio-environmental vulnerability maps that allow target populations to be identified; implementing educational programs, enabling information access, and developing community leadership training programs in vulnerable areas; participating in environmental licensing processes from risk analysis to future scenario design; applying, where pertinent, prevention principles; cleaning up areas contaminated by hazardous products; and drafting master infrastructure plans within the framework of urban ecology and the healthy spaces concept. Examples of the latter are demarcating land and creating healthy environment reserves, adopting incentive policies for agroecological and family agricultural production, implementing human rights and anti-discrimination policy programs, fostering community tourism, and generating and utilizing alternative energies. The future of current generations and those to come will depend on how policy- and decision-makers go about managing and developing a healthy and sustainable environment.

WATER, SANITATION, AND SOLID WASTE DISPOSAL

Sanitation is an integral part of health, development, and poverty-reduction strategies. Basic sanitation is the series of actions taken within the human ecosystem to improve water supply services and sanitary wastewater and excreta disposal, solid waste management, household hygiene, and industrial water use in an institutional, legal, and political context in which diverse players from the national, regional, and local levels participate. This series of actions keeps public health and basic sanitation management in permanent interaction. Several countries from the Region incorporate management of these areas into such sectors as the environment and housing, whose subsequent coordination with the health sector is essential for achieving sustainable development.

The population's access to drinking water supply, sanitation services, and sanitary disposal of solid waste are analyzed here within the context of the MDGs, public health, and the economic benefits accruing from good health through the achievement of sustainable services of acceptable quality. Critical and emergency situations that have arisen in Latin America and the Caribbean are also addressed.

At the Millennium Summit of the United Nations held in September 2000, 189 Member States, 147 of which were represented by Heads of State and Government, adopted the Millennium Declaration that set forth the Millennium Development Goals. The United Nations General Assembly proclaimed the 2005–2015 period as the International Decade for Action under the slogan "Water for Life" (*6*), which began on 22 March 2005 and coincided with that year's observance of World Water Day. Nations were urged to provide a coordinated response to achieve fulfillment of the MDGs related to water and sanitation and to lay the foundations for going forward in upcoming years, without overlooking the need to enhance equity in access, quality, and sustainability of services, including the protection of water resources.

The International Decade for Action will be instrumental in keeping these worldwide goals focused on measures aimed at improving equitable access to water and sanitation services in order, at the same time, to reach international goals projected for water that are contained in Agenda 21 and its local action plan, the Millennium Declaration, and the Johannesburg Plan of Implementation. This is important for Latin America and the Caribbean, where one out of every four persons lacks access to safe water and basic sanitation services, and in the Region's communities and areas in which socioeconomic inequalities are most acute, this need affects one out of every two persons.

General Comment No. 15, which relates to Articles 11 and 12 of the International Covenant on Economic, Social, and Cultural Rights and pertains to the right to water, was adopted in November 2002, constituting a milestone in the history of human rights. For the first time, access to water is explicitly recognized as a fundamental human right, thereby establishing the obligation of governments to progressively ensure universal and equitable access to safe drinking water without discrimination. In setting the legal basis for the right to water, the Comment states: "the human right to water entitles everyone to sufficient, safe, acceptable, physically accessible, and affordable water for personal and domestic uses." As a result, Member States recognized that water must be treated as a cultural and social good, and not merely an economic one (*7*), a perspective that marks a radical departure from the focus adopted at different international fora held during the 1990s when water was considered a commodity.

> *"In the past, and too frequently today, public water supplies have given rise to much illness and death caused by diseases such as typhoid, dysentery, diarrhea, and cholera. A safe water supply is absolutely essential and should figure among the first permanent measures adopted by communities to protect their health."*
>
> **Hugh Cumming, 1933**

There is a strong social movement that advocates for water as a human right and a common good, which came to the fore at the 4th World Water Forum held in Mexico City at the end of March 2006 (*8*). Nevertheless, and in spite of the subsequent controversy, the Forum's final declaration does not recognize access to water as a human right, and the Governments of Bolivia, Cuba, Uruguay, and Venezuela issued a separate declaration affirming this access as a fundamental human right. At the same time, social organizations from more than 40 countries organized an alternative forum in which they denounced the idea that many governments and companies consider drinking water just one of many commodities and not a fundamental right that guarantees human survival.

To attain MDG water and sanitation targets, intense pressure must be brought to bear on health authorities. The right to drinking water will not be achieved solely through application of economic approaches; rather it also requires a strong moral conviction for the respect of three fundamental values: freedom, equity, and solidarity with society's most disadvantaged.

Monitoring MDG Targets

The WHO/UNICEF Joint Monitoring Program (JMP) for Water Supply and Sanitation evaluates progress made in fulfilling Target 10 (halving the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015) of MDG 7 (ensuring environmental sustainability). This evaluation is based on household surveys and population censuses conducted in the countries, and its main purpose is to monitor trends and programs, strengthen monitoring capacity, and report on the sectors' situation in terms of international and national policies. Only where this kind of data is unavailable does JMP use information

TABLE 1. Technological options for MDG Target 10 indicators of progress, JMP, 2004.

Drinking water		Sanitation	
Improved	Unimproved	Improved	Unimproved
Piped water into dwelling, plot, or yard	Unprotected dug well	Piped sewer system	Open pit
Public tap/standpipe	Unprotected spring	Septic tank	Pit latrine without slab
Tube well/borehole	Cart with small tank/drum	Pit latrine with slab	Bucket or hanging latrine
Protected dug well	Bottled water	Pit latrine	No facilities or bush or field
Protected spring	Tanker truck	Ventilated improved pit latrine	
Rainwater collection	Surface water	Composting toilet	

Note: JMP considers that improved technologies are more likely to provide adequate amounts of drinking water, privacy, and hygiene than unimproved technologies. Bottled water is considered an unimproved source if it is the only source available or is used with another unimproved source of water.

Source: WHO/UNICEF Joint Monitoring Program (JMP) for Water Supply and Sanitation. Meeting the MDG Water and Sanitation Target: A Mid-term Assessment of Progress; 2004.

from companies that provide these services in the countries. Given the current difficulty of taking routine, rapid measurements of the quality of drinking water and sanitation services, JMP uses two indicators for access or coverage: the percentage of the population (urban and rural) that uses improved drinking water sources, and the percentage of the population (urban and rural) that uses improved sanitation facilities.

According to the JMP, drinking water is water used for domestic purposes, including water for consumption and hygiene. The Program considers that in rural areas if more than 30 minutes are needed to reach the water source and return home, there is a tendency to use less water than the amount required to cover basic needs. Monitoring instruments for use do not consider costs, services continuity, or water quality at the source or home. The "improved sources of drinking water" could already be contaminated or, given the lack of household connection or service continuity, the water could become contaminated during its transport or from inappropriate storage in the home. For this reason, the population that has safe water available, as required by Target 10 of MDG 7, is probably far less than that which has access to "improved water sources" (Table 1). To overcome these limitations, JMP applies a methodology to rapidly assess water quality in seven countries in different regions of the world, including Nicaragua in Latin America.

In Nicaragua, the drinking water quality rapid assessment study was conducted between 2004 and 2005. The study highlighted the importance of raising awareness among field personnel and communities regarding water quality and how interaction between the two groups contributed to enhancing environmental education. This methodology yielded highly reliable and representative results in terms of the technologies used in supplying water and distributing it throughout the entire country. The most obvious result of the assessment has been to confirm that there is a serious nationwide problem with the quality of water that Nicaraguans consume. The 2005 final report (*9*) indicates that arsenic contamination of drinking water may be more far reaching in geographical terms than what was previously assumed and that household fecal contamination is most likely also greater.

JMP monitoring results of Target 10 in other countries of the Region are analyzed more in depth in the section in this chapter entitled "Equity in Sustainable Access to Water and Basic Sanitation Services." It is likely that Target 10 will not be achieved in all the countries of the Americas, particularly in rural areas, and above all as regards access to sanitation services, due to the greater deficit to be covered. Despite commitments assumed by national leaders, the financing needed for its attainment has not been forthcoming as was expected. In most countries many tasks still remain to be done, including readjusting rates so as to ensure the economic and financial sustainability of the entities that provide these services, creating effective subsidy systems for low income groups, and fully applying regulatory frameworks. In addition to macroeconomic instability and the structural deficit in public finances, reforms in this sector to date have not produced the level of success earlier anticipated. The next five-year period, however, may yield more promising conditions.

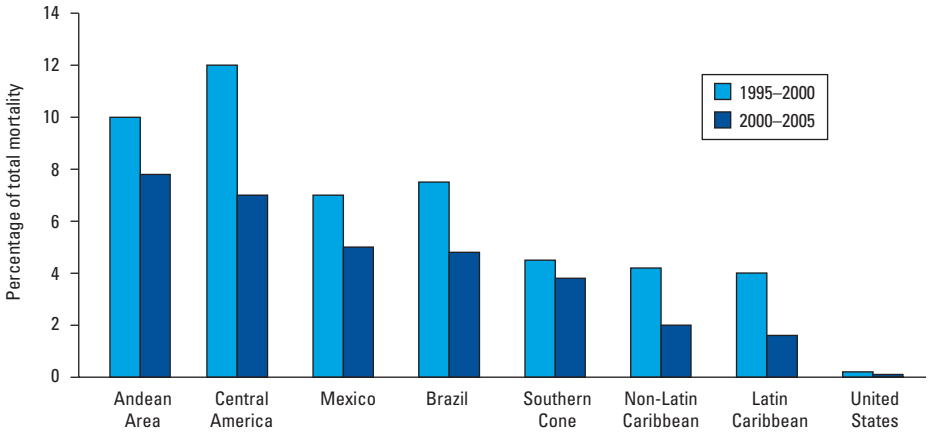
Development policies for the solid waste sector in Latin America and the Caribbean must incorporate Agenda 21 and MDG targets related to universal coverage by 2025, improvement of 100 million people's living conditions by 2020, the population's right to receive adequate services, as well as the achievement of equity.

"Improving water resources management and development is also a critical factor for meeting the broader set of [Millennium Development] Goals [. . .] reducing child mortality, improving maternal health, combating major diseases."

"Health, dignity and development: what will it take?"

Final report of the United Nations Millennium Task Force on Water and Sanitation

FIGURE 3. Mortality in children under 5 years of age from acute diarrheal diseases, by country or subregion, Region of the Americas, 1995–2005.



Source: Pan American Health Organization, Area of Sustainable Development and Environmental Health.

Such policies must likewise promote the formal creation of a solid waste disposal sector—alongside currently existing water and sanitation sectors—as well as the restructuring of solid waste management, establishment of laws for the new sector, and strengthening of oversight, regulation, municipal management, institutional coordination, civil society participation and sustainability, and private initiative.

Water, Basic Sanitation, and Public Health

The Global Water, Sanitation, and Hygiene for All (WASH) Forum, held in Dakar, Senegal, in 2004, explicitly links improvements in solid waste management with achievement of MDGs regarding water, sanitation, and human settlements. Fulfillment of Target 10 is central to reaching other targets related to health and development. Access to water and sanitation services also contribute to attaining other MDGs, such as reducing poverty, hunger, and malnutrition; reducing child mortality; and promoting gender equality and empowerment of women, in addition to forming part of MDG 7's emphasis on effective management and protection of natural resources.

Clearly, access to water and sanitation services is an indispensable requisite for improving health conditions in general, but is particularly important in the case of women and children, as well as for groups for whom inequalities in health and services provision constitute a pervasive reality. In the Region's poorest countries, children are the innocent victims in the sense that their right to adequate drinking water and sanitation services goes unprotected. Poverty, characterized by precarious housing conditions and unhealthy physical environments, increases children's exposure to numerous health threats. During the 2000–2005 period, mortality attributable to acute diarrheal diseases among children under 5 years old was 3.7%, and in the Andean subregion, this figure reached 7.8% (Figure 3).

Diarrheal diseases and parasitosis are among the leading causes of morbidity in children under 5 in the Americas and affect three health indicators: life expectancy at birth, as well as the mortality rate and rate of chronic malnutrition among children under age 5. To demonstrate the impact of water and sanitation on health, countries in the Americas have been classified (using the cluster technique in a statistical analysis computer program) in four developmental phases, according to the existing relationship between health (measured by the above-mentioned indicators), water and sanitation, and level of development. Table 2 shows the results of this classification and demonstrates the direct correlation between satisfactory water and sanitation coverage and acceptable levels of human development and health. Haiti, for example, which has the lowest water and sanitation coverage levels, also has the lowest Human Development Index (HDI) values and highest child mortality rates, in contrast to Chile, Costa Rica, Cuba, and Uruguay, among others, which have higher values.

Figure 4 shows the reciprocal relationship between access to water and sanitation and mortality in children under age 5 in the countries of the Region.

Inadequate sanitation infrastructure, discharge of untreated household wastewater into natural water bodies, as well as poorly functioning in situ sanitation systems (septic tanks and latrines), which mainly contaminate groundwater, create enormous problems for public health in the Americas. Using wastewater for irrigation has been associated with the transmission of enteric diseases, such as cholera and typhoid fever, even in areas where these illnesses are not endemic. Other gastrointestinal diseases, such as dysentery, giardiasis, and even infectious hepatitis, can be spread through contaminated vegetables.

In Latin America and the Caribbean there is a high correlation between the HDI and solid waste generation (Figure 5). Nations such as Bolivia, Grenada, Guatemala, Haiti, Honduras and Nicaragua, whose HDI is less than 0.7, generate less than

TABLE 2. Countries of the Americas, grouped by level of health development.[a]

Countries in the group	Level of health development	Human Development Index[b]	Life expectancy at birth[c] (years)	Drinking water coverage[d] (%)	Sanitation coverage[d] (%)	Chronic undernutrition in children under 5[c] (%)	Mortality in children under age 5[c] (per 1,000 live births)
Haiti	1	47.5	51.6	71.0	34.0	23.0	117.0
Bolivia, Guyana	2	70.3	63.6	84.0	57.5	19.0	66.5
Honduras, Guatemala	3	66.5	67.5	92.5	64.5	39.0	43.0
Belize, Dominican Republic	4	75.1	69.5	92.0	52.0	12.0	35.5
Argentina, Brazil, Colombia, Ecuador, El Salvador, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Venezuela	5	77.0	72.0	86.4	75.1	15.5	26.8
Antigua and Barbuda, Barbados, Canada, Chile, Costa Rica, Cuba, Dominica, Saint Lucia, Trinidad and Tobago, United States, Uruguay	6	84.3	75.7	96.2	94.7	5.8	11.9

[a]Countries grouped with similar selected indicators, in order from lowest to highest level of health development.
Sources: [b]UNDP. Human Development Report 2004. Values averaged by group of countries.
[c]PAHO. Basic Indicators 2001.
[d]JMP water and sanitation data results for Latin America and the Caribbean, 2002.

0.6 kg/inhabitant/day of solid waste, while Argentina, Uruguay, and the English-speaking Caribbean countries, whose HDI is over 0.8, produce more than 1.0 kg/inhabitant/day. By way of comparison, the per capita generation of solid waste in the Region's industrialized countries is 2.0 kg/inhabitant/day in the United States and 1.9 kg/inhabitant/day in Canada.

Per capita generation of municipal or urban solid waste varies according to the size of the population nucleus. In a large population nucleus (more than 201,000 inhabitants), the weighted regional average for household waste is 0.88 kg/inhabitant/day, and municipal waste generation is 1.09 kg/inhabitant/day. In a medium-sized nucleus (51,000 to 200,000 inhabitants), the corresponding values are 0.58 kg/inhabitant/day (household) and 0.75 kg/inhabitant/day (municipal), while in a small population nucleus (up to 50,000), they are 0.54 kg/inhabitant/day and 0.52 kg/inhabitant/day, respectively. Average values for the Region are 0.79 kg/inhabitant/day (household) and 0.91 kg/inhabitant/day (municipal).

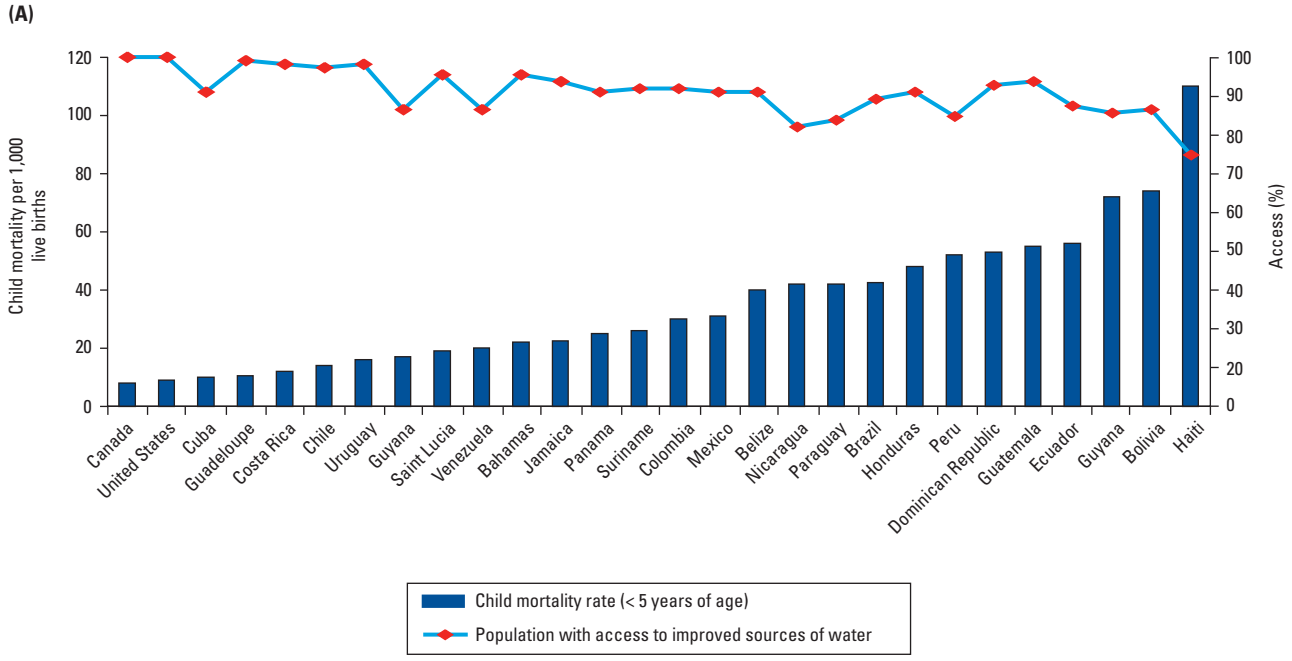
As may be seen in Figure 6, solid waste collection coverage varies a great deal between countries: in Argentina and Chile, for example, nationwide coverage is around 100%, while in the Dominican Republic and Paraguay, these percentages are 70% and 51%, respectively. The English-speaking Caribbean countries typically have collection coverage close to 100%, with the exception of Dominica, where it is 50%.

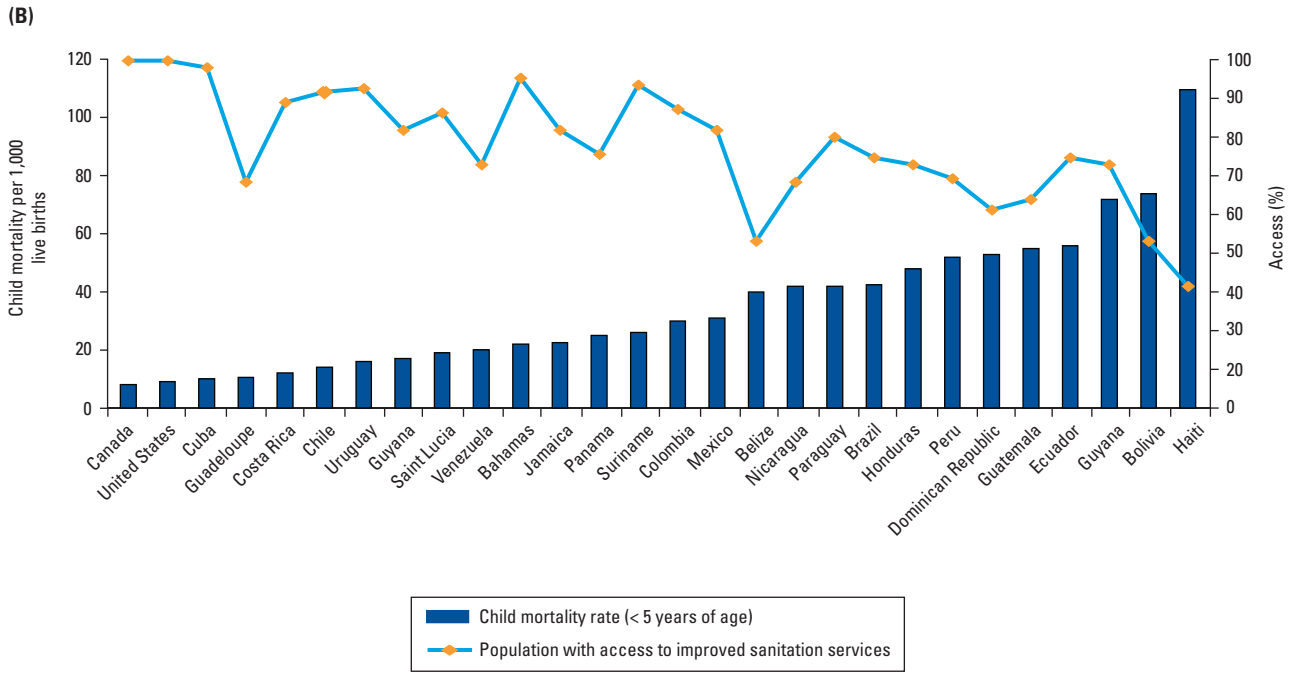
As Table 3 illustrates, solid waste generation, storage, collection, sorting, recycling, and its inadequate disposal in the Region affect health and the environment. Conditions associated this situation include gastrointestinal, parasitic, respiratory, dermatological, degenerative, infectious, and vector-borne diseases and diseases of the mucous membranes, as well as poisonings, work-related accidents, and mental disorders. The principal groups most exposed are the population that lacks adequate collection and storage systems, workers in the solid waste sector, persons who sort garbage, those who consume meat from swine raised near final waste disposal sites, those who reuse containers, and persons living in close proximity to final disposal or incineration sites for solid waste. The associated environmental effects include hazardous waste exposure; vector proliferation; land, air, and water pollution; food contamination; soil degradation; chemical container reuse; contaminated compost production; drainage systems modifications; and feeding livestock solid waste. In the Region, the percentage of garbage sorters who are women and children exceeds 50% (*10*).

The Economic Benefits of Water and Sanitation Services Access

WHO has conducted studies to estimate the costs and benefits associated with MDG Target 10 and has compared the differences in these based on five separate scenarios (Table 4). These studies

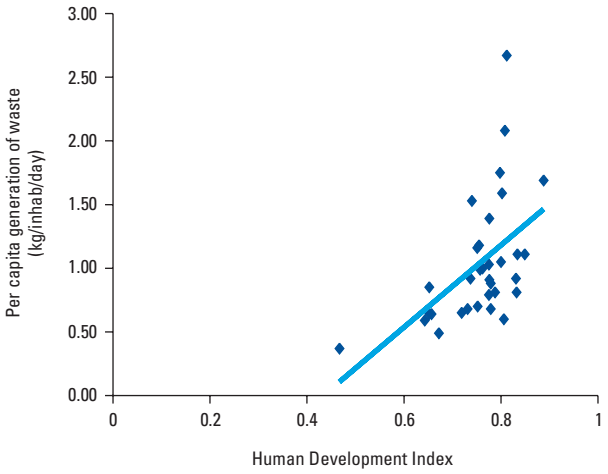
FIGURE 4. Correlation between access to water (A) and sanitation services (B) and child mortality, by country, Region of the Americas.





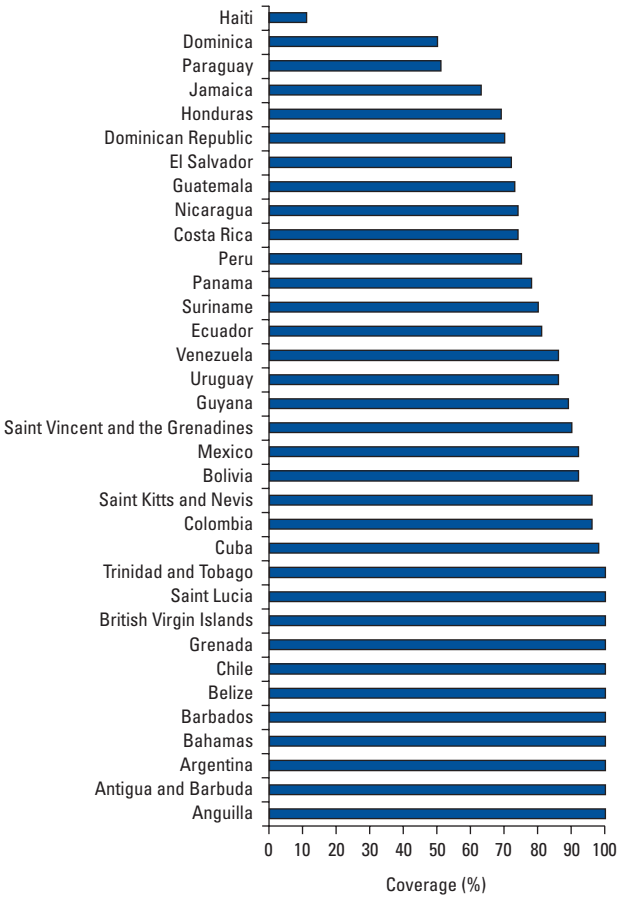
Sources: Adapted from Otterstetter H, Galvão LA, Witt P, Caporali S, Pinto PC. Health Equity in Relation to Safe Drinking Water Supply. In: Pan American Health Organization. Equity and Health: Views from the Pan American Sanitary Bureau (Occasional Publication No. 8), 2001; Pan American Health Organization. Health Statistics from the Americas, 2003 Edition; WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation. Meeting the MDG Drinking Water and Sanitation Target: A Mid-term Assessment of Progress, 2004.

FIGURE 5. Correlation between the Human Development Index and per capita generation of solid waste in Latin America and the Caribbean.



Source: Pan American Health Organization. Report on the Regional Evaluation of Municipal Solid Waste Management Services in Latin America and the Caribbean. Washington, D.C.: PAHO; 2005.

FIGURE 6. Average solid waste collection coverage, by country, Latin America and the Caribbean.



Source: Pan American Health Organization. Report on the Regional Evaluation of Municipal Solid Waste Management Services in Latin America and the Caribbean. Washington, D.C.: PAHO; 2005.

included epidemiological, demographic, and economic data from several international sources, JMP coverage and cost data from 2000, and recurring costs from specialized literature and different projects. The impact of water and sanitation interventions was measured in terms of reductions in incidence of disease and death related to infectious diarrheal diseases and the corresponding savings in treatment for the health sector and patients, values related to death and disabilities that were avoided, and time saved due to not needing medical care or having to carry water, among other factors. Time saved is reflected in productivity, school attendance, and quality of life.

Countries in Latin America and the Caribbean were included in three groups according to their epidemiological characteristics (Table 5).

Reported results have been consolidated in Table 4 and Figure 7, from which the following may be observed:

- Scenario 2 lays out the cost-benefit analysis for achieving Target 10, according to JMP indicators, although a good option would be to include household water quality management (scenario 4), since it has the best cost-benefit ratio and a good additional benefit. This should be done concomitantly without forgoing the quest for universal access to regulated services for treated drinking water and wastewater, in keeping with the need to implement comprehensive water source management and achieve the MDGs as a whole.
- Interventions of this kind yield benefits for the health sector, but the greatest benefit of all is time-savings, which translates into measurable gains in the education, agriculture, industry, and tourism sectors, among others. To better estimate the value of this time-savings, it would be useful to conduct economic studies at the local and national levels.
- Different sectors may provide financing for such interventions, but the health sector can play a key role in preparing computer programs (for example, on health education for bringing about behavior modification) and contribute with testing and analysis to improve decision-making in other sectors for the benefit of the most vulnerable segments of the population.

Water system privatization was undertaken during the 1990s, within the context of a development model known as the "Washington Consensus." This model—built on the pillars of a free market, fiscal austerity, and public services privatization—argues that the free market, when free from government interference and corruption, can transform developing countries' economies. International lending organizations have advocated this model in

TABLE 3. Environmental health problems related to inadequate management of wastes, Latin American and Caribbean countries.

Solid waste management phase	Environmental problem	Health risks	Exposed population group
Inadequate generation and storage	Environmental hazard due to hazardous or potentially hazardous materials of daily household use. Proliferation of vectors (insects, rats, rodents, and pathogen organisms). Food contamination. Foul odors.	Gastrointestinal diseases. Poisoning of infants and pets. Dengue. Zoonoses.	Population lacking adequate storage and/or collection systems.
Inadequate disposal in public areas	Proliferation of vectors (insects, rats, rodents and pathogen organisms). Air pollution due to open-air burning. Surface water contamination due to dumping of wastes. Food contamination. Foul odors. Landscape deterioration.	Gastrointestinal and respiratory diseases.	Population lacking adequate collection services.
Collection, transportation, storage in transfer stations	Landscape deterioration. Foul odors. Noise pollution.	Gastrointestinal, respiratory, and dermatological diseases. Occupational diseases and accidents (ergonomic disorders, traffic accidents, injuries with sharp objects).	General population. Formal and informal urban sanitation workers.
Sorting and recycling	Reuse of chemical products bottles and containers. Feeding of beef cattle and swine with unhealthy organic wastes. Application of contaminated compost to soil.	Gastrointestinal, respiratory, and dermatological diseases. Occupational diseases and accidents, chronic degenerative diseases, mental health disorders, alcoholism, and drug addiction. Poisonings.	Sorters. Population that acquires products in reused containers. Consumers of beef and pork from animals bred in dumps or fed organic wastes from garbage.
Treatment and final disposal	Soil contamination. Air pollution due to open-air burning. Surface and groundwater contamination. Modification of drainage systems (public sewers, canals, and riverbeds). Landscape deterioration. Fires. Alteration of natural ecosystems.	Infectious and parasitic diseases; allergies; respiratory tract, skin, and mucous membrane diseases. Occupational diseases and accidents, chronic degenerative diseases, mental health disorders, alcoholism, drug addiction, dengue, and emerging diseases.	Population adjacent to final disposal sites. Peri-urban population sectors where wastes are accumulated or burned. Formal or informal workers from this sector.

Source: Pan American Health Organization. Report on the Regional Evaluation of Municipal Solid Waste Management Services in Latin America and the Caribbean. Washington, D.C.: PAHO; 2005.

TABLE 4. Cost-benefit of water and sanitation intervention scenarios, Latin American and the Caribbean countries.

Scenarios (access and level of service by 2015)	Annual cost[a]	Annual benefit[a]	Cost-benefit ratio
1. Reduce by 50% the deficit in water access	171	2,199	12.8
2. Reduce by 50% the deficit in water and sanitation access (in accordance with MDG Target 10 using JMP indicators)	788	9,635	12.2
3. Reduce by 100% the deficit in water and sanitation	1,577	22,532	14.3
4. Universal access to water and sanitation services (scenario 3) plus water disinfection at the point of use	1,937	38,129	19.7
5. Universal access to regulated water and sanitation systems plus water and wastewater treatment	14,085	69,223	4.9

[a]In US$ millions (2000).

Source: Hutton G, Heller L. Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level. Geneva: WHO; 2004.

TABLE 5. Countries of the Region of the Americas, by mortality stratum.

Mortality stratum	Countries
A[a]	Canada, Cuba, United States
B[b]	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Dominican Republic, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela
D[c]	Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru

[a]Very low child mortality and low adult mortality.

[b]Low adult and child mortality.

[c]High adult and child mortality.

Source: Hutton G, Heller L. Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level. Geneva: WHO; 2004.

government reforms as a solution to insufficient financing for infrastructure and inefficiency of water and sanitation systems and other public services. On occasions, these organizations have established privatization as a prerequisite for providing loans; until this occurs, affected countries generally suffer from a scarcity of capital in the public sector charged with providing water, which worsens operating capacity of these services.

Almost all countries have implemented or are preparing to implement some modality of private sector participation in their water systems. These privatization schemes vary depending on the country and the specific characteristics of their respective sanitation services, and range from mere operations and maintenance outsourcing to comprehensive water and sanitation management. Currently, emphasis is placed on service quality, and countries are defining their program policies in this regard.

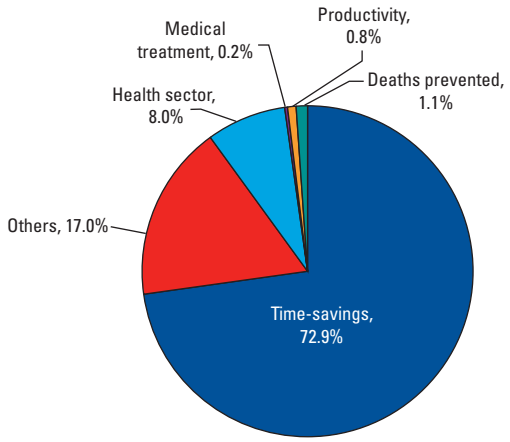
Equity in Sustainable Access to Water and Basic Sanitation Services

Between 1990 and 2004, the population in Latin America and the Caribbean grew from 441.5 million to 553.7 million. At the same time, the percentage of the population with access to water services increased from 83% to 91%, while access to sanitation services rose from 68% to 77%. In the Assessment of Drinking Water and Sanitation 2000 in the Americas Regional Report, an average production of 600 m^3/sec of wastewater is reported, of which 14% is treated and only 6% received adequate treatment. This situation remains unchanged, and according to the 2001 regional assessment of solid waste management, urban centers produced around 369,000 tons of municipal solid waste per day; of this amount, large urban centers generated 56%, medium-sized centers 21%, and small centers 23%.

According to indicators defined and used by the JMP for global monitoring (Table 6), by 2004 the drinking water deficit recorded in 1990 (baseline MDG) decreased by 8%, dropping from 17% in 1990 to 9% in 1994 (a 3% reduction from 7% to 4% in urban areas, and a 15% decrease from 42% to 27% in rural areas). The total reduction required to reach Target 10 of MDG 7 by 2015 is 9%, which would mean a 4% decrease in urban areas, with access rising from 93% in 1990 to 97% by 2015, and a 21% drop in rural areas, with access increasing from 58% in 1990 to 79% by 2015. In keeping with this trend, it is feasible that some countries in the Region would be able to meet this target, while other countries will need to intensify actions (Figure 8).

In general, when comparing urban area drinking water coverage in most Latin American and Caribbean countries in 2004 (*11*)

FIGURE 7. Estimated benefit of water and sanitation interventions envisaged under scenario 2[a], MDG Target 10 in Latin America and the Caribbean, based on JMP indicators.



[a]See Table 4.
Source: Hutton G, Heller L. Evaluation of the Costs and Benefits of Water and Sanitation Improvements at Global Level. Geneva: WHO; 2004.

in light of 1990–2015 growth trends, it can be expected that with the exception of Haiti, there will be no serious obstacle in reaching MDG Target 10 by 2015 in terms of the coverage indicator. Efforts must persist, however, in improving and monitoring quality of service indicators as regards continuity, quality, quantity, and cost, and even more so in rural areas of Bolivia, Brazil, Chile, Colombia, El Salvador, Haiti, Nicaragua, Paraguay, and Peru, where inequitable drinking water coverage, both in terms of quality and quantity, is longstanding. According to the JMP report (*11*), some countries did not record data, which therefore are not displayed.

The inequalities between urban and rural areas are well known, and according to the JMP, the vast majority of the 53 million people (more than 68%) who have no drinking water supply live in rural areas. Figure 9 shows deficit distribution by subregion and as can be seen, nearly 66% of the population lacking water lives in Brazil and the Andean countries. The situation is similar regarding sanitations services, with more than 127 million people having no access to improved facilities.

Although the deficit for basic sanitation coverage is higher than for drinking water coverage, the proportion of the population without access to drinking water is six times greater in rural areas than in urban areas and three-and-a-half times greater with regard to sanitation. The situation is even more critical in light of the fact that in rural areas the conditions under which services are provided do not meet water quality requirements; furthermore, sanitation facilities are often not used as planned. Long distances between rural communities constitute the most significant obstacle to providing services, even more so than potential income level differences between communities. In countries such as Brazil or Peru, for example, even the poorest urban families have higher levels of household connection than the segment of rural families with the highest per capita spending (Figure 10) (*12*).

In Peru, inequality in water and sanitation services provision, particularly sanitation, means that the poorest have the lowest percentage of access to water and sanitation (Figure 11). The sanitation coverage gap between the poorest and the richest quintiles is 68%, while the child malnutrition gap between these same groups is 30%.

It is estimated that more than 127 million people (almost 32% of the urban population) live in informal settlements in underprivileged urban areas of the Region. In general, these are large families who live and carry out their activities in impoverished, overcrowded, and vulnerable conditions (*13*). Lack of access to drinking water services means that this population must resort to unsafe sources of water, such as informal vendors who provide water of questionable quality at higher prices than those paid by individuals who have a connection to the public network.

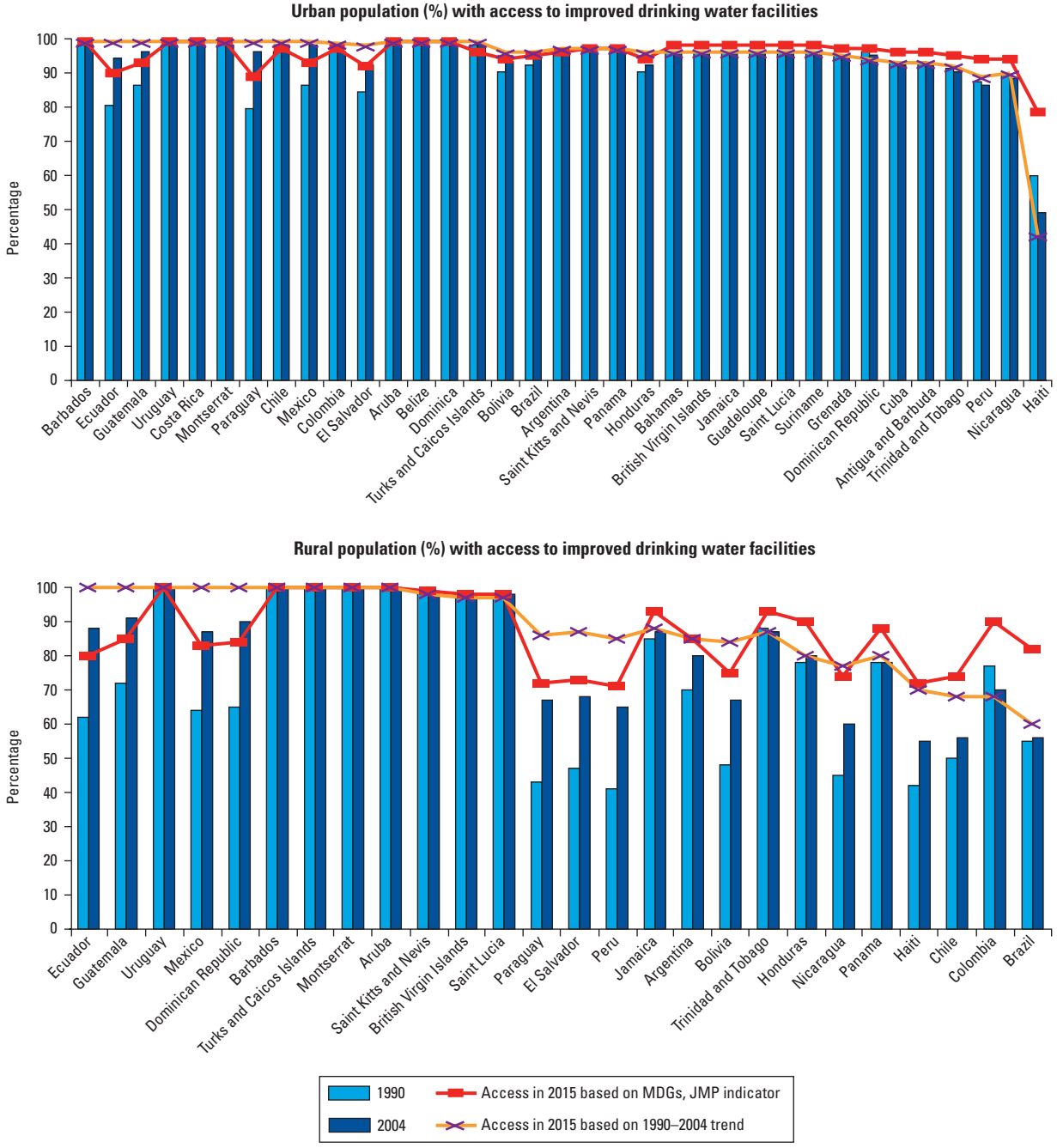
The sanitation deficit, on average, was reduced by 9% between 1990 and 2004, decreasing from 32% to 23% (13% in rural areas and 9% in urban areas), while the total reduction required to achieve Target 10 by 2015, according to the JPM indicators (Table 7), is 17% (32% in rural areas and 10% in urban areas). Provision of sanitation services lags behind drinking water, such that in most countries actions must be intensified and new

TABLE 6. Access to improved sources of drinking water, Latin American and Caribbean countries.

	Population (in millions)					Proportion of population (%)						
	2004					With access					Access deficit	
	With access		Without access	Total	1990	2004			Projection for 2015[c]	Target for 2015[d]	1990	2004
Area	Home[a]	Others[b]				Home[a]	Others[b]	Total				
Urban	378.7	25.3	16.8	420.8	93	90	6	96	98	97	7	4
Rural	59.8	37.2	35.9	132.9	58	45	28	73	83	79	42	27
Total	438.5	62.5	52.7	553.7	83	80	11	91	97	92	17	9

[a]Access to water service by direct household piped connection.
[b]Other access by means of public taps and fountains and protected wells.
[c]Projected access by 2015, according to 1990–2004 trends.
[d]Projection based on achievement of MDG 7's Target 10, according to JMP indicator.
Source: WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation database, 2006.

FIGURE 8. Trends in access to drinking water, by country, Latin America and the Caribbean, according to JMP-defined indicators and based on JMP data.

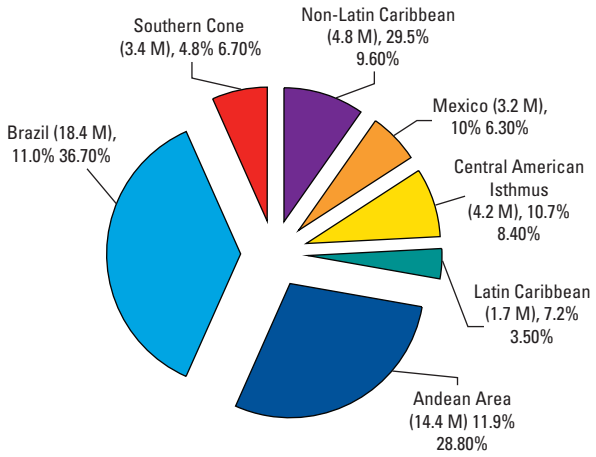


Source: WHO/UNICEF Joint Monitoring Program (JMP) for Water Supply and Sanitation. Meeting the MDG Water and Sanitation Target: A Mid-term Assessment of Progress; 2004.

strategies devised in order to reach sanitation access targets proposed for 2015 (Figures 12 and 16).

Growth trends in sanitation coverage for the 1990–2015 indicate that by 2004, several Latin American and Caribbean countries (*11*), among them Bolivia, Brazil, El Salvador, Nicaragua, and Peru, began to show signs of having difficulties reaching the Target 10 coverage indicator in urban areas, and would have to redouble efforts to finance construction and maintain infrastructure. The most significant obstacles for fulfilling Target 10 can be found in rural areas, especially in countries such as Bolivia,

FIGURE 9. Population in millions (M) without access to improved drinking water sources, by country or subregion, Latin America and the Caribbean.



Note: The whole pie represents the 53 million people in Latin America and the Caribbean without access to improved water sources. Population (1st percentage) without access as compared to that subregion's total population. Population (2nd percentage) without access in the subregion as compared to the 53 million people without access in Latin America and the Caribbean.
Source: WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation database, 2006.

Brazil, Chile, Colombia, El Salvador, Haiti, Jamaica, Nicaragua, Panama, and Peru.

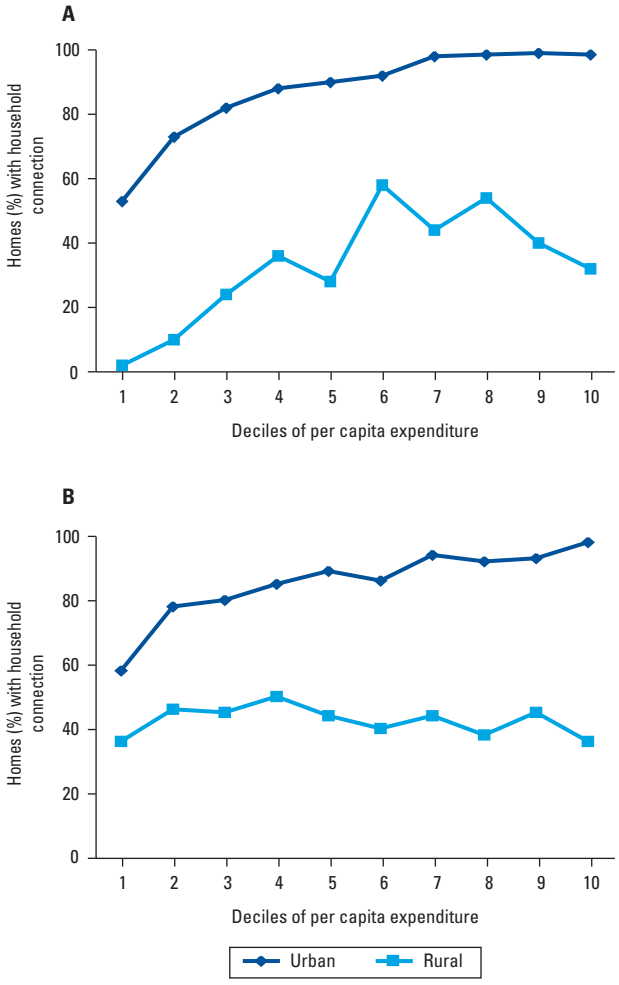
Figure 13 illustrates differences (inequities) in excreta disposal coverage in both urban and rural areas of Latin America and the Caribbean. Mexico has the most marked difference in urban vs. rural coverage (51%), while Barbados, Costa Rica, and Grenada, in contrast, have the greatest differences in rural vs. urban coverage.

Figure 14 depicts the degree of exclusion in rural and urban areas in Latin America and the Caribbean. In the case of Suriname, for every urban inhabitant who lacks sanitation services, there are eight rural dwellers without such services. The situation in Costa Rica and Venezuela is the inverse, with the degree of exclusion being greater in urban areas than rural ones.

By using the Gini coefficient and the Lorenz curve to estimate sanitation coverage inequity in the countries of the Americas (Figure 15), it can be seen that 47.5% of the population accumulates 86.5% of the sanitary deficit, in addition to an unacceptable degree of inequality (Gini coefficient = 0.53).

Despite the progress achieved, limitations to sanitation and water services persist for a significant portion of the population. Indeed, 127 million people (23%) do not have access to improved sanitation facilities. Analysis conducted by subregions highlights the fact that this deficit is most acute in the Andean countries and Brazil, where more than 50% of sanitation coverage shortages are concentrated (Figure 16). In Latin America and the Caribbean, as in most developing countries, the problem of universal access to water and sanitation is found principally in the poorer segments

FIGURE 10. Water coverage in rural and urban areas of Brazil (A) and Peru (B) and its relationship to deciles of expenditure.



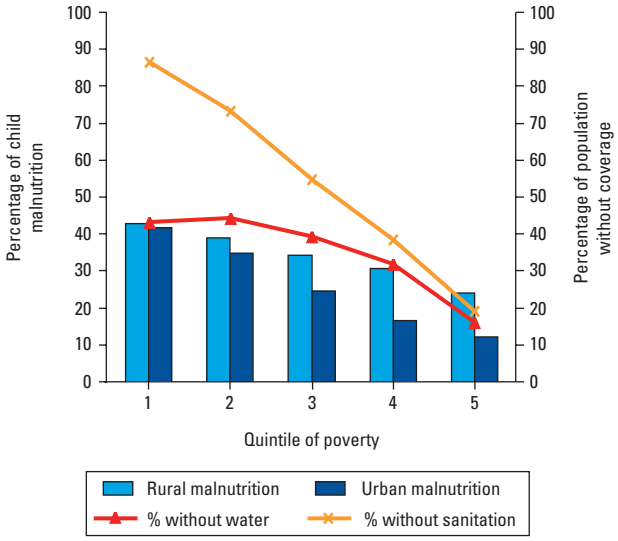
Source: Organización Panamericana de la Salud. Desigualdades en el acceso, uso y gasto del agua potable en América Latina y el Caribe. Serie de informes técnicos no. 2 y no. 11. Washington, D.C.: OPS; 2001.

of the population, which in the case of the Region of the Americas belong to readily identifiable groups. Specifically, the population segments that suffer from the most notable inequities in access to basic services are indigenous peoples and those living in rural and outlying urban areas. Most of these inequalities are linked to geography (given the great distances between rural towns in particular), socioeconomic status (all groups mentioned typically suffer from high levels of poverty or extreme poverty), and ethnic origin.

Quality and Sustainability of Basic Water and Sanitation Services in the Region

Inequalities in drinking water and sanitation are also determined by other service quality indicators, in addition to access or

FIGURE 11. Percentage of population of Peru without water and sanitation coverage; percentage of child malnutrition by quintile of poverty.



Source: Pan American Health Organization, Area of Sustainable Development and Environmental Health.

coverage. In the Assessment of Drinking Water and Sanitation 2000 in the Americas (*14*), 33 countries reported on the continuity of urban water systems; of these, 16 (or nearly half) noted interruptions in service. This intermittence in receipt of services constitutes a public health risk and inefficient use of the existing infrastructure, contributes to a deterioration of public confidence in the service, and compromises its economic viability.

Although the Region's health and environmental authorities share an interest in having more integrated water resources management—expressed in declarations from the Meeting of Health and Environment Ministers of the Americas held in Ottawa in 2002 (*15*) and in Mar del Plata in 2005 (*16*)—only 14% of the effluents from sewage systems in Latin America and the Caribbean receive any kind of treatment before being discharged. Inadequate management of water resources, including wastewater discharges, together with limitations in infrastructure for treating water for human consumption, degrade the quality of water distributed to users.

To ensure sustainability of drinking water and sewerage systems in the countries of the Region and protect progress made in coverage levels, significant challenges must be overcome to guarantee the quality of services, both for drinking water, as well as sanitation in general. In many cases, drinking water and sewerage systems are either totally obsolete or in need of renovations and/or expansion. To make matters worse, in many countries of the Region serious deficiencies persist in equipment and facility operation and maintenance, causing service interruptions, distribution system losses, and disinfection problems, all of which compromise the efficiency of the provision entities and the quality of services rendered to consumers. The Assessment of Drinking Water and Sanitation 2000 in the Americas notes high values of non-metered water, considered to be the ratio between water charged and water produced. In large cities, distribution systems recorded an average of 45% of non-metered water. Although generally speaking, disinfection is applied in large urban centers to 100% of the systems, in rural systems disinfection is insufficient and in many cases nonexistent.

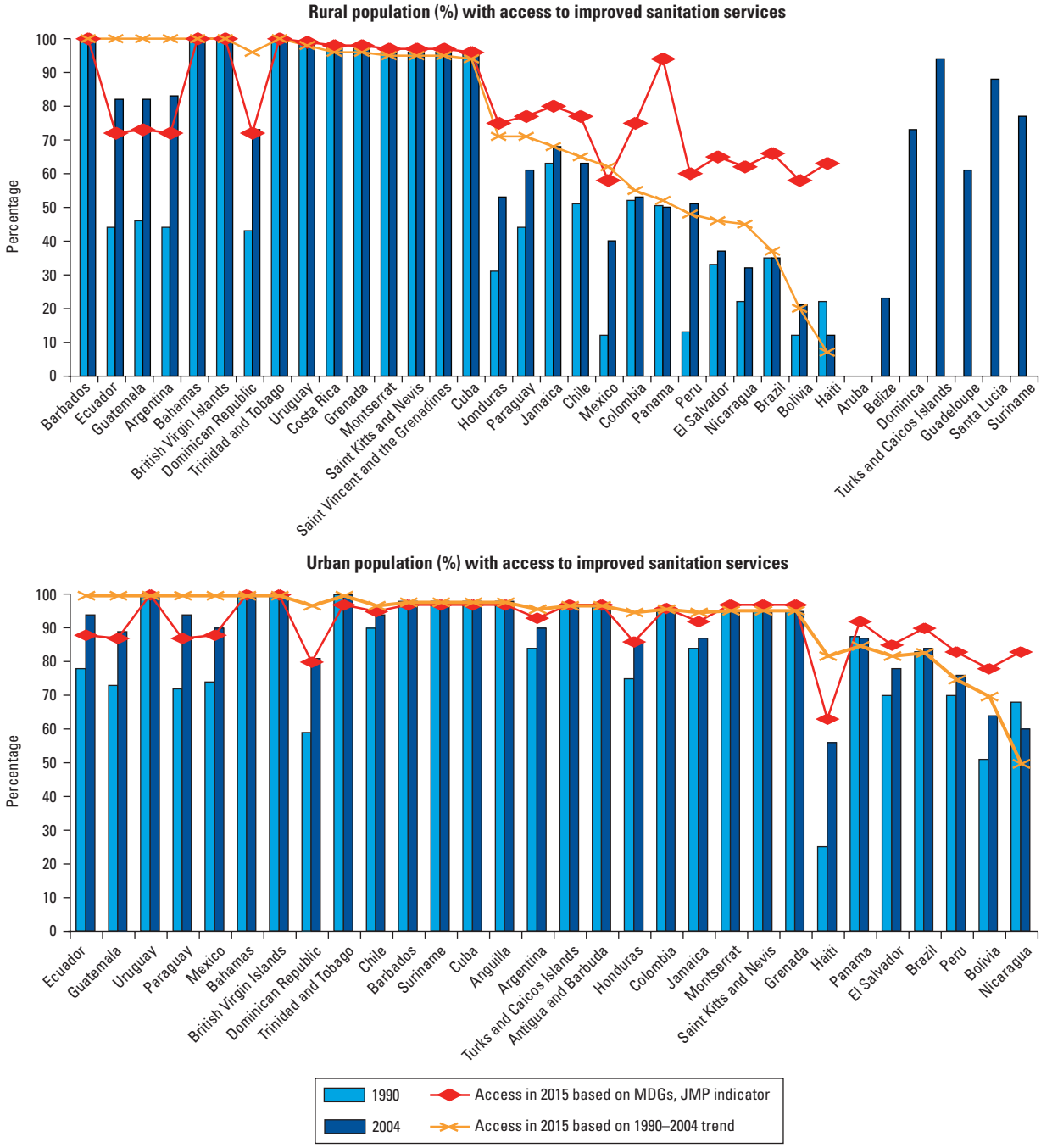
The population that enjoys adequate water quality control and monitoring systems is limited in urban areas and insignificant in rural areas. According to the 2000 Assessment, 52% of the urban population in the Region has effective water quality monitoring systems, with this percentage only reaching 24% in Latin America and the Caribbean. Indeed, in very few of these countries are water quality control and monitoring programs backed by adequate regulation or legislation that determines resources and establishes required responsibilities. PAHO defines a basic monitoring program as one that includes sanitary inspection of system components and, at a minimum, determines levels of residual chlorine, pH, and turbidity.

TABLE 7. Access to improved sanitation facilities, Latin American and Caribbean countries.

	Population (in millions)					Proportion of population (%)						
	2004					With access					Access deficit	
	With access		Without			2004			Projection	Target for		
Area	Home[a]	Others[b]	access	Total	1990	Home[a]	Others[b]	Total	for 2015[c]	2015[d]	1990	2004
Urban	260.9	101.0	58.9	420.8	81	62	24	86	90	91	19	14
Rural	14.6	50.5	67.8	132.9	36	11	38	49	59	68	64	51
Total	275.5	151.5	126.7	553.7	68	51	26	77	84	85	32	23

[a]Access to household sewerage system connection.
[b]Other access to individual sanitation systems in situ, such as septic tanks and latrines.
[c]Projected access by 2015, according to 1990–2004 trends.
[d]Projection based on achievement of MDG 7's Target 10, according to JMP indicator.
Source: WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation database, 2006.

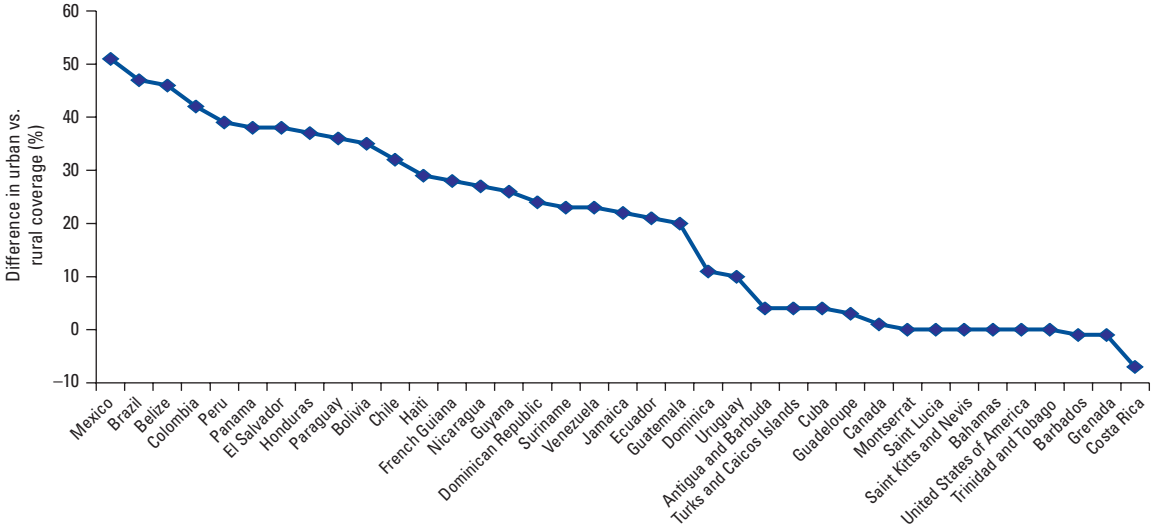
FIGURE 12. Rural and urban trends in access to sanitation services based on JMP-defined indicators, by country, Latin America and the Caribbean.



Source: WHO/UNICEF Joint Monitoring Program (JMP) for Water Supply and Sanitation. Meeting the MDG Water and Sanitation Target: A Mid-term Assessment of Progress; 2004.

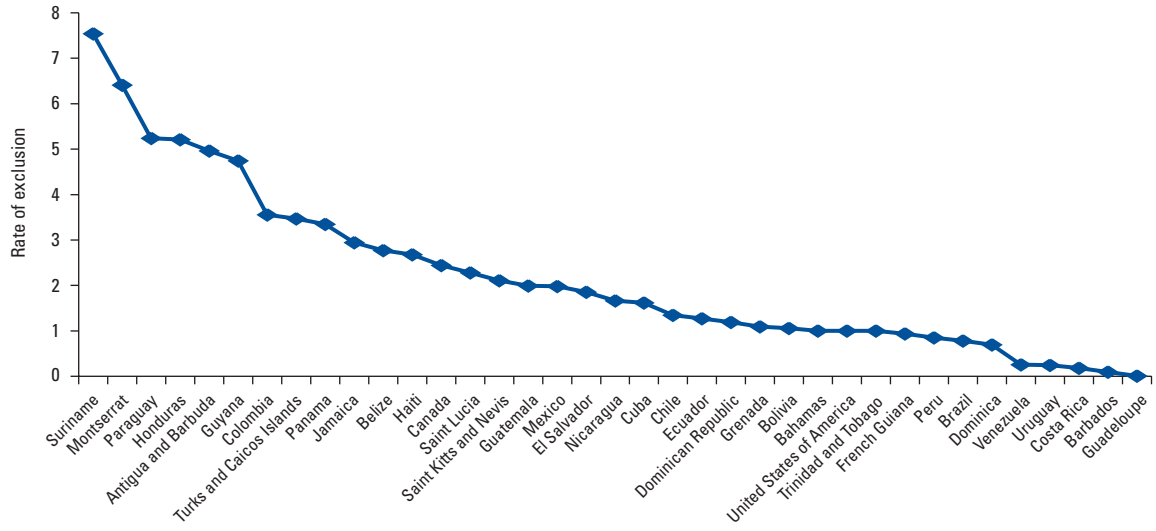
As part of water services quality assurance, particularly drinking water quality, there must be measurable indicators and reliable data, with an acceptable level of uncertainty in order to adopt needed preventive and corrective measures. The problem lies in the limited capacity of the countries of Latin America and the Caribbean (as compared to developed countries) to take environmental measurements, specifically to determine water quality and the presence of toxic substances in drinking water and wastewaters. Moreover, significant differences can be seen between capitals and large cities, and small cities and rural towns. Countries

FIGURE 13. Coverage of excreta disposal, by country, Region of the Americas, 2001.



Source: WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation database, 2002.

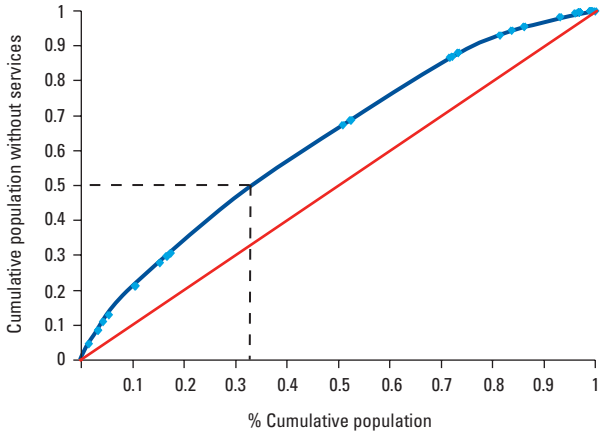
FIGURE 14. Rate of exclusion from sanitation in rural and urban areas, by country, Region of the Americas, 2002.



Source: WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation database, 2002.

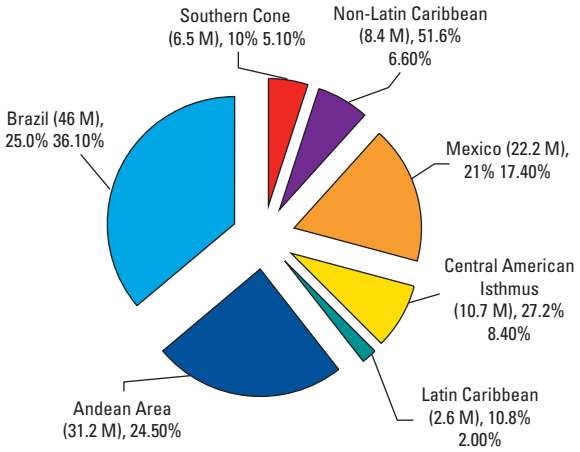
such as Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru, among others, have the capacity to measure a large number of parameters, but the methods used are not necessarily validated, accredited, or subjected to a permanent quality control program. An assessment study of 40 laboratories conducted by PAHO's Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) (*17*) estimated that, on average, measurement capacity is 86% for basic parameters; 37% for nutrients; 68% for toxic metals in general; 46% for lead, 39% for cadmium, 39% for copper, and 30% for mercury; 20% for toxic organic residues and chlorinated pesticides; 11% for phosphorics and other more complex parameters with minimum measurement capacities; 51% for organic matter indicators; and 62% for microbiological quality indicators. The study evaluated laboratories that belong to the Latin American and Caribbean Network of Environmental Laboratories (RELAC), principally laboratories belonging to ministries of health and the environment, water companies, some universities, and other sites. Fifty-eight percent of the laboratories utilized

FIGURE 15. Lorenz curve for sanitation services, Latin American and Caribbean countries.



Source: Pan American Health Organization, Area of Sustainable Development and Environmental Health, based on JMP data.

FIGURE 16. Population in millions (M) without access to improved sanitation facilities, by country or subregion, Latin America and the Caribbean.



Note: The whole pie represents the 127 million people in Latin America and the Caribbean without access to improved sanitation facilities. Population (1st percentage) without access as compared to that subregion's total population. Population (2nd percentage) without access in the subregion as compared to the 127 million people without access in Latin America and the Caribbean.
Source: WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation database, 2006.

unvalidated modified methods. According to another interlaboratory study by CEPIS, PAHO's Sustainable Development and Environmental Health Area, and the International Atomic Energy Agency (*18*), around 25% of the data on water quality have an error exceeding 20%, with variations on the acceptability of data according to the measurement's complexity.

To carry out these activities, measurements of water, biota, sediments, and municipal and hazardous waste are required. Hazardous waste may be household (e.g., batteries, containers for insecticides, pesticides, disinfectants), from medical and hospital centers (e.g., waste from medicines and disinfectants, as well as pathological and radiological waste, among other types), or industrial in nature (from small and medium-sized industry, agribusiness, the metal-working and mining industries, foundries, and factories of different kinds, all of whose hazardous waste materials and discharges can reach water sources and pollute them). Countries need to have reliable laboratories that comply with the respective regulatory frameworks (legislation and technical standards) and public health surveillance, and generate data for purposes of decision-making, research, and control of public health risks and harm. The main problems in this area are related to:

- a lack of knowledge at a local level regarding the environmental risks, both real and potential, related to public health;
- a lack of infrastructure to measure control and monitoring indicators of environmental factors that impact public health, and a dearth of qualified personnel and capital allocated for establishing laboratories;
- inequalities in measurement capacity (programs, training, and technology) between countries, capitals, provinces, and rural areas;
- a need for improvement in environmental analytical quality and capacity and greater participation by authorities in implementing quality management systems to generate reliable primary data; and
- a need for national systems that can certify and accredit environmental laboratories.

CEPIS and PAHO's Sustainable Development and Environmental Health Area promote RELAC's strengthening in order to improve analytical capacity and quality and thus comparative data analysis. To this end, PAHO is promoting a regional strategic plan that includes executing situational analysis programs, training for laboratory professionals and technicians, use of validated and periodically controlled analytical methodologies, performance assessment, laboratory accreditation, research promotion, and development of methodologies to fit specific conditions.

It is recognized that to attain the service quality and coverage levels that the population desires, there must be viable financial systems. This means that rates must at least cover operating and maintenance costs, and, in most cases, investment to expand the systems. Although progress has been observed in some countries of the Region (e.g., Argentina and Chile), in many other countries rates continue to be low and do not even cover operating costs. In general, the sector still depends on the state budget to finance capital investment, and to a lesser extent—albeit to a considerable degree—operating and maintenance costs (*19*).

In several countries in the Americas, decentralization processes of water and sanitation services have taken hold. The common trend is toward transferring responsibility for providing services to the regional, provincial, or municipal levels, or to an autonomous agency that eventually will be managed in accordance

> *"Since the countries and territories of the Americas are essentially rural, there are increasing needs and opportunities for promotion by health services of satisfactory water supplies and safe disposal of sewage in rural areas."*
>
> **Fred Lowe Soper, 1954**

with commercial and technical criteria. The main difficulty noted is a lack of capacity on the part of many municipalities to effectively manage these services. This situation, in turn, leads to a deterioration of the services, the recovery of which is very costly.

Protection of Water Resources

Protecting sources of drinking water is merely the first line of defense to safeguard water for human consumption from substances and microorganisms that are harmful to human health. For drinking water systems, the raw material is surface and groundwater, and, as such, these should be protected from all types of contamination for the purpose of fostering sustainable development. Underground water resources in the Region have received little attention, and have thus become contaminated from agricultural activities (e.g., nitrates, pesticides), in situ sanitation (e.g., nitrates, microorganisms), solid waste disposal, and industrial activities, among other factors. All of the foregoing suggests that aquifer recovery will be very difficult, if not impossible.

Eutrophication is the process of macrophyte plant and algae overproduction in bodies of water, which can cause problems for drinking water supply due to the alteration of organoleptic properties (smell and taste), and to different disruptions in the water purification treatment process. Although eutrophication may occur gradually from natural causes, today it is essentially cultural in nature and is accelerated by the continuous introduction of nutrients from anthropogenic sources. In some eutrophied lakes and reservoirs, high levels of organic substances, together with the chlorine added to the drinking water supply, could generate substances that are harmful to human health in the long term, through production of chlorinated organic compounds. Furthermore, the harmful impact on human health of toxins produced by different species of cyanobacteria resulting from eutrophication has been documented, both from recreational contact and from their presence in drinking water sources. Indigenous rural populations are particularly exposed to these risks. Eutrophied bodies of water also offer a habitat for some disease vectors, such as mosquitoes. In a CEPIS regional study, more than 75% of the lakes and reservoirs assessed (in Argentina, Brazil, Colombia, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru, Puerto Rico, and Venezuela) were classified as eutrophied or undergoing eutrophication.

Sources of water in large Latin American cities will become ever more scarce, both in terms of quality and quantity, and it will be increasingly necessary to resort to increasingly distant sources, thereby increasing competition between different uses and users (e.g., human consumption, agriculture, industry). Economic development in some countries and within specific areas will improve quality of life, increasing the demand for "virtual water," which is defined as water contained in products that are imported by countries or their regions.

Protection of Recreational Waters

In the majority of Latin American and Caribbean coastal cities, raw sewage discharges occur at or very near public recreational beaches. Geometric average levels of total coliforms in excess of 100,000 MPN/100 ml (most probable number/100 ml) have frequently been observed at public recreational beaches, especially during the summer season, with individual measurements at times approaching levels of raw sewage. The problems associated with near-shore discharge of untreated sewage are aesthetic in nature, can cause potential public health and ecological hazards, and often bring economic consequences due to curtailed tourism.

An epidemiological study conducted in 2001 by WHO and the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (*20*) documented the relationship between health and recreational use of waters polluted by urban wastewater discharges. The study estimated that such discharges caused 250 million cases of gastroenteritis and respiratory diseases every year and that the cost to society is approximately US$ 1.6 billion per year. At the XXVIII Congress of the Inter-American Association of Sanitary and Environmental Engineering (AIDIS) held in Cancún, Mexico, in 2002, WHO issued its Guidelines for Safe Recreational Water Environments (*21*). PAHO is coordinating the adaptation of these Guidelines for Latin America and the Caribbean.

Solid Waste

It is estimated that approximately 78% of the Region's population are urban dwellers. Small and medium-sized urban centers, which face the greatest difficulties in adequately managing solid waste, produce 44% of municipal solid waste. Collection service in outlying areas, where the population is generally poor and access is hampered by inadequate road conditions and infrastructure, is not a high priority.

The Region's solid waste sector and its institutional framework have differing degrees of development. Ministers of health and the environment provide oversight and regulate the sector, while municipalities maintain ownership of services provision. In general, deficiencies can be observed in sector management, as well as in medium- and long-term planning and programming. Municipalities typically lack management and economic capacity; notable omissions are seen in the legal framework; adequate control instruments to verify compliance and impose penalties are wanting; there are overlapping legislation—at times contradictory—and jurisdictional conflicts; and only a few countries have established specific laws dealing with solid waste.

Most countries do not have comprehensive solid waste management policies, and those that do often do not enforce or disseminate them. Few countries have comprehensive plans and strategic planning for the sector, and in many it is impossible to define a national lead agency for policy and plans. The few oversight responsibilities that are fulfilled are done so in a patchwork manner by the ministries of health and the environment. Municipalities set forth regulations for household, non-hazardous industrial, and hospital solid waste, and regulate rates with some executive control.

The Region's average cost for solid waste services is US$ 29 per ton, 70% of which corresponds to sweeping, collection, and transport. The rate, however, only covers 47% of service costs, and delinquent payments approach 50%. Sector-wide investment is limited compared to that which is made in electricity, water, and sanitation. In most countries, the service is supported by collection of a municipal fee, but the fee is not only for the cleaning service; rather, it is part of street lighting, property taxes, and other taxes.

It is estimated that only 22.6% of waste generated in the Region is deposited in a sanitary landfill; 23.7% ends up in controlled landfills, and 45.2% in open-air dumps or watercourses. Society's participation in solid waste management is limited and is only given effective expression when there is support from nongovernmental organizations.

The creation of microenterprises and cooperatives to manage solid waste is on the rise. These companies represent an economic municipal alternative, using low-cost technology and intensive labor, creating employment, and fostering community participation. Their participation in cleaning services is usually carried out with the support of nongovernmental organizations. Solid waste management cooperatives, although not numerous, provide services to the poorest segments of the population.

Basic Water and Sanitation in Critical and Emergency Situations in Latin America and the Caribbean

Natural disasters and their impact on existing systems constitute an "external" factor that represents a threat to water and sanitation services. Over the past decade, the Americas have been the second continent most affected by natural disasters (*22*). The effects of natural disasters of a catastrophic magnitude on all aspects of the economy and development have been obvious—particularly on water and sanitation systems—with economic losses of US$ 650 million during the 1994–2003 period alone. In the wake of Hurricane Mitch in Honduras, for example, socioeconomic conditions and infrastructure were set back 30 to 40 years (*23*). Moreover, since many of the Region's affected communities are geographically dispersed, in some cases the damages to small, sensitive systems never came to light.

Year after year, natural disasters strike many countries in the Region. During the last five years, natural disasters in the Americas have inflicted enormous loss of life, damage to water and sanitation infrastructure, and the subsequent difficulties of getting access to water suitable for human consumption, as well as enormous economic losses.

TABLE 8. Estimated damages[a] to drinking water and sanitation services, floods in Venezuela, December 1999.

Service	Damages		
	Total	Direct	Indirect
Drinking water	178.2	118.3	59.9
Sanitary sewerage system	38.3	38.3	0
Storm drainage	9.1	9.1	0
Greater expenditure/ lower earnings	17.3	0	17.3
Total	242.9	165.7	77.2

[a]In US$ millions.

Source: Economic Commission for Latin America and the Caribbean. The Socioeconomic Effects of the Floods and Landslides in Venezuela in 1999. Mexico City: ECLAC; 2000.

On 13–14 December 1999, torrential rains led to flooding and mudslides that affected 10 states in northern Venezuela, including the capital city of Caracas. National authorities estimated that more than 20,000 perished as a result. Water and sanitation services infrastructure suffered considerable damage. More than 200,000 people were affected, and more than 4,000 had to be given temporary lodging in La Guaira, Caracas, Maracay, and Valencia. A 2000 socioeconomic assessment conducted by the Economic Commission for Latin America and the Caribbean (ECLAC) estimated damages to water, sanitation, and run-off drainage systems to be approximately US$ 243 million (Table 8).

Earthquakes in El Salvador in January and February of 2001 caused great losses, and according to an ECLAC report on the disaster (*24*), reconstruction costs for water and sanitation systems infrastructure, both in urban and rural areas, totaled US$ 18.6 million and affected more than 200 water and sanitation systems. Close to US$ 400,000 alone was spent on water distribution using tanker trucks as part of the emergency relief efforts. According to data from the National Aqueduct and Sewerage System Administration of El Salvador, over a period of 138 days 98,700 m^3 of water was distributed, at a cost equivalent to US$ 4 per m^3.

On 23 June 2001, an earthquake struck the southern coast of Peru, mainly affecting the cities of Arequipa, Moquegua, Ilo, Tacna, Ica, and Cusco.

In July 2001, an intense drought occurred in El Salvador, Guatemala, Honduras, Nicaragua, and, to a lesser extent, Costa Rica. Data from ECLAC (*25*) indicate that the drinking water systems in Central America that used surface water sources were affected. The metropolitan area of Tegucigalpa, Honduras, was the hardest hit, and the company that provides water in this city incurred more expenses and earned less income during the entire year. ECLAC estimated that in addition to the foregoing, damages wrought by the drought reached approximately US$ 3.5 million.

In November 2001, Hurricane Michelle struck the Caribbean coasts of Nicaragua and Honduras, and the island nations of

Jamaica, the Bahamas, and Cuba, with the latter suffering the greatest extent of damages.

In November 2002, the Reventador Volcano, located 95 km to the northeast of Quito, Ecuador, erupted and shot out a significant amount of ashes that mostly affected Quito and the central provinces (in addition to Pichincha, Imbabura, Cotopaxi, Orellana, and Sucumbíos). Many water distributions systems, particularly water treatment plants, were damaged.

In September 2004, Hurricane Ivan, the worst storm of the season, left behind a trail of destruction in the Caribbean. The Cayman Islands and Grenada bore the brunt of the hurricane, although Cuba, Haiti, Saint Vincent and the Grenadines, and Jamaica also suffered its consequences.

While world attention focused on the Indian Ocean tsunami that struck South and Southeast Asia in late December 2004, flooding in Guyana was the worst natural disaster in this country's recent history. In January 2005, torrential rains equivalent to almost 10 times the average rainfall unleashed intense flooding in the coastal area, Guyana's most densely populated region. More than 300,000 people—close to half of the country's population—were affected. Moderate flooding is not unknown in Guyana, but January's extreme prolonged flooding was the worst experienced in a generation. At the apex of the crisis, more than 192,000 people in the capital of Georgetown, the East Bank, and West Demerara were affected. Three weeks later, 92,000 people still had water in or around their homes. The greatest difficulties faced by the authorities were drinking water coverage, ensuring water quality, sanitation, and basic refuse management.

In August 2005, in the United States, Hurricane Katrina first made landfall in Florida and then continued along the Gulf Coast to the states of Mississippi, Louisiana, and Alabama, where this Category 5 hurricane unleashed its destruction. Katrina flooded the historic city of New Orleans and caused the deaths of more than 1,300 people, becoming the most destructive natural disaster in U.S. history. The Mississippi Emergency Management Agency and the Federal Emergency Management Agency together allocated over US$ 9.4 billion in disaster relief aid in Mississippi, of which US$ 1.6 million was used to repair water control devices, such as irrigation ditches and reservoirs, and more than US$ 1.3 billion was earmarked for waste and rubble collection, including almost US$ 222 million for coastal waste and US$ 790 million for waste on flooded land.

In July 2005, Hurricane Emily struck several Caribbean islands and the Mexican and U.S. coasts. According to data from the Secretary of Government's National Center for Disaster Prevention and ECLAC, in Mexico, more than 226,000 inhabitants (in 43 localities in 11 municipalities, in an area covering approximately 35,000 km^2) had restricted water and sanitation services due to damages to these systems.

In October 2005, rains from Hurricane Stan in Central America and Mexico caused flooding and landslides in towns along the Atlantic coasts of Mexico, Guatemala, Nicaragua, and El Salvador. The National Aqueduct and Sewerage System Administration in El Salvador reported sanitary infrastructure damage estimated at US$ 11.5 million, with Guatemala suffering losses of US$ 4 million to its water and sanitation facilities. Tropical storms Alpha and Beta followed Stan at the end of October 2005, striking Haiti and the Dominican Republic, as the conclusion to one of the most active and destructive hurricane seasons ever known.

Table 9 summarizes the main natural disasters recorded in the Americas during the 2000–2005 period.

AIR POLLUTION

Air pollution and its effect on humans is a growing public health concern. A wide variety of pollutants are found in the air in the form of gases, dust, or particulate matter that come from human activities as disparate as transportation, power generation, industrial processes, food preparation, and home heating. A limited number of other sources of pollution are the result of natural environmental processes such as climatic changes (it should be noted, however, that some of these changes are linked to human endeavors, i.e., the greenhouse effect due to carbon emissions). Significant differences exist both in the magnitude and sources of pollution in outdoor and indoor environments where people live and carry out their activities. There are further differences in pollution according to where it occurs; for example, in rural areas exposure to carbon emissions is more closely linked to pollutants arising from biomass combustion inside the home, whereas in urban areas pollution is particularly serious outdoors and is related more to the use of fossil fuels in transportation, power generation, and industry.

In response to concern over environmental pollution, several countries have proposed and ratified international treaties, specifically the Kyoto Protocol to the United Nations Framework Convention on Climate Change (*26*), the Montreal Protocol on Substances that Deplete the Ozone Layer (*27*), and the United Nations Millennium Declaration, which established the Millennium Development Goals (*28*), whose targets include decreasing, in upcoming decades, gas emissions and other pollutants that harm the environment. The following sections will address various dimensions of outdoor air pollution and its effects on human health.

Air Quality in the Americas

Increasing use of fossil fuels is the greatest source of outdoor air pollution in many cities of the Region and the world. The main pollutants created during this process are particulate matter, nitrogen oxides, sulfur oxides, carbon monoxide, and ozone.

Burning fossil fuels and biomass (principally firewood) causes environmental degradation and is therefore a serious concern that is addressed in MDG targets, specifically MDG 7's Target 9, which addresses sustainable development principles and envi-

TABLE 9. Leading natural disasters, by country, Region of the Americas, 2000–2005.

Countries affected	2000	2001	2002	2003	2004	2005
Argentina	F (May)			F (Feb., Apr.)		
Aruba					H (Ivan, Sep.)	H (Emily, Jul.)
Bahamas	H (Debby, Aug.)	H (Michelle, Nov.)		TS (Odette, Dec.)	H (Frances, Aug.) TS (Jeanne, Sep.)	H (Wilma, Oct.)
Barbados	H (Keith, Sep.) TS (Joyce, Sep.)	TS (Jerry, Oct.) H (Iris, Oct.)	TS (Lily, Sep.)		H (Ivan, Sep.)	H (Emily, Jul.)
Belize		TS (Chantal, Aug.) TS (Jerry, Oct.) H (Iris, Oct.)		TS (Claudette, Jul.)		H (Emily, Jul.) H (Stan, Oct.) H (Wilma, Oct.) TS (Gamma, Nov.)
Bolivia	F (Apr.)	F (Jan.)	F (Feb.)	F (Jan.) L (Apr.)	F (Jan.) D (Nov.)	
Brazil	L (Aug.)	F (Dec.)		F (Jan.)		
Canada						
Chile	F (Jun.)		F (May)			E (Jun.)
Colombia	F (May)			F (Dec.)	F (May, Oct.) H (Ivan, Sep.) E (Nov.)	F (Feb.) H (Wilma, Oct.) V (Galeras, Nov.)
Costa Rica	H (Keith, Sep.) TS (Joyce, Sep.)		F (May) F (Dec.)	E (Dec.)	F (May, Nov.) E (Nov.)	F (Jan.) F (Sep.) H (Stan, Oct.) H (Beta, Oct.)
Cuba	H (Debby, Aug.)		TS (Isidore, Sep.) TS (Lily, Sep.)	TS (Claudette, Jul.)	H (Charley, Aug.) H (Ivan, Sep.)	H (Dennis, Jul.) H (Emily, Jul.) H (Rita, Sep.) H (Wilma, Oct.)
Dominican Republic	H (Debby, Aug.)	TS (Jerry, Oct.) H (Iris, Oct.)	TS (Lily, Sep.)	E (Sep.) F (Nov.) TS (Odette, Dec.)	F (May) H (Frances, Aug.) H (Ivan, Sep.) TS (Jeanne, Sep.)	
Ecuador		V (Tungurahua, Aug.) FL (Jun.)	F (Mar.) V (Nov.)	V (Tungurahua, Jul.)		
El Salvador	H (Keith, Sep.) TS (Joyce, Sep.)	D (Jul.) E (Jan., Feb.) TS (Jerry, Oct.) H (Iris, Oct.)	F (Sep.)			TS (Adrian, May) F (Jun.) V (Santa Ana, Sep.) F (Oct.) H (Stan, Oct.) H (Beta, Oct.)
Guatemala	F (Jun.)	E (Jan.) D (Jul.) TS (Jerry, Oct.) H (Iris, Oct.)	V (Feb.) L (Sep.) TS (Lily, Sep.)	L (Apr.)	D (Nov.)	L (Jun.) F (Jul.) H (Stan, Oct.) H (Beta, Oct.)
Guyana						F (Jan.)
Haiti	H (Debby, Aug.)	E (Jan.) D (Jul.) TS (Chantal, Aug.) TS (Jerry, Oct.) H (Iris, Oct.) H (Michelle, Nov.)	F (May) TS (Lily, Sep.)	TS (Odette, Dec.) F (Dec.)	F (May) H (Ivan, Sep.) TS (Jeanne, Sep.)	L (Jun.) H (Dennis, Jul.) H (Emily, Jul.) H (Stan, Oct.) H (Wilma, Oct.) TS (Alpha, Oct.)
Honduras	H (Keith, Sep.) TS (Joyce, Sep.)	D (Jul.) TS (Jerry, Oct.) H (Iris, Oct.)	F (Sep.)	F (Sep.)	D (Nov.)	H (Stan, Oct.) H (Wilma, Oct.) TS (Beta, Oct.) TS (Gamma, Nov.)

(continued)

TABLE 9. (Continued).

Countries affected	2000	2001	2002	2003	2004	2005
Jamaica	H (Keith, Sep.) TS (Joyce, Sep.)	TS (Chantal, Aug.) TS (Jerry, Oct.) H (Iris, Oct.) H (Michelle, Nov.)	F (May) TS (Lily, Sep.) TS (Isidore, Sep.)	TS (Claudette, Jul.) TS (Odette, Dec.)	H (Charley, Aug.) H (Ivan, Sep.)	H (Dennis, Jul.) H (Emily, Jul.) H (Wilma, Oct.)
Mexico	V (Popocatépetl, Dec.) H (Keith, Sep.) TS (Joyce, Sep.) E (Aug.)	TS (Chantal, Aug.) H (Juliette, Sep.) TS (Lorena, Oct.) TS (Jerry, Oct.) H (Iris, Oct.) H (Michelle, Nov.)	F (Aug.) TS (Isidore, Sep.) TS (Lily, Sep.) H (Kenna, Oct.)	E (Jan.) TS (Claudette, Jul.) H (Ignacio, Aug.) H (Marty, Sep.) F (Sep.) TS (Larry, Oct.) H (Olaf, Oct.)	F (Apr.) H (Ivan, Sep.)	H (Emily, Jul.) H (Rita, Sep.) H (Stan, Oct.) H (Wilma, Oct.) TS (Gamma, Nov.)
Nicaragua	H (Keith, Sep.) TS (Joyce, Sep.) E (Jul.)	D (Jul.) H (Michelle, Nov.)	F (Sep.)		L (Jul.)	H (Stan, Oct.) H (Wilma, Oct.) TS (Beta, Oct.)
Panama	H (Keith, Sep.) TS (Joyce, Sep.)		F (Dec.)	E (Aug., Dec.)	F (Sep., Oct.)	F (Jan.)
Paraguay			F (May) D (Oct.)			D (Chaco)
Peru		F (Mar.) E (Jun.)	F (Feb.)	F (Jan.)	F/D (Feb.)	E (Sep.)
Puerto Rico					H (Frances, Aug.) TS (Jeanne, Sep.)	
Trinidad and Tobago		TS (Chantal, Aug.)			H (Ivan, Sep.)	H (Emily, Jul.)
United States					H (Charley, Aug.) H (Frances, Aug.) H (Ivan, Sep.) TS (Jeanne, Sep.)	H (Dennis, Jul.) H (Emily, Jul.) H (Katrina, Aug.) H (Rita, Sep.) H (Wilma, Oct.)
Uruguay	D (Feb.)	F (Jun.)				F (Aug.)
Venezuela	H (Keith, Sep.) TS (Joyce, Sep.) F (Nov.)		F (Jul.)		H (Ivan, Sep.)	F (Feb.) H (Emily, Jul.)
Other Caribbean islands[a]	H (Debby, Aug.) H (Keith, Sep.) TS (Joyce, Sep.)	TS (Jerry, Oct.) H (Iris, Oct.) H (Michelle, Nov.)	TS (Lily, Sep.) TS (Isidore, Sep.)	TS (Claudette, Jul.) TS (Odette, Jul.)	H (Frances, Aug.) H (Charley, Aug.) H (Ivan, Sep.) TS (Jeanne, Sep.)	H (Emily, Jul.) H (Dennis, Jul.) H (Stan, Oct.) H (Wilma, Oct.) TS (Gamma, Nov.)

F: Flood TS: Tropical Storm E: Earthquake H: Hurricane
V: Volcanic Eruption L: Landslide D: Drought

[a]Includes Anguilla, Antigua and Barbuda, Bermuda, British Virgin Islands, Dominica, French Guiana (France), Grenada, Guadeloupe (France), Cayman Islands, Martinique (France), Montserrat, Netherlands Antilles, Saint Lucia, Saint Vincent and the Grenadines, Saint Kitts and Nevis, and Turks and Caicos Islands.

Source: Data from ReliefWeb (http://www.reliefweb.int/rw/dbc.nsf/doc100?OpenForm). ReliefWeb was launched in October 1996 and is managed by the United Nations Office for the Coordination of Humanitarian Affairs.

ronmental resources conservation, and includes indicators on the use of energy and biomass, and atmospheric emissions.

According to a recent report (*29*), between 1990 and 2001 the average level of energy use in Latin America and the Caribbean, measured by petroleum consumption in kilos per dollar of gross domestic product (GDP), increased slightly from 0.18 to 0.19. Large increases (>0.05) were seen in Bolivia, Brazil, Haiti, Jamaica, Panama, Trinidad and Tobago, and Venezuela, however, while in the rest of the countries for which data are available, the general trend was decreasing (Table 10). During this same pe-

TABLE 10. Energy consumption and carbon dioxide emissions, by country, Region of the Americas, 1990–2000.

	Consumption of energy/$ of GDP[a]		Metric tons of CO_2 per 1,000 population	
Country	1990	2000	1990	2000
Antigua and Barbuda	. . .	. . .	421	3
Argentina	0.17	0.2	2,100	3,300
Bahamas	. . .	. . .	66	66
Barbados	. . .	. . .	21	12
Belize	. . .	. . .	16	28
Bolivia	0.22	0.27	76	77
Brazil	0.15	0.2	8,500	6,200
Chile	0.2	0.2	662	470
Colombia	0.14	0.1	2,000	1,200
Costa Rica	0.12	0.1	267	145
Cuba	. . .	. . .	778	504
Dominica	. . .	. . .	1	1
Dominican Republic	0.17	0.18	274	486
Ecuador	0.36	0.22	604	207
El Salvador	0.15	0.16	423	117
Grenada	. . .	. . .	4	4
Guatemala	0.16	0.18	357	256
Guyana	. . .	. . .	19	20
Haiti	0.12	0.17	. . .	169
Honduras	0.23	0.21	115	122
Jamaica	0.36	0.5	424	49
Mexico	0.21	0.2	12,000	2,200
Nicaragua	. . .	. . .	87	35
Panama	0.15	0.2	252	180
Paraguay	0.17	0.18	240	116
Peru	0.13	0.1	801	189
Saint Kitts and Nevis	. . .	. . .	6	3
Saint Vincent and the Grenadines	. . .	. . .	2	7
Saint Lucia	. . .	. . .	11	3
Trinidad and Tobago	0.73	0.8	138	79
Uruguay	0.11	0.1	416	102
Venezuela	0.42	0.5	3,300	2,500

[a]Energy use (equivalent in kilograms of petroleum) per dollar of GDP.

Source: Economic Commission for Latin America and the Caribbean. The Millennium Development Goals: A Latin American and Caribbean Perspective, Santiago: ECLAC; 2005.

riod, carbon dioxide emissions (CO_2) in Latin America and the Caribbean fell on average from 5,868 metric tons (MT) per 1,000 individuals to 3.072, a situation that was seen, in differing degrees, in most nations. Countries such as Argentina, Brazil, Colombia, Mexico, and Venezuela had CO_2 levels that were almost 25 times greater than in the rest of the Region in 1990. Furthermore, this group of countries with the highest CO_2 levels in 1990 succeeded in decreasing those values to almost half (average 3,080 MT).

Short- and long-term exposure to pollutants has been associated with an increase in mortality and morbidity due to respiratory and cardiovascular diseases (*29*). It is estimated that 800,000 premature deaths occur annually worldwide from respiratory and cardiovascular causes, lung cancer, and respiratory infections (in children under age 5) that are specifically linked to exposure to particulate matter (*30*).

In 2005, PAHO conducted a systematic search and review of scientific evidence presented in the Americas regarding the effects on health of exposure to particulate matter and the significance of this phenomenon for the Region. As part of this initiative, data were also gathered on concentrations of particulate matter of 10 µm in diameter (PM_{10}) reported by different urban areas in the Region (Table 11). The situation regarding outdoor air pollution varies a great deal. For example, in Arequipa, Peru, elevated concentrations of PM_{10} (up to 111 µg/m^3) have been reported; in contrast, in other cities, annual concentrations are rather low, such as in Belo Horizonte, Brazil, (13 µg/m^3) and San Juan, Puerto Rico, (32 µg/m^3). In general terms, annual concentrations of PM_{10} in urban areas surpass national standards, as well as those established in the global air quality guidelines recommended by WHO (*29*, *31*), although between 2000 and 2004 there was a decreasing trend in 7 out of 11 countries that had more than three years of recordings during this period (*31*).

Global air quality guidelines are based on the epidemiological and toxicological results of effects on health and represent a threshold level (i.e., the level under which no adverse effects would be seen). To the extent that the concentrations reported exceed those limits, it can be inferred that a significant number of people in the Region are exposed to concentrations that harm their health.

It is important to point out that there are notable variations in the availability of data on PM_{10} in the Region. In some cities, air quality monitoring is a longstanding practice; in other cities, the annual average concentration for the entire period was not available or was not recorded at all. The situation is similar for other pollutants that result from burning fossil fuels, and, in fact, data available for these are even more limited.

Air pollution is a major problem for urban areas because it affects the entire population. Due to its significance for public health, good air quality indicators are essential, and this is achieved through reliable monitoring systems. Adequate monitoring provides the foundation for developing air quality profiles with which to identify the extent of human exposure, for conducting epidemiological studies on the impact from such exposure, and for guiding selection, implementation, and assessment of prevention and control measures.

Another source of pollution, in addition to fossil fuel use, is the burning of biomass, whose impact on air quality is not well known. In 21 Latin American and Caribbean countries for which

TABLE 11. Average annual concentration of PM_{10} ($\mu g/m^3$), selected cities of Latin America and the Caribbean, 2000–2004.

City/Country	Annual standard ($\mu g/m^3$)	Average annual concentration of PM_{10} ($\mu g/m^3$)				
		2000	2001	2002	2003	2004
Arequipa, Peru	50	111	91	102	100	90
Belo Horizonte, Brazil	50	13	21	26	. . .	. . .
Bogotá, Colombia	65	58	64	66	66	66
Cochabamba, Bolivia	. . .	. . .	. . .	98	104	64
Fortaleza, Brazil	50	84	74	81	. . .	. . .
Guatemala City, Guatemala	. . .	. . .	54	. . .	. . .	. . .
Havana, Cuba	. . .	. . .	75	60	54	
La Paz, Bolivia	. . .	. . .	. . .	. . .	. . .	49
Medellín, Colombia	65	. . .	. . .	87	93	. . .
Mexico City, Mexico	50	71	60	65	64	54
Quito, Ecuador	50	. . .	. . .	. . .	. . .	54
Rio de Janeiro, Brazil	50	. . .	39	40	53	. . .
San Salvador, El Salvador	50	. . .	60	. . .	. . .	. . .
San Juan, Puerto Rico	50	32	31	31	32	30
Santiago, Chile	. . .	77	72	70	74	68
São Paulo, Brazil	50	52	49	51	48	41

Source: Pan American Health Organization. An Assessment of Health Effects of Ambient Air Pollution in Latin America and the Caribbean. Santiago: PAHO; 2005.

data are available, it is estimated that the per capita biomass consumption fell from 0.7 to 0.6 between 1990 and 2001. In Chile, El Salvador, Guatemala, Guyana, Honduras, Nicaragua, Panama, and Paraguay, however, this consumption continues to be very high and is between two and five times greater than the Region's average (Table 12).

Clearing farmland and eliminating agricultural waste by burning is a deeply rooted practice. In Brazil, for example, a total of 226,252 forest fire outbreaks were reported in 2005. This problem can extend beyond rural areas, since substances emitted by fires can travel great distances and affect air quality in urban areas, even in bordering countries.

The Effects of Air Pollution on Human Health

International epidemiological literature has shown that short- and long-term exposure to airborne pollutants in urban areas is associated with the appearance of a wide range of cardiovascular and respiratory conditions (Table 13). Furthermore, maternal exposure to such pollutants during pregnancy may be harmful to fetal development (*32*).

A review of literature on the effects of air pollution on health in the Americas (*29*) covering the 1994–2004 period identified 85 studies published in scientific journals. Most of these papers focused on urban populations in just a few Latin American countries: Brazil, Chile, Cuba, Mexico, Peru, and Venezuela. More than half of the articles reviewed were temporal series studies, which are designed to allow for estimating the impact of temporary (usually daily) variations of air pollutants on mortality and morbidity using statistical models in which the daily number of deaths is related to daily concentrations. This design enables the effects of short-term exposure to be assessed.

The outcomes of short-term studies in the Region were similar to those reported in international literature. Temporary variations in particulate matter have been associated with an increase in daily mortality due to cardiovascular and respiratory causes. It has been further associated with an increase in hospital admissions from respiratory causes.

As part of the review of testing conducted, a quantitative analysis was carried out to calculate summary measures of the effects on mortality from exposure to PM_{10}, based on the results of temporal series studies. Such measures provide a more precise estimate of the exposure-response function, which can be used in formulating public policies to calculate health costs due to air pollution and benefits associated with reducing particulate matter concentrations. The measures estimated for Latin America were compared with those calculated for other regions of the world. In this meta-analysis, it was observed that the quantitative summary estimates for mortality in all age groups and in persons over 65 were similar in magnitude to figures from other parts of the world (Table 14).

In general, evidence from Latin America suggests that exposure to particulate matter is associated with an increase in mortality and morbidity. It should be noted that the summary estimates are based on studies conducted in three Latin American cities (Mexico City, Mexico; São Paulo, Brazil; and Santiago, Chile), and therefore the data are not necessarily representative of the Region of the Americas as a whole. Summary quantitative es-

TABLE 12. Per capita biomass[a] consumption, selected Latin American and Caribbean countries, 1990–2001.

Country	1990 level	2001 level	Difference
Bolivia	0.09	0.02	–77.8
Brazil	0.05	0.04	–20.0
Chile	0.14	0.18	28.6
Colombia	0.10	0.04	–60.0
Costa Rica	0.16	0.01	–93.8
Dominican Republic	0.08	0.03	–62.5
Ecuador	0.05	0.03	–40.0
El Salvador	0.17	0.16	–5.9
Grenada	0.04	0.05	25.0
Guatemala	0.30	0.27	–10.0
Guyana	0.28	0.29	3.6
Haiti	0.11	0.11	0.0
Honduras	0.25	0.16	–36.0
Jamaica	0.03	0.04	33.3
Mexico	0.07	0.06	–14.3
Nicaragua	0.22	0.22	0.0
Panama	0.13	0.13	0.0
Paraguay	0.27	0.18	–33.3
Peru	0.11	0.07	–36.4
Suriname	0.08	0.08	0.0
Uruguay	0.10	0.09	–10.0

[a]Includes firewood, sugar cane products, and other raw materials.

Source: Economic Commission for Latin America and the Caribbean. The Millennium Development Goals: A Latin American and the Caribbean Perspective. Santiago: ECLAC; 2005.

TABLE 13. Health effects attributed to short- and long-term air pollution[a] exposures.

Short-term effects
- Daily mortality
- Respiratory and cardiovascular hospital admissions
- Respiratory and cardiovascular emergency room visits
- Respiratory and cardiovascular primary care visits
- Use of respiratory and cardiovascular medications
- Days of restricted activity
- Work and school absenteeism
- Acute symptoms (wheezing, coughing, phlegm production, respiratory infections)
- Physiological changes (lung function)

Long-term effects
- Respiratory and cardiovascular disease mortality
- Chronic respiratory disease incidence and prevalence (asthma, chronic obstructive pulmonary disease)
- Chronic changes in physiological function
- Lung cancer
- Chronic cardiovascular disease
- Intrauterine growth restriction (intrauterine growth retardation, term low birthweight, small for gestational age)

[a]Includes particulate matter, nitrogen oxides, sulfur oxides, carbon monoxide, and ozone.

Source: Gouveia N, Maisonet M. Health Effects of Air Pollution. In: World Health Organization. WHO Air Quality Guidelines: Global Update 2005. Geneva: WHO; 2006.

timates were only calculated for some effects on health for some age groups and for some pollutants. Significant data are lacking in the Region on the effects of particulate matter exposure on child morbidity and mortality and adult morbidity.

In light of this situation, PAHO has responded by acknowledging the lack of data and information gathered and analyzed systematically on aspects such as exposure to pollutants and its potential effects and is stimulating and bolstering environmental monitoring processes in the Region's countries. At the same time, PAHO, together with professionals and groups of experts in the field from various centers of technical expertise in the Americas and other regions, is preparing technical guides on measuring environmental exposure and its effects, such as the air quality guidelines recently published. To strengthen the processes for attaining information and knowledge on this issue, PAHO has developed information, bibliographies, technical guides, methodologies, and training activities that are available electronically through its Virtual Library of Sustainable Development and Environmental Health.

TABLE 14. Quantitative summary estimates of percentage changes in mortality from all causes associated with a 10 µg/m^3 increase of PM_{10}, selected regions of the world.

Region	Percentage change (CI)	Reference
All causes, all ages		
Asia	0.49 (0.23; 0.76)	HEI, 2004
Europe	0.60 (0.40; 0.80)	Katsouyanni, 2001
Latin America	0.61 (0.16; 1.07)	PAHO, 2005
United States	0.21 (0.09; 0.33)	Dominici, 2003
Worldwide	0.65 (0.51; 0.76)	Stieb, 2002
All causes, over 65 years of age		
Europe	0.70 (0.50; 1.00)	Katsouyanni, 2001
Latin America	0.86 (0.49; 1.24)	PAHO, 2005
Worldwide	0.86 (0.61; 1.11)	Stieb, 2002

Source: Pan American Health Organization. An Assessment of Health Effects of Ambient Air Pollution in Latin America and the Caribbean. Santiago: PAHO; 2005.

CHEMICAL CONTAMINANTS

In the environmental health field, preventing or mitigating exposure to chemical contaminants is one of the priorities of government action. The globalization of contaminants and their presence in almost all phases of productive processes—from the extraction of raw materials to product processing, consumption, and finally, waste—place the entire population permanently at risk, particularly the most vulnerable groups: children, pregnant women, exposed workers, older adults, and the illiterate or barely

educated, who have limited or no access to basic information about the toxicity of these substances.

Chemical waste has become a serious environmental problem that requires special attention. In Brazil, for example, in 2004, 1,964,380 people were identified as having been exposed to chemical products at 703 sites with contaminated soil. The Government made provisions for the following risk assessments to be conducted in areas exposed to contaminating waste: organochlorides (Cidade dos Meninos, State of Rio de Janeiro); lead (Santo Amaro da Purificação, State of Bahía); solvents (Campinas, State of São Paulo); and volatile organic compounds (Barão de Mauá, State of São Paulo) (*33*, *34*).

In North America, the Commission for Environmental Cooperation (CEC)—created by Canada, Mexico, and the United States as part of the North America Free Trade Agreement (NAFTA)—used data available up to 2004 to identify children as the group that suffered the greatest exposure to dangerous chemical substances and recommended giving priority to preventive actions (*35*). Despite efforts being made in several countries and subregions of the continent, data available on chemical substances and their effects on the environment and health (acute intoxications and, fundamentally, chronic intoxications) do not reflect the magnitude of the problem. Of the different kinds of chemical substances increasingly used in the Region, metals and pesticides have required particular attention from health authorities due to problems arising in the last five years.

The CEC cites a study on metals that shows a drop in the average lead concentration in blood taken from children under 5 years old in the United States from 15 µg/dL in 1976–1980 to 1.7 µg/dL in 2001–2002. This decrease is linked to the elimination of lead sources in gasoline and paint, and to epidemiological surveillance. In Mexico, studies conducted from 1992 to 2005 on children in rural and urban areas indicated high lead concentrations, in some cases exceeding by more than five times the level of 10 µg/dL (*35*).

In the Amazon subregion, which encompasses Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela, contamination from mercury used in gold production threatens the population's health. Brazil produces an average of 200 tons/year, and is thus responsible for emitting mercury into the atmosphere, soil, and rivers.

Studies have indicated the possibility of "natural" exposure to mercury in the Brazilian Amazon area. Average concentrations of this metal found in the hair of inhabitants living in communities in the State of Pará that are not directly exposed to anthropogenic mercury sources were high, at levels ranging from 3.98 to 8.58 µg/g. These values were higher than those found in individuals not exposed to mercury in some countries in the Northern Hemisphere, where the average mercury in hair does not reach 3 µg/g (*36*).

Pesticides also pose a serious public health problem in South America and the Caribbean. Several countries report on the amounts of pesticides utilized and cases of acute poisonings, as indicated in Table 15. Over the last 40 years, approximately 85,000 tons of DDT were sprayed in Mesoamerica (Mexico and the seven countries of the Central American isthmus) to control agricultural pests and mosquitoes that are malaria vectors. DDT is an extremely stable toxic compound that accumulates in living organisms, persists in soil for decades, and is transported by the water cycle to areas far removed from where it was originally utilized, thus contributing to environmental pollution all over the world. Central America is predominantly covered by agricultural and forest land where a constant increase in pesticide use has been observed. In 2001, imports of 46 million kg of active ingredients were recorded, which constitutes 1.5 times more per person than the worldwide average, according to WHO estimates. The utilization of chemical pesticides as the principal strategy for controlling pests has significant social costs, as it produces both acute and chronic harmful effects on human health and inflicts damage on the environment, animals, and food.

TABLE 15. Extent of pesticide use and reported cases of acute poisonings, selected countries of the Americas, 2000–2005.

Country	Pesticide use (kg)	No. of poisoning cases
Argentina	46,347,000 (2001)	3,881 (2001)
Barbados	295,000 (2002)	2 (2002)
Bolivia	6,700,000 (2000)	2,208 (2000)
Brazil[a]	131,970,000 (2001)	4,273 (2001)
Colombia	77,000,000 (2000)	2,763 (2005)
Chile	24,197,000 (2000)	804 (2005)
Ecuador	36,118,222 (2004)	1,991 (2004)
Saint Vincent and the Grenadines	546,000 (2002)	29 (2002)
Saint Lucia	44,000 (2002)	3 (2002)
Uruguay	7,600,000 (2000)	439 (2002)

[a]Fourth largest consumer in the world.
Source: Ministries of Health and Agriculture.

Interventions

In order to address problems that pesticide use has brought about in Mesoamerica, national governments and PAHO, through its Sustainable Development and Environmental Health Area, have implemented various subregional initiatives, two of which are described in the following paragraphs.

The Occupational and Environmental Aspects of Exposure to Pesticides in the Central American Isthmus project, better known as PLAGSALUD, was carried out between 1994 and 2003 with financial support from the Danish International Development Agency with the objective of reducing the prevalence of health problems linked to pesticides and supporting the implementation of sustainable agricultural alternatives. The project scored a number of important achievements, a few of which are described below.

Health surveillance. All countries involved were successful in establishing acute pesticide poisoning surveillance and incorpo-

rating it into their national epidemiological surveillance systems, thereby allowing needed prevention and control actions to be better targeted (*37*). As a result, reported poisonings initially increased. After various project interventions between 1999 and 2002, however, the number of acute poisoning cases reported dropped from 7,227 to 6,010, and the number of deaths fell from 867 to 712. The poisoning rate per 100,000 population decreased from 20.3 to 15.8; the mortality rate fell from 2.4 to 1.8; and the poisoning rate for agricultural workers went from 91.7 to 67.7 per 100,000 population. Indicators obtained from the surveillance systems, and the tools these provided, made local interventions to reduce health and environmental risk factors possible. This information also swayed decision-makers in the health, labor, education, agricultural, and environmental fields to promote and support adequate case treatment, develop prevention and control measures, and improve existing legislation regarding pesticides, not only at a municipal and national level, but also throughout the Central American subregion (*38*).

Intersectoral and interinstitutional coordination. One of the most effective and practical results of PLAGSALUD was the creation across Central America of more than 300 intersectoral local commissions on pesticides made up of representatives of the health, labor, education, environment, and agricultural sectors; city halls; nongovernmental organizations; workers' associations; and civil society. These commissions were the most vivid expression of the work done locally in Central America to reduce the negative effects of pesticides, raise community awareness, and promote the use of alternatives to agrochemicals.

Legislation. Guidelines developed for improving pesticide legislation over the course of the project facilitated many achievements. For example, in all seven countries, legislation governing pesticide restrictions and prohibitions was gathered and analyzed. Such legislation was also widely disseminated to relevant sectors to foster and consolidate institutionalized civil society participation in all stages of decision-making.

In addition, Agreement No. 9 regarding the prohibition of 107 pesticides and the restricted use of 12 others was approved at the XVI Special Meeting of the Health Sector of Central America and the Dominican Republic (RESSCAD) held in 2000. This forum brings the issue of health into the subregion's social development process, and its principal aim is to foster the sharing of experiences, and, above all, to obtain a commitment from participating governments to jointly address common environmental public health problems in a coordinated fashion in the spirit of the Central American integration framework.

Education. PLAGSALUD prepared and published educational materials designed for the general public, schoolchildren, workers, health professionals, and agricultural experts on a variety of topics, including acute pesticide poisoning diagnosis, treatment and prevention; health surveillance of pesticides; alternatives to pesticide use (integrated pest management and organic agriculture); pesticide legislation; epidemiological status of acute pesticide poisonings; and research outcomes. This material continues to be used today, not only in Central America, but also in other Latin American countries. The creation of school-based organic vegetable gardens in several countries, an initiative supported by PLAGSALUD, deserves special mention. During the school year, students actively participated in tending vegetable gardens located near their schools, where they learned about the viability of growing agricultural products free of chemical pesticides and how this strategy could help them take better care of the environment.

> *"We must be able to determine more precisely the essential limits of environmental quality so that we can set realistic standards that will not interrupt development on the one hand or compromise health on the other."*
>
> **Abraham Horwitz, 1973**

Research. Professionals were trained in research methodology, both locally and nationally in all countries, which then made it possible to conduct studies on priority issues related to pesticides, generate data needed to carry out an adequate assessment of the situation, and propose appropriate interventions. Of note among this body of research are studies focusing on pesticide-related knowledge, attitudes, and practices; the underreporting of acute pesticide poisoning incidents (conducted in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama); monitoring bodies of water (Honduras and Belize); determining levels of organochloride and organophosphorous pesticides in six water treatment plans in San Salvador, El Salvador; raising awareness among health services personnel regarding acute pesticide poisoning case management; pesticide exposure in women working in the flower-growing industry; assessing the level of awareness regarding pesticide use, management, and legislation among workers at agrochemical points of sale (Guatemala); and gender roles in social behavior regarding pesticide use in banana cooperatives (Panama).

A second noteworthy initiative undertaken by the Mesoamerican countries in conjunction with PAHO's Sustainable Development and Environmental Health Area is the Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America, which is a four-year program (2004–2008) supported by the UNEP, the Global Environment Facility (GEF), and the CEC, and known as the DDT/UNEP/GEF/PAHO Program.

Malaria is a transboundary public health problem with multisectoral implications that affects approximately 89 million people in Mesoamerica, the majority of whom live in indigenous communities. Population growth, the rapid expansion of agricultural lands, environmental degradation, and high rates of migration

among the affected population groups facilitate the disease's spread across national borders. Given this situation, and bearing in mind the negative repercussions of intensive DDT and other persistent insecticide use for both human health and the environment, PAHO, together with the Governments of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama, are executing the DDT/UNEP/GEF/PAHO Program (*39*), whose principal objective is to prevent the reintroduction of DDT into the subregion and to show that alternative methods to DDT for controlling malaria are both cost-effective and sustainable within the framework of community participation. The Program's three components are described in the following paragraphs.

Demonstration projects and dissemination. This component utilizes the comprehensive malaria vector control model (without DDT use), in which principles of epidemiology are blended with those of the social sciences through the active participation of the health, education, environmental, and agricultural sectors. The projects are based on the WHO Roll Back Malaria Partnership model and the successful Mexican experience. The projects incorporate a combination of interventions that address vector control, early diagnosis, and timely case treatment, and emphasize physical control, with measures focused on environmental sanitation, clearing the home and yard of potential vector breeding sites, and whitewashing dwellings. They also include biological control using larvivorous fish, biological larvicides, and other environmentally friendly forms of control. An important dimension of the project is to strengthen the principles of social equity through greater interventions coverage in indigenous rural communities that have historically been excluded and provided little or no health care. More than 80% of the inhabitants of the areas selected for these projects are from indigenous communities with high rates of malaria transmission. To this end, resources have been allocated so that new vector control modalities may be adapted to the unique culture of each community and implemented with the active involvement of local organizations and leaders. Discussion forums, in which indigenous leaders, local technicians, representatives of municipal governments, and authorities from various governmental sectors participate, have bolstered the indigenous communities' acceptance of new malaria control alternatives that do not depend on persistent insecticide use. Experience obtained from these projects can be used as a model that can be replicated not only in other countries in the Americas, but also in other regions of the world. The bottom-up approach, rooted in the active participation of local communities, nongovernmental organizations, and government institutions, also contributes to ensure the sustainability of the models introduced under the Program.

Strengthening of national institutional capacity to control malaria without DDT. This component has been instrumental in boosting national capacity to assess the risk of malaria transmission. Furthermore, laboratory infrastructure has improved and the population has gained more awareness about malaria.

Elimination of DDT stockpiles. Under this component, the Program, in compliance with the Basil Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Stockholm Convention on Persistent Organic Pollutants (POPs) (*40*, *41*, *42*), will allow 136 tons of DDT and 64 tons of other POPs—toxaphene, chlordane, hexachlorobenzene, aldrin, dieldrin, and mirex—to be safely eliminated from the eight countries involved in the DDT/UNEP/GEF/PAHO Program by incineration. These POPs, which are inadequately stored, pose a significant risk of contamination.

Chemical Safety in Latin America and the Caribbean

Actions regarding chemical safety in Latin America and the Caribbean have followed the recommendation from Chapter 19 of the Rio Declaration on Environment and Development's Agenda 21 regarding ecologically sound chemical management. The Third Session of the Intergovernmental Forum on Chemical Safety was held in Salvador da Bahia, Brazil, in October 2000. In February 2006, the International Conference on Chemicals Management defined the Overarching Policy Strategy and the Global Plan of Action for international activities on this issue. In line with this work, headway has been made in the following areas:

- Several countries in the Region of the Americas (Argentina, Brazil and Venezuela, among others) now have national chemical safety profiles, an instrument that enables existing infrastructure and management capacities for these products to be evaluated.
- Seventeen countries have one or more poison control centers that provide treatment and information.
- Several toxicology and chemical security networks have been created, enhancing information exchange on chemicals, both regionally in Latin America and the Caribbean (RETOXLAC), as well as nationally: REDARTOX (Argentina), RENACIAT (Brazil), RITA (Chile), LINATOX (Cuba), RETOMEX (Mexico), and REPATOX (Panama).
- Eight PAHO/WHO Collaborating Centers in the Region have actively supported chemical risk management and assessment activities.
- The Virtual Library of Sustainable Development and Environmental Health has gathered data on chemical substances, thereby strengthening human resources capacity in assessment and risk management through self-learning courses available through the Library. These courses include risk communication; assessment, treatment, and prevention

of acute pesticide poisoning; methodologies for identifying health risks at contaminated sites; and chemical disaster prevention, preparedness, and response.
- Work has begun on harmonizing reporting requirements for the most hazardous pesticides in Central and South America in order to decrease or eliminate exposure to these toxins.
- Countries have national integrated chemical substance management plans, although the current trend is to design and execute subregional plans that bolster national capacities (e.g., the Central American Subregional Plan, under the aegis of RESSCAD, and the Andean Subregional Plan).
- Efforts are under way to apply the new global chemicals classification and labeling system.

FOOD SAFETY

Chemical and microbiological food contamination continues to significantly affect public health and indirectly impact tourism and international trade in food. Foodborne diseases (FBD) are a worldwide problem that has been exacerbated over the past several decades due to changes in the international arena, such as population growth, poverty, rapid urbanization in developing countries, and increasing international trade in food for human and animal consumption, in addition to the appearance of new foodborne disease-causing agents and mutant microorganisms with greater pathogenicity. FBD can have serious consequences not only on health, but also on individual, family, and national finances, and the most vulnerable groups include children, the aged, and immunodepressed individuals. Studies conducted during the last 30 years on acute diarrheal diseases—the principal symptom of FBD—have shown a decline in associated mortality rates, but morbidity rates have remained relatively stable. These infections remain one of the main causes of morbidity and mortality in children under age 5, with 1.5 billion cases of diarrhea in the world annually, resulting in 21% of deaths in children under age 5, which, according to estimates, accounts for 1.5–2.5 million deaths every year (*43*).

The incidence of illnesses caused by microorganisms that are principally foodborne, such as *Salmonella* spp. and *Campylobacter* spp., has risen considerably in many countries. Data on South America from the WHO program for epidemiological surveillance of *Salmonella* and other enteric microorganisms (*44*) indicate that from 2000 to 2004 there was a 43.5% rise in the number of *Salmonella* isolations, for a total of 15,737. During this period, the most prevalent serotypes were *S. enteritidis* (40%) and *S. typhimurium* (16%) (*44*). Moreover, new and serious hazards have emerged in the food chain, such as infections from enterohemorrhagic *Escherichia coli* and bovine spongiform encephalopathy.

Chemical contaminants remain an important cause of FBD, a striking example of which is the massive methanol poisoning that occurred in Nicaragua in September 2006. The Nicaraguan Ministry of Health reported 788 poisoning cases, resulting in 44 deaths. Likewise, natural toxins, such as mycotoxins and marine toxins, as well as environmental toxins such as mercury and lead, have been implicated in FBD outbreaks.

Deficiencies in epidemiological surveillance coverage in general persist throughout the Region, particularly as regards the FBD component, as well as outbreak detection and research, reporting, and analysis, and geographical inequalities. From 1993 to 2002, PAHO's regional FBD system received reports of outbreaks in 22 countries in the Region: of the 4,093 outbreaks in which an etiological agent was identified, 21% were caused by marine toxins (838 of them from ciguatoxin) and 4.6% by unspecified chemical contaminants. More recently, in a WHO consultation of experts on the burden of FBD that took place in September 2006 (*45*) it was determined that arsenic, cadmium, fluoride, lead, and methylmercury are the chemical FBD-causing agents for which the greatest quantitative data are available.

It is important to emphasize the link between tourism and food safety. Tourism is one of the biggest growth industries in the Americas, where the number of visitors has had a cumulative increase of 5% over the past decade (1990–2000). In several nations, tourism accounts for up to 25% of GDP and is the country's main source of employment and income. According to data from the World Travel and Tourism Council, in the Caribbean the industry provided 2.4 million jobs and generated economic activity worth US$ 35.3 billion in 2000, which is a nearly tenfold increase when compared to the US$ 3.8 billion generated in 1980. Therefore, all factors impacting quality and competitiveness are extremely important. FBD outbreaks in tourist areas and hotels have led to travel and reservation cancellations, as well as a growing concern on the part of the tourism and public health sectors, government authorities, and medical insurers. Several countries have shown an increase in the number of reports of "traveler's diarrhea" from different bacterial and viral agents associated with contaminated food. It is reported that 20%–50% of travelers suffer at least one episode of diarrhea (*46*). The direct cost associated with such episodes is also significant. Jamaica, for example, reports that medical treatment for each traveler affected represents a loss for the national economy of US$ 116.50, which is the total estimated cost per case (*47*).

Food safety and agrifood trade are also closely linked. Fresh products, which include vegetables, fruit, meat, and seafood, make up approximately half of all agricultural and food exports of developing countries. In Latin America, agricultural exports from Central America, the Southern Cone, and the Andean subregion account for 48%, 34%, and 23%, respectively, of all exports. In Brazil, agribusiness accounts for 33.8% of GDP, 44% of exports, and 37% of employment. All of this trade is governed by the World Trade Organization's Agreement on the Application of Sanitary and Phytosanitary Measures, whose standards play a

key role in ensuring food safety, which in turn facilitates the achievement of sustained economic growth.

Countries have invested significant effort in improving their food safety control systems, such as in Uruguay's project under the Uruguayan Food Security Agency, Ecuador's and Venezuela's development of integrated national food control systems, and Colombia's and Peru's application of epidemiological surveillance systems, which have a FBD component. Nevertheless, weaknesses may still be detected in the food control systems in force, as shown in a PAHO study (*48*) featuring the organization of member countries' food safety systems in terms of their institutional framework. Using the cluster analysis technique, the study defined five task frameworks: food laws and regulations; food control management; inspection services; food monitoring/epidemiological surveillance and laboratory services; and information, education, communication, and training. The analysis performed generated seven clusters that satisfied 87% of the whole variability studied. Although the data obtained do not accurately reflect the reality of the countries, due to the fact that the information obtained was insufficient, they do reflect the trends observed in food safety systems of the countries assessed.

The first cluster is made up of the three countries whose food safety systems are in the best condition, reaching in all the task frameworks defined, a level of development that ranges from 96% to 100%, with an overall average of 99%. Thus, this cluster's degree of development is nearly equivalent to the ideal level. In contrast, the other two clusters, made up of 19 countries, have food safety systems that are less developed, ranging from 25% to 60%, with an overall average of 44% and 48%, respectively. These figures illustrate that these countries do not meet even half of the conditions of the ideal system proposed in the study and at the same time indicate where potential modernization efforts should be focused. The four remaining clusters, encompassing 11 countries, have an overall average development level that ranges from 58% to 81% and could be described as having food safety systems that are at mid-level development. Their full development could be reached with a coordinated restructuring and modernization program.

Finally, the morbidity, mortality, and disability burden due to FBD is not well defined in the countries in the Region. PAHO, in conjunction with national public health authorities, has organized several Region-wide activities designed to help countries strengthen their disease surveillance systems and determine the morbidity burden due to acute gastroenteritis. The data obtained will enable an evaluation to be conducted of the acute gastroenteritis burden of foodborne origin associated with specific pathogens commonly transmitted by food. For 2004, the Foodborne Diseases Active Surveillance Network in the United States, better known as FoodNet, estimated that the rate of acute foodborne gastroenteritis was 0.72 cases per person-year, which would indicate the existence of 195 million episodes nationally (*49*).

The first protocol of disease burden studies carried out jointly by WHO, PAHO, the Public Health Agency of Canada, U.S. Centers for Disease Control and Prevention (CDC), and the Cuban Ministry of Health concluded during the first half of 2006. Preliminary data from three sentinel sites, selected because of their cultural, economic, cultural, geographic and climatological differences, found that for each case of infection from *Shigella* spp. reported to the surveillance system, there were 688, 639, and 570 individuals that requested medical attention in their community, respectively (*50*).

This preliminary study clearly underlines the need to determine the true FBD burden. Estimating FBD underreporting and adapting improved microbiological and epidemiological methodologies to detect and report on pathogenic agents nationally will boost epidemiological analysis capacity for developing active FBD surveillance systems based on the cases diagnosed.

WORKERS' HEALTH

Work-related illnesses, injuries, and deaths are determined not only by traditional and emerging occupational hazards, but also by social determinants (employment situation, income level, gender, ethnic group), access to occupational health services and programs, and work practices that affect health. The structural characteristics of the Region's countries (including demographic and economic dimensions, as well as the relative share of private-sector participation) have led to deepening inequities that affect working conditions and workers' health. An ECLAC study determined that 20%–40% of the employed population still did not earn sufficient income to purchase a basic basket of goods (*51*). It also found that only 30% of all formal-sector workers received some type of occupational health services (*52*), which generally was geared towards treatment and not prevention or promotion. The rate of fatal occupational accidents was 2.5 times greater in Latin America and the Caribbean than in Canada and the United States (*53*).

Since 1992, the rate of fatal occupational accidents among Hispanic construction workers in the United States has been markedly higher than for non-Hispanic construction workers. In 2001 (the most recent year for which data are available), the rate of fatal occupational injury among Hispanic construction workers was 19.5 per 100,000 full-time workers, or 62.5% greater than the 12.0 per 100,000 for non-Hispanic construction workers (*54*). At the same time, 44.0% of workers in Latin America earn wages that place them below the poverty line and 19.4% under the extreme poverty line (*55*). In Honduras and Nicaragua, it is estimated that 8%–12% of all children and youth under the age of 18 live and work in the street. It is anticipated that the number of children who work will continue to rise due to rapid urbanization, unequal income distribution, economic crises, natural disasters, and poverty (*56*). Such inequities have been exacerbated by macroeconomic and social policy changes related to globalization; government, health, and social security

reforms; the so-called labor market flexibilization; and longer workdays (*57*).

Nonetheless, it must be acknowledged that the number of Latin American and Caribbean children and youth who work has dropped. In Latin America in 2000, approximately 17.4 million children aged 5–14 worked (16.1% of all children in the Region), while by 2004, this figure had fallen to 5.7 million children (5.1% of the Region's total number of children). The number of economically active children therefore decreased by more than two-thirds over that four-year period. The recent economic activity rate (5.1%) for children now approaches that of a heterogeneous group of nations, including developing countries, emerging economies, and several Middle Eastern and North African countries (*58*).

The slightly positive trends seen in the labor market in Latin America and the Caribbean in recent years are in part thanks to three successive years of economic growth exceeding 4%. The unemployment rate for the total population rose only slightly in 2006, but increased 1.8% during the past decade, mainly because of the increase in the proportion of female workers, which rose from 41.5% in 1996 to 47.0% in 2006. The rate of female participation in the labor market increased from 46.1% in 1995 to 52.4% in 2006 (*59*).

Social protection varies considerably from country to country (Table 16), and not enough reliable, comparable data are available, as shown in the assessment survey of the PAHO Regional Plan on Workers' Health (*60*).

According to the International Labor Organization (ILO), between 1992 and 2002 the Latin American informal economy grew from 42.8% to 46.5%. Generally, informal employment is associated with greater occupational hazards, an absence of legal protection, health benefits, and other forms of social protection, as well as unstable working conditions and few opportunities to overcome a level of economic subsistence. Women, children, and aged are the least protected of all occupational groups (*61*).

Workplace Hazards and the Occupational Morbidity and Mortality Burden

Close to half of the Region's population spends a third of their lifetime working. According to WHO, two-thirds of workers are exposed to unsafe and unhealthy working conditions, in which several categories of risk factors are pervasive (Table 17) (*62*).

In a 2005 WHO report on the impact of occupational hazards on the global burden of occupational disease, five predominant factors were assessed: carcinogens, airborne particles, noise, ergonomic stressors, and injury hazards. The report indicates that in 2000 these hazards led to 850,000 fatalities in the world—almost 40% of the 2.2 million total deaths estimated by the ILO (*63*)—in addition to the loss of 24 million healthy life years.

Despite the gravity of the situation, in Latin America and the Caribbean the dearth of data and the obstacles to gathering reliable information on occupational injuries and diseases are notable. This is due to the dearth of adequate surveillance systems to define damages and their risk factors, underdiagnosis, underreporting, and the need for adequately trained medical and public health professionals. It is estimated that only 5%–10% of all occupational diseases are reported in developing countries. In Argentina, Brazil, Chile, Colombia, and Nicaragua, however, there is growing political interest, which, coupled with subregional integration processes, has led to significant legislative changes and strengthened occupational surveillance systems.

Occupational Accidents

The earlier-mentioned 2005 WHO report estimates that occupational accidents represent 8% of all accidents in the world and cause 312,000 deaths and a loss of 10 million disability-adjusted life years (DALYs). The agricultural, construction, and mining industries present the greatest number of risks for workers, especially in developing countries. The PAHO Regional Plan on Workers' Health assessment survey revealed that in 2003, among the Latin American and Caribbean countries with the most reliable data systems, the percentage of workers who had suffered accidents totaled 8.8% in Chile (*64*), 8.8% in Argentina, 6.8% in Colombia, 5.0% in the United States, and 2.0% in Canada. Many other countries could not provide these figures or only had data from years previous to the 2000–2005 period.

As regards occupational accidents trends, the Mexican Social Security Institute (IMSS) indicates that during the decade of 1992–2002, the rate of occupational accidents for every 100 insured workers fell from 6.6 in 1992 to 3.5 in 2002 for men, and from 2.7 to 1.3 for women during that same period (*60*).

In Chile, a 2004 occupational survey (*65*) showed that the rate decreased from 10.4% in 1997 to 7.1% in 2004. At the same time, the rate of fatal accidents dropped from 12% in 2003 to 9% in 2004 (*53*). These figures contrast with data provided by the 2005 Occupational Health Equity Report, which indicate a slight reduction in the rate of accidents between 1990 and 2002 (from 11.5% to 9.0%), and by the Superintendent of Social Security, which reported a decrease in the rate of accidents from 9.1% in 2000 to 8.8% in 2003 (*64*).

In Colombia, a constant increase can be observed in the number and rate of occupational accidents between 1994 and 2003; however, in 2004 these figures began to drop, and towards the end of 2005, 327,235 presumed occupational accidents were reported, of which more than 75% were described as being job-related, with a rate of 5.2% (*66*).

Occupational Diseases

Occupational diseases over the last several decades are characterized by mixed risk profiles, with a prevalence of "old epidemics," such as occupational respiratory diseases, dermatosis, occupational hypoacusia, and poisonings, together with "new epidemics," such as musculoskeletal disorders, chronic cardiovascu-

TABLE 16. Coverage under workers' compensation systems, selected countries of the Americas, 2001–2004.

Country	Year	% of economically active population	% of population employed	% of wage-earners and salaried workers	Source
Cuba	2004	79.4	100	NA	INSAT. Estimates from the PAHO Regional Plan Assessment Survey
Canada	2004	68.0	100	NA	Estimates from the PAHO Regional Plan Assessment Survey
United States	2004	63.0	75.4	81.5	University of Texas. Estimates from the PAHO Regional Plan Assessment Survey
Chile	2004	61.9	68.3	96.1	Ministry of Health. Estimates from the PAHO Regional Plan Assessment Survey
Panama	2002	56.7	66.2	NA	MSST. Estimates from the PAHO Regional Plan Assessment Survey
Costa Rica	2001	52.4	72.6	72.6	FISO/IDB
	2004	50.9	71.5	71.5	CCSS
Argentina	2004	32.3	45.1	59.1	SRT. Estimates from the PAHO Regional Plan Assessment Survey
Mexico	2003	28.7	29.4	NA	IMSS. Report to the Federal Executive Branch 2003–2004, June 2004
Guatemala	2001	24.6	NA	NA	FISO/IDB 2002
Colombia	2004	23.4	27.0		SENA. Estimates from the PAHO Regional Plan Assessment Survey
El Salvador	2000	19.6	24.5	47.2	FISO/IDB 2002
Nicaragua	2001	16.5	18.5	NA	FISO/IDB 2002
	2004	16.2	18.5	NA	Estimates from the PAHO Regional Plan Assessment Survey
Peru	2004	9.5	12.0	90.0	MSST. Estimates from the PAHO Regional Plan Assessment Survey
Brazil	2001	NA	40.0	NS	ILO 2003 Labour Overview
Ecuador	NA	NA	NA	NA	NA
Dominican Republic	2002	NA	NA	(9.0)	Number of insured unknown (ILO 2004)
Paraguay	2001	NA	9.0	NA	ILO 2003 Labour Overview
Uruguay	NA	NA	NA	NA	NA
Venezuela	NA	NA	NA	NA	NA

NA: data not available.
INSAT: National Institute of Workers' Health.
ILO: International Labor Organization.
FISO/IDB: Ibero-American Occupational Health and Safety Foundation/Inter-American Development Bank.
CCSS: Costa Rican Social Security Fund.
SRT: Office of the Superintendent for Workers' Compensation.
IMSS: Mexican Social Security Institute.
SENA: National Training Service.
MSST (Panama): Ministry of Labor and Social Security.
MSST (Peru): Occupational Health and Safety Bureau.

lar diseases, occupational stress, psychological harassment, and other emerging diseases, such a multiple chemical hypersensitivity, workplace-related cancer, and the effects of nanotechnology.

Exposure to asbestos, silica, and hazardous chemicals at the workplace is responsible for 9% of all cancers of the lung, trachea, and bronchus, and 2% of all cases of leukemia in the world. It is estimated that occupational exposure to carcinogenic agents led to 102,000 deaths and 1 million DALYs in the world in 2000. The fraction of deaths and DALYs attributable to pneumoconiosis (silica, asbestos, and coal) and mesothelioma is 100%. In Brazil, more than 2 million workers—concentrated in the construction, mining, metal working, and non-metallic mineral processing industries—are exposed to silicon during more than 30% of the working day. In Bolivia and Peru, the prevalences are similar, al-

TABLE 17. Profiles of occupational risk factors, by type, Region of the Americas.

Risk factors	Principal economic activities where found	Consequences (effects)	Current situation in the Americas
Physical: • Noise • Vibrations • Radiation (ionizing and non-ionizing) • Extreme temperatures • Electromagnetic fields	• Mining • Agriculture • Construction • Fishing • Forestry	Hearing disorders and, in particular, deafness, are one of the leading causes of occupational morbidity in various countries in the Region. According to WHO, 16% of hypoacusia cases are attributable to exposure in the workplace. Diseases stemming from exposure to the other physical risk factors also cause significant occupational morbidity and disability in the Region.	The diverse complexity of etiology, diagnosis, and evaluation of physical risk factors present an obstacle to the formulation of comprehensive intervention strategies. These factors affect up to 80% of the workforce in developing countries.
Ergonomic: • Lifting heavy loads • Monotonous and repetitive work • Fast pace of work	• Mining • Agriculture • Construction • Services sector	Musculoskeletal disorders are one of the leading causes of occupational morbidity. WHO has estimated that 37% of all cases globally of lumbar-region pain are attributable to work-related situations.	Musculoskeletal disorders, particularly those affecting upper extremities or the lumbar region, are currently the most common occupational diseases in the countries of the Region. Such disorders are a significant disability, especially among young workers.
Biological: • More than 200 kinds of viruses, bacteria, fungi, parasites, molds, pollen, and organic dust	• Services sector (health workers) • Agriculture	Biological phenomena cause airborne and blood-borne infectious diseases, such as tuberculosis, HIV infection, and hepatitis, and emerging infections such as severe acute respiratory syndrome (SARS) and avian influenza infection in humans.	Several Latin American and Caribbean countries have reported that health workers run 1.5 to 2 times greater a risk of being infected by the hepatitis B virus. Nevertheless, vaccination coverage against this disease stands as low as 39% in several countries.
Psychosocial: • Occupational stress—Psychological harassment • Overburdening • Little control	• Services sector (financial, banking, insurance, telecommuting) • Agriculture • Manufacturing	Occupational stress and psychological harassment in the workplace are the most common consequences of this kind of risk. Post-traumatic stress syndrome is also of importance, especially among health workers. Occupational stress is also associated with cardiovascular and digestive problems and diseases of the immune system, among others.	Psychosocial risks are reported to be the second-most common cause of work-related problems among U.S. workers, and they increasingly are the cause of disability, productivity decreases, and absenteeism in several other countries in the Region.
Chemical: • Handling chemicals • Fire and explosions • Disposal of hazardous wastes	• Agriculture • Chemical industry • Manufacturing • Pharmaceutical industry • Chemical production	Exposure to harmful chemicals in the workplace are responsible for such conditions as acute pesticide poisonings, asthma, dermatitis, allergies, injuries to the peripheral and central nervous system, hepatic injuries, reproductive problems, and various kinds of cancer.	Between 1,500 and 2,000 chemicals are used intensively in various economic activities in the Region. In 2002, the acute pesticide-poisoning rate in Central America was 15.8 per 100,000 inhabitants, with a total 712 fatalities that year.

Source: Pan American Health Organization, Area of Sustainable Development and Environmental Health.

though silicotuberculosis is also reported. In 2005, 3,500–4,000 workers in Peru without social security coverage suffered from silicosis.

According to WHO estimates, nonmalignant chronic lung diseases caused 360,000 deaths and close to 6.6 million DALYs (*63*). In the year 2000, 11% of asthma cases worldwide were considered to stem from occupational exposure. The WHO report also estimated 0.8 million DALYs lost from ergonomic stressors and 4.2 million from hearing losses. For health workers, the report determined that 40% of hepatitis B and C and 1%–12% of all cases of HIV/AIDS are due to needlestick injuries.

At the end of the 1990s, when the PAHO Regional Plan on Workers' Health was drawn up, it was estimated that in Latin America and the Caribbean only 1%–4% of the cases of occupa-

tional diseases were reported, and it was proposed that strategies for diagnosis and recognition of these illnesses in the Region be strengthened. The results, however, are not very encouraging. The survey of the PAHO Regional Plan, recent studies, and other sources show that Chile reported a significant increase in the number of cases between 2000 (4,481) and 2004 (9,200). Argentina reported 5,630 cases for 2003, with a rate of 10 per 10,000 workers. Colombia reported a rate of 2.43 cases per 10,000 workers in 2003, while in the United States for that same year the rate was 33.3 cases per 10,000 workers. The remaining countries did not have national data available, although the great majority of them do have an official list of occupational diseases. The differences between the rates in the United States and Latin America stem from underreporting in the latter.

In Mexico, for example, between 1992 and 2002, the IMSS recorded 5,212,372 claims for workmen's compensation, of which only 0.9% were categorized as occupational diseases. The most frequent were hearing disorders and traumatic deafness, respiratory infections from different kinds of chemical exposure (pneumoconiosis, anthracosilicosis, and chronic bronchitis), and contact dermatitis. There is significant underreporting, given that more than 50% of all workers are not insured by the IMSS and do not contribute to the social security system.

In Costa Rica, occupational illness records are included as part of the occupational accident statistics, which is why it is difficult to distinguish and analyze them. By 2004, poisoning and intoxications (430) were included, as well as dysphonias (398), effects from climatological exposure (224), suffocations (101), effects from electricity (81), harmful effects from radiation (33), lumbagos (5,693), and others (4,474). Nevertheless, it is difficult to correlate reported exposure and injuries, as it is impossible to draw conclusions regarding the occupational disease situation beyond the fact that there is a relatively high number of lumbagos, intoxications (type unknown), and dysphonias. In Argentina, the Superintendent of Occupational Hazards indicated that in 2003 work-related health conditions accounted for 1.4% of the reported accident cases and estimated the incidence of occupational diseases to be 1 per 1,000 workers. The most frequent condition is hypoacusia, which accounts for more than 50% of the cases (*67*).

In Chile, the Superintendent of Social Security indicated that in 2004, 44.3% of occupational diseases led to temporary disability, 0.8% to partial permanent disability, and 0.01% to total permanent disability (eight cases) and one death. It was not possible, however, to find diagnoses recorded as such in this source. The Mutual Accident Insurance Association reported 4,481 work-related health conditions in 2000, principally skin injuries, osteoarticular disorders, upper and lower respiratory diseases, poisonings, and hypoacusia (*68*), a figure that remained stable during the 2000–2001 period.

In Colombia, the number of occupational diseases reported was approximately 700 cases a year for the 1996–1999 period, and close to 900 cases a year for the 2000–2003 period, with an annual average rate of 2 cases per 10,000 workers. In the last two-year period, the figures increased significantly, doubling by 2005, with 1,909 reported cases (a rate of 3.74 per 10,000 workers) (*69*). Among these illnesses, musculoskeletal afflictions continue to be the most frequent and costly, accounting for 33.8% of the total, despite underreporting and diagnostic difficulties. These were followed, in order of frequency, by chronic respiratory conditions, with 23.8% of the total; dermatosis, with 18.4%; and occupational hypoacusia, with 14.5%.

A study of occupational health conditions that was conducted among more than 12 million workers in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama also acknowledged reporting and underreporting problems regarding occupational diseases in these countries (*70*). It is striking that in three countries—Costa Rica, Nicaragua, and Panama—several chronic health problems were reported as being associated with occupational exposure to pesticides, including a high incidence of skin injuries and chronic neurotoxic effects among workers who previously suffered organophosphorous insecticide poisonings and among male and female vector control workers on banana plantations who had been exposed to DDT.

Occupational Mortality

According to ILO data, global occupational mortality, due to both occupational accidents and diseases, has been increasing. The ILO assigned 11% of global fatal occupational accidents to Latin America and estimated close to 140,000 work-related fatalities in that subregion in 2003. Absolute numbers reveal that cases in Latin America and the Caribbean consist mainly of occupational accidents and violence, genitourinary disorders, circulatory diseases, malignant neoplasms, and communicable diseases. Circulatory system diseases and malignant neoplasms are among the leading mortality causes, making up close to 55% of total cases, followed by accidents and violence, at 22%.

Only 46% of the countries surveyed provided mortality statistics on occupational accidents and only 30% on occupational diseases. The work-related accident mortality rate ranged between 32.8% in Nicaragua to 4.0% in the United States. In Central America, PLAGSALUD-supported surveillance systems reporting on cases of acute pesticide poisoning fatalities show a progressively upward trend in the rate, which rose from 0.30 per 100,000 inhabitants in 1992, to 2.44 per 100,000 in 1999, and then decreased to 1.87% in 2002 (*60*).

International Policies and Partnerships

During the 2001–2005 period, important progress was observed in the field of occupational health in the Region, as reflected at the IV Summit of the Americas, held in Mar del Plata, Argentina, in November 2005. At this gathering, Heads of State committed to promoting "integrated frameworks of public environmental, employment, health, and social security policies to

protect the health and safety of all workers" and fostering "a culture of prevention and control of occupational hazards in the Hemisphere" (*71*). Their commitment was born of intense and effective work on occupational health programs and best practices, and was based on strategic, programmatic, and operational partnerships between the labor, private, and academic sectors of national governments, including the Network of PAHO/WHO Collaborating Centers, and nongovernmental organizations, including the Hispanic Forum Network in the United States, and numerous international, regional, and subregional institutions, including WHO, ILO, the International Commission on Occupational Health, the United Nations Development Program (UNDP), GEF, the UNESCO Regional Office for Education in Latin America and the Caribbean, the Organization of American States (OAS) and its Inter-American Committee on Education, the Inter-American Conference of Ministers of Labor (IACML), the Inter-American Development Bank (IDB), the Central American Integration System, the Southern Common Market (MERCOSUR), and the Andean Community of Nations (CAN).

The synergetic work produced by these partnerships has mainly been guided by the Healthy Workplace Initiative, the cross-cutting strategy of PAHO's Regional Plan on Workers' Health that is geared towards institutional strengthening in the countries of the Americas through human resources training, establishing data systems, supporting applied research, disseminating information, managing workers' health systems, and sharing information on best practices and successful programmatic strategies.

Some noteworthy examples of progress achieved include the execution in Central America of consolidated programs on best practices by the OAS/IACML and ILO. Such programs have used the PAHO/CERSSO (Regional Center for Occupational Safety and Health) toolkit to implement the Healthy Workplace Initiative in the maquiladora and flower-growing industries. The cost-benefit analysis with the toolkit highlighted the fact that investments in the prevention of occupational accidents and diseases in the maquiladoras—for example, those introduced in Guatemala and the Dominican Republic—would yield a return on investment of between 3 and 33 times (*72*).

Also to be noted is PAHO's commitment to promote the intersectoral and Region-wide Strategic Alliance of Health, Labor, Education, Environment, and Occupational Health and Safety Initiatives as a horizontal technical cooperation tool aimed at seeking and strengthening synergies between sectors with common goals.

Another important step forward is the work done jointly with the ILO to bolster data systems and reduce factors that contribute to underreporting. In conjunction with the IACML and ILO, two basic regional indicators—fatal and nonfatal accidents, and pesticide poisonings—will be prepared. They will be the first indicators entered in a newly created PAHO joint database. The proposed database will be based on reliable data systems established in Argentina, Brazil, Chile, Colombia, Jamaica, Mexico, and Nicaragua, with strengthened diagnosis and occupational disease reporting, and the creation of occupational health observatories required by law. In order to disseminate data, PAHO has sponsored and provided technical support, jointly with the ILO, to a virtual occupational safety and health network, which operates as a discussion forum and brings together participants from 40 Spanish and Portuguese-speaking nations.

Furthermore, the Americas Regional Plan to Eliminate Silicosis was implemented with the support of PAHO/WHO Collaborating Centers, the U.S. National Institute of Occupational Safety and Health, the National Institute of Public Health of Chile, the Jorge Duprat Figueiredo Foundation for Medicine and Workplace Safety (FUNDACENTRO) in Brazil, and WHO's Occupational Health Program.

CHILDREN'S ENVIRONMENTAL HEALTH

Over the last decade, the demographic and socioeconomic dynamic in the Region has been characterized by rapid population growth, displacement of persons from rural areas to urban centers, poverty, a proliferation of informal human settlements, and overpopulation in the outlying areas of large cities, in addition to widespread industrial, commercial, and agricultural development. All of the foregoing has contributed to unprecedented pollution of the air, soil, and water, and the emergence of many diseases that affect society's most vulnerable groups, particularly children.

In industrialized countries, children face new risks and threats stemming from urban pollution and chemical and radioactive waste, as well as from changes to the social fabric due to an increase in psychotropic substances abuse, violence, and injuries from accidents. In developing countries, traditional risks persist, and these threats are heightened by a variety of factors, such as disorderly demographic growth, poverty, limited access to drinking water and basic sanitation services, and inadequate housing, which exacerbate conditions of inequality and inequity. The interplay of all these factors continues to manifest itself in the spread of diarrheal diseases, respiratory infections, and vector-borne diseases, in addition to the risk of poisoning from improper use and/or inadequate elimination of pesticides. Furthermore, the transformation of the environment caused by climate change, deforestation, droughts, and flooding increases the incidence of emerging and reemerging diseases.

Children are at a higher risk than adults to environmental hazards because they are more easily exposed to environmental threats and their still-developing bodies are more vulnerable to certain types of exposures that are harmful to human health. Behaviors typical of children's early developmental stages, such as putting objects in their mouths; crawling on their hands, knees, and stomach; climbing up to dangerous places; and, in general, exploring their surroundings and practicing new skills, intensify

their level of exposure. When children live, play, learn, and/or work in degraded environments, these behaviors increase their level of risk to accidents, injuries, and communicable diseases. Poor children are the most affected, as they generally live in unsafe and polluted surroundings, and if their bodies are compromised by lack of adequate nutrition, their weakened immune system is less likely to be able to fight off disease and infection. In addition, poor children are more apt to become part of the workforce at an early age, to support either themselves or their families, and typically perform dangerous activities that increase the risk of injury and/or disease.

Better data are needed to have a more accurate understanding of the environments in which children live and of the complex interaction of the various types of threats to good health found in these environments. The best way to express this knowledge is through the use of specific indicators that not only point to environmental threats and their possible impact on health, but also furnish data for decision-making and assessment of interventions.

Political Commitments

Four international declarations specifically address the issues of poverty reduction, of investments in the environment for the purpose of sustainable development, and of the need for a commitment to the health and well-being of children as an investment in the future. These are the United Nations Conference on Environment and Development (Earth Summit) (*73*), the United Nations Millennium Declaration (*74*), the Johannesburg Declaration on Sustainable Development (*75*), and the Declaration of Mar del Plata (*76*).

United Nations Conference on Environment and Development (Earth Summit)

In 1992, during the Earth Summit that took place in Rio de Janeiro, Brazil, the leaders of the world's nations adopted historic principles of sustainable development. They likewise approved Agenda 21, which established a platform for integrated action for achieving socioeconomic development and securing environmental protection. Article 40 of the Rio Declaration on Environment and Development's Agenda 21 urges governments to draw up effective indicators for decision-making aimed at attaining sustainable development and executing and evaluating development interventions that could impact the environment and/or human health. The first principle of the Rio Declaration provides that "human beings are at the center of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." This principle seeks to focus political interest on economic development activities that concomitantly help to alleviate health problems and improve the population's well-being.

United Nations Millennium Declaration

In September 2000, world leaders adopted the Millennium Declaration, in which they recognize their ". . . collective responsibility to uphold the principles of human dignity, equality, and equity at the global level." The Declaration also sets forth the duty of leaders to meet, in particular, the needs of "the children of the world, to whom the future belongs," and establishes the goals of eradicating extreme poverty and hunger (the topic of MDG 1), reducing child mortality (MDG 4), and improving maternal health (MDG 5). In the Declaration, Heads of State resolve that by 2015 ". . . children everywhere, boys and girls alike, will be able to complete a full course of primary schooling" and will have "equal access to all levels of education." The Declaration also promotes gender equality and empowerment of women (MDG 3) and calls for measures to be adopted for bettering the lives of inhabitants of poor neighborhoods and strategies to be formulated "for decent and productive work for youth." It reminds the world of the commitments assumed to protect the environment and ecosystems and highlights the need to bequeath to future generations a planet rich in natural resources. The 18 MDG targets, which are measurable and quantifiable, were designed for use in assessing and reporting on annual progress made toward achieving the eight MDGs.

Johannesburg Declaration on Sustainable Development

The World Summit on Sustainable Development, held in Johannesburg, South Africa, in 2002, provided an unprecedented opportunity to strengthen the role of health in sustainable development. The first principle of the Rio Declaration was reaffirmed at this Summit, and it was further emphasized that health is not only a resource, but also a product of sustainable development. Therefore, development cannot take root as long as poverty and disease continue to weaken individuals, and the population's health cannot be sustained without an adequate response from health systems within a healthy environment. Countries were urged to fight poverty as a means for endowing the population with health and sustainable development.

At the Johannesburg Summit, the Healthy Environments for Children Alliance was launched for the purpose of reaching the health- and environment-related MDGs. The Initiative's overriding goal is to galvanize global action to eliminate health threats and risks to which children are exposed in the environments where they live, play, and learn. A significant number of risk factors were considered in these three contexts, including an inadequate quantity and quality of water supply; inadequate hygiene and insufficient sanitation; diseases transmitted by vectors; air pollution (e.g., from the use of solid fuels, tobacco smoke in the home); unintentional injuries (accidents) inside and outside of the home; exposure to chemicals (e.g., pesticides, lead); and unhealthy behaviors. The Initiative calls for integrated and coordinated local action with the participation of the health, social protection, environmental, educational, industrial, agricultural, and energy sectors. The World Summit on Sustainable Development emphasized the need for information-sharing among sectors and for a more in-depth analysis of the effects of development on the environment and public health to take place, with special atten-

tion being accorded to society's most vulnerable groups. To facilitate this process, the Global Initiative on Children's Environmental Health Indicators was created under WHO's leadership.

Declaration of Mar del Plata

The Declaration, signed in November 2005, reiterates the commitment to direct efforts toward strengthening and consolidating partnerships among ministries of health and the environment and health and environment-related sectors in the Region of the Americas. It recognizes the importance of coordinating efforts among these sectors and promotes public policies on sustainable development that strive to reduce poverty and inequity and protect public health in the countries of the Americas. In the Cooperation Agenda in the Declaration's Annex, Summit participants focus their efforts on regional and subregional integrated management of water resources and solid waste management, sound management of chemicals, and children's environmental health.

With regard to this last point, the issues highlighted include strengthening training with respect to children's environmental health at every level of the health care system; strengthening programs of education and incentives for public participation, as part of a broad strategy for promoting children's environmental health; incorporating the theme of children's environmental health into formal educational programs; promoting the organization of fora on children's environmental health, as well as incorporating this issue into other fora; developing strategies for the implementation of initiatives on children's environmental health; promoting cohort studies on the effects of pollution on children's health; promoting measures aimed at the reduction of environmental risks related to zoonotic diseases; promoting the establishment and networking of pediatric environmental health specialty units; and strengthening capacities to recognize and manage poisonings in children derived from pesticides and other chemicals.

Progress in Children's Environmental Health

The main activities carried out by PAHO in cooperation with countries were:

- In 2003, as part of Health in the Americas Week, a regional workshop was held in Lima, Peru, on key scientific and political issues in environmental health. During this meeting the PAHO-designed Healthy Environments, Healthy Children Initiative was launched, and consensus recommendations were drafted for improving children's health and controlling environmental threats in the Region (*77*).
- National and international intersectoral groups were mobilized to prepare country profiles on the state of children's environmental health (2004). The 18 national profiles submitted yielded a wealth of information and provided the basis for drafting a regional summary of data and results.
- To promote children's environmental health initiatives, promotional multimedia packages for instruction, education, and awareness were prepared and made available to the public in English, French, Portuguese, and Spanish (2004). Under this project, a variety of messages were developed for print, radio, and television media outlets and targeted toward children and other community groups, with the goal of raising public awareness in the Americas regarding the importance of having clean, healthy, and safe surroundings to protect children from environmental hazards. Two thousand kits, each with a video, DVD, and resource materials, were prepared and distributed (*78*).
- PAHO's Sustainable Development and Environmental Health Area collaborated with Argentina, the Dominican Republic, Ecuador, and Paraguay in the drafting of national action plans on children's environmental health, which included creating environmental pediatric units. This activity was guided by data and other input from the earlier-described national profiles on children's environmental health.
- PAHO led initiatives on children's environmental health indicators, or participated in them, in its capacity as member of the consultative group of the Commission for Environmental Cooperation created under NAFTA. In 2006, the Commission published a set of indicators regarding three environmental health dimensions: air quality, exposure to chemical substances, and water quality (*79*).
- In 2004, PAHO organized a meeting in Costa Rica with Latin American and Caribbean countries in which the first set of children's environmental health indicators for the Region were identified. A background document and report on the meeting were prepared as tools to be used by participants to gather the necessary data upon their return to their respective countries (*80, 81*).
- In 2004, a technical report was written, in cooperation with the Regional Institute for the Study of Toxic Substances, on the effects of POPs on human health (*82*).
- In June 2005, PAHO presented a children's health and environment regional action plan at the Second Meeting of the Health and Environment Ministers of the Americas held in Mar del Plata, Argentina.
- PAHO's Sustainable Development and Environmental Health Area produced a scientific document on air pollution, based on data and experience from the entire Region, which largely focused on exposure to particulate matter and its impact on children's health. This document showed that due to generalized air pollution and high population density in many of the Region's urban areas, a large number of individuals were being exposed to harmful substances. A broad array of economic repercussions for society was highlighted, from a greater need for medical attention to a decrease in productivity and quality of life. This research was inspired by the Declaration that came out of the Johannesburg World Summit on Sustainable Development in 2002 regarding the need to reduce, in particular, the prevalence of

respiratory diseases and other health consequences from environmental pollution (*83*).

FOOD AND NUTRITIONAL SECURITY

An essential aspect of human health is food security, understood as suitable nutritional management resulting from a sound balance between the food available and nutritional requirements. Unmet basic needs regarding food, water, air, and others are the results of food and nutritional insecurity (*84*).

This phenomenon in general can be observed indirectly, by the prevalence of its manifestations, which are delayed and almost always irreversible. Alterations in physical growth and mental development; abnormal changes in body weight, with deficiencies and excesses; acute and chronic morbidity; obstacles to school performance and adult economic productivity; and mortality in all age groups are some of the short- and medium-term outcomes of food and nutritional insecurity, whose most belated manifestation is human underdevelopment.

It should be highlighted that although statistics on food and nutritional insecurity's manifestations are useful for gaining an overall vision of the problem's magnitude, as well as its social and geographic distribution, they are insufficient for guiding decisions and public policies that require data on the basic conditions that bring about food insecurity.

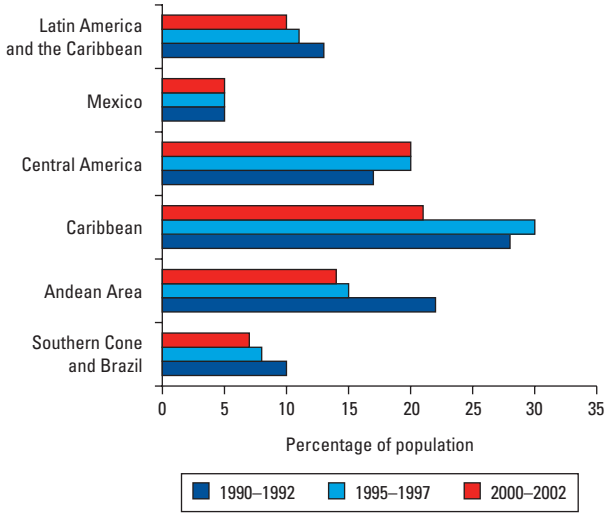
The MDGs highlight the relevance of food and nutritional insecurity; and MDG 1, specifically, sets out to reduce hunger and reinforces the significance of food and nutrition as an underlying cause of other problems and deficits that afflict humanity. In particular, Target 2 of MDG 1 proposes halving, between 1990 and 2015, the proportion of people who suffer from hunger. Specifically, the indicators for Target 2 focus on a reducing the proportion of the population unable to met minimum calorie requirements to lead a healthy life (undernourishment) and decreasing the percentage of children under age 5 who are underweight for their age (undernutrition).

This section will present information on undernourishment and nutritional anthropometry, bearing in mind the double burden of nutritional deficiencies and excesses in the Region of the Americas.

Undernourishment

As regards the target of reducing by half the proportion of the Region's undernourished population, between the 1990–1992 period and the 2000–2002 period, the undernourished population decreased from 13% to 10% (equivalent to 6.6 million people) (Figure 17). In the analysis by subregion, only the Southern Cone countries and Brazil have experienced a drop in both the rate (from 10% to 7%) and in the absolute numbers, as can be seen in Table 18. In the Andean subregion, the relative figures for undernourished individuals fell during this period, but the absolute numbers increased slightly—by 200,000 to be precise—between the 1995–1997 and 2000–2002 periods. As Figure 17 shows, the Caribbean subregion as a whole experienced a 7% decrease over the entire 10-year period. During 1995–1997, however, there was an increase in both the proportion and the absolute number of undernourished persons, followed by a notable drop in both values. Mexico showed a constant rate of undernourished population throughout the period, and, therefore, the absolute number of undernourished individuals has grown in step with the population. Finally, Central America experienced a deterioration in each of the subperiods: in relative terms, the rate increased 18%, while in absolute terms, the rise was 48%, possibly as a result of the worsening situations in Guatemala and Panama.

FIGURE 17. Changes in percentage of undernourished population, by country or subregion, Latin America and the Caribbean, 1990–2002.



Source: Food and Agriculture Organization. The State of Food Insecurity in the World 2004. Rome: FAO; 2004.

TABLE 18. Undernourished population, by country or subregion, Latin America and the Caribbean, 1990–2002.

Subregion	Number (in millions) per period		
	1990–1992	1995–1997	2000–2002
Southern Cone and Brazil	21.4	18.6	17.4
Andean Area	20.0	15.2	15.4
Caribbean	7.8	8.9	6.7
Central America	5.0	6.5	7.4
Mexico	4.6	5.0	5.2

Source: Food and Agriculture Organization. The State of Food Insecurity in the World 2003 and 2004. Rome: FAO; 2003, 2004.

TABLE 19. Proportion of undernourished population, by category and country, Latin American and Caribbean countries, 2000–2002.

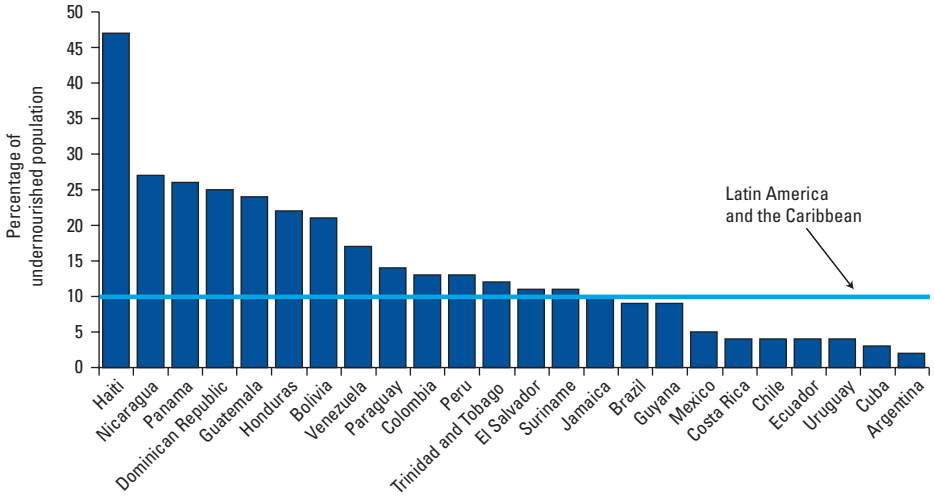
Very low < 2.5%	Low 2.5%–4.0%	Medium 5%–19%	High 20%–34%	Very high ≥ 35%
Argentina	Chile	Brazil	Paraguay	Bolivia	Haiti
	Costa Rica	Colombia	Peru	Dominican Republic	
	Cuba	El Salvador	Suriname	Guatemala	
	Ecuador	Guyana	Trinidad and Tobago	Honduras	
	Uruguay	Jamaica	Venezuela	Nicaragua	
		Mexico		Panama	

Source: Food and Agriculture Organization. The State of Food Insecurity in the World 2004. Rome: FAO; 2004.

Using Region-wide data, the countries have been grouped in five categories by proportion of undernourished during the 2000–2002 period: from very low—<2.5%, to very high—≥35.0%. Table 19 and Figure 18 likewise illustrate disparities among the countries. In Figure 18, high levels of undernourishment are noted in Haiti, the Dominican Republic, Bolivia, Venezuela, Paraguay, Colombia, Peru, Trinidad and Tobago, Suriname, and countries of the Central American subregion, as compared to the Region-wide average.

With regard to food availability, most countries do not have enough data available on total caloric intake to allow dietary changes to be analyzed over time. They generally do have, however, data on the kinds of food consumed by their population, and this, in turn, sheds light on the dietary structure, showing the different proportions of energy that come from specific food groups. A study on trends in food consumption in Latin America and the Caribbean (*85*) indicates that harmful changes have occurred in diets, with a perceptible increase in the consumption of refined sugars; a reduction in the consumption of fruits, vegetables, and fiber; and an increase in the total intake of calories and fat, particularly saturated fats. There is clear evidence of a link between dietary changes that have taken place in the Region and the processes of globalization, modernization, and urbanization since 1980. Such changes are similar to those observed earlier in developed countries and constitute a higher dietary cost, which only middle and higher socioeconomic classes can afford. The gap, therefore, has widened between the groups that can habitually consume high-priced processed food and the poorest sectors that have maintained their traditional diets based on grains, vegetables, legumes, and tubers. Currently, however, even the poorest can purchase processed food high in fat and sugars, which has led to an increased incidence of overweight, obesity, and diabetes in the Region.

FIGURE 18. Prevalence of undernourishment in 24 Latin American and the Caribbean countries, 2000–2002.



Source: Food and Agriculture Organization. The State of Food Insecurity in the World 2004. Rome: FAO; 2004.

Nutritional Anthropometry

All of Latin America and the Caribbean and its subregions experienced substantial improvements in the prevalence of underweight (low-weight-for-age) by age from 1980 to 2000. There was a 51% decrease in the entire Region, with the most marked drop occurring in the Caribbean (62%), followed by South America (56%). Data for Central America and Mexico reveal that the situation there also improved, but at a slower pace (44%). Figure 19 illustrates this indicator's situation during the 1996–2002 period among children under age 5 in selected countries. The average low-weight-for-age prevalence in Latin America and the Caribbean is estimated to be around 5%.

Of the 24 countries in Latin America and the Caribbean, only Guatemala remains among those with a high prevalence (20%–29%), according to the WHO classification (*86*). Based on this classification, Ecuador, El Salvador, Guyana, Haiti, and Honduras have rates that place them among the countries with mid-level prevalence (10%–19%), and the rest are grouped in the low category (< 10%).

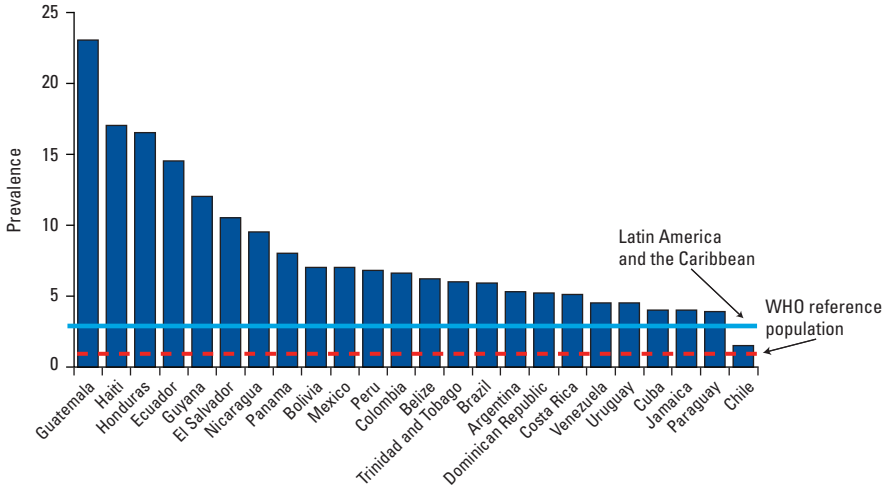
The drop in the rate of low-height-for-age (stunting) in the Region between 1980 and 2000 was 44%, lower than the rate of reduction in low-weight-for-age (51%). In all subregions there were also improvements in the prevalences of low-height-for-age, and the pattern is identical to that described above regarding weight—the Caribbean countries have improved at a faster pace than the other countries, and Central America, although it shows progress, again has done so more slowly than the Andean and Southern Cone subregions. Figure 20 shows the disparities in the 1996–2002 prevalence of low-height-for-age in preschool-aged children in Latin America and the Caribbean. The average rate of low-height-for-age in this region is estimated to be around 15%.

Of the 24 countries, only Guatemala has a very high prevalence of low-height-for-age (≥40%), according to the WHO classification. Bolivia, Ecuador, Haiti, Honduras, Nicaragua, and Peru are in the mid-level category (20%–29%), and the rest of the countries are in the low category (< 20%).

The Evolution of Overweight and Obesity in Latin America and the Caribbean

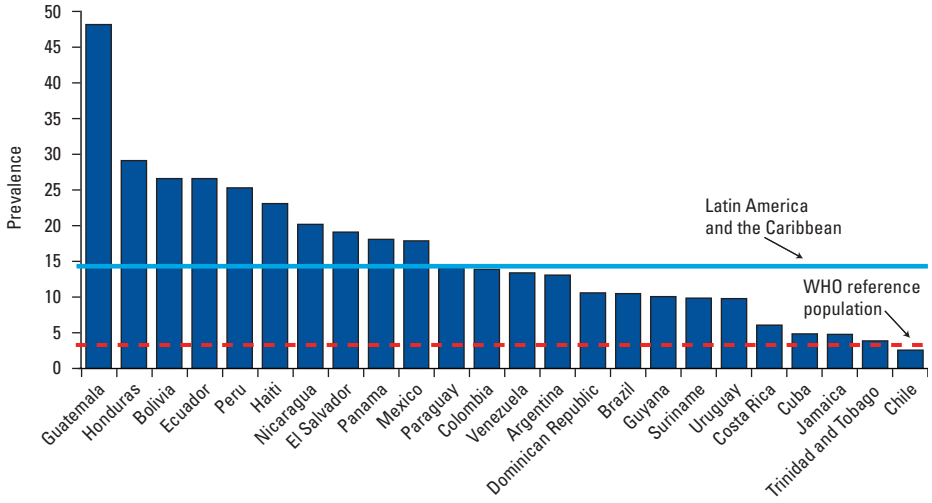
As has been suggested previously, many Latin American and Caribbean countries began their nutritional transition early and now have reached the stage of exhibiting noncommunicable chronic diseases associated with diet before other regions. The current situation in the Americas is one of contrasts, with countries such as Haiti and some areas of Central America still having pockets of hunger and poverty (*87*), while in other areas of the Region, the greatest burden of obesity has likewise moved toward the poor segments of the population. Brazil and Chile were the first to reach this stage, with studies conducted in both countries (*88*) indicating that the greatest burden of obesity has become concentrated in the poorest segments of the population. In the case of Chile, both sexes are affected, while in the case of Brazil, women are most affected. In Mexico, over only a short period of time, there has been a considerable increase in obesity rates (from 10.4% of the female population in 1987 to 24.4% in 1999), with a high prevalence of diabetes among adults (7%). The case of Cuba, however, exemplifies how changes of a macroeconomic

FIGURE 19. Prevalence of underweight-for-age in children under 5 years of age in 24 Latin American and Caribbean countries and at Region-wide level, 1996–2002.



Source: World Health Organization, Standing Committee on Nutrition. Fifth Report on the World Nutrition Situation: Nutrition for Improved Development Outcomes. Geneva: WHO; 2004.

FIGURE 20. Prevalence of stunting among children under 5 years of age in 24 Latin American and Caribbean countries and at the Regional level, 1996–2002.



Source: World Health Organization, Standing Committee on Nutrition. Fifth Report on the World Nutrition Situation: Nutrition for Improved Development Outcomes. Geneva: WHO; 2004.

nature can have positive effects on caloric imbalances and obesity, as analysis suggests annual reductions of 0.64% in the prevalence of obesity in the female population between 1982 and 1998.

In comparison to the United State and Europe, where annual growth of the prevalence of overweight and obesity is 0.25, in Latin America and the Caribbean the corresponding growth rates are extremely high. Recent studies indicate an annual increase that ranges from 0.48 among Cuban females to 2.38 among Mexican females (*87*). Data available on overweight and obesity in the Americas highlight the need to make this dimension of malnutrition a priority, both due to the magnitude of the problem as well as its upward trend. During the 1992–2002 period, prevalences of overweight and obesity in children under 5 years of age in 11 countries were greater than the Latin American and Caribbean regional average, which is 4.4%. The specific rates are shown in Table 20.

Due to the special characteristics of the nutritional transition process in Latin America and the Caribbean, in the same household undernutrition in children and overweight in adults may be found to coexist. The foregoing demonstrates the nutritional deficiencies, excesses, and imbalances (lack of fortifying food, as well as macro- and micronutrients) that interact in the same social environment, a situation that places a double burden of morbidity on countries with high rates of social exclusion and obliges them to develop and apply simultaneously policies and programs aimed at preventing factors that give rise to both nutritional deficiencies and dietary excesses. The coexistence of overweight and obese mothers and chronically undernutritioned children in the same home can be seen in 16% of families, as revealed in surveys conducted in Guatemala and Honduras, such as the 2002 National Survey of Maternal and Child Health, carried out by the Ministry of Public Health and Social Assistance and the National Institute of Statistics of Guatemala, and the 2001 National Epidemiological and Family Health Survey, conducted under the auspices of the Honduran Association of Family Planning and Ministry of Health of Honduras.

TABLE 20. Prevalence of overweight and obesity in children under 5 years of age, selected Latin American countries, 1992–2002.

Country	Prevalence (%)
Argentina	9.2
Dominican Republic	8.4
Chile	8.0
Bolivia	6.5
Peru	6.4
Uruguay	6.2
Costa Rica	6.2
Guatemala	5.4
Mexico	5.3
Cuba	5.2
Brazil	4.9
Regional average	4.4

Source: World Health Organization Global Database on Child Growth and Malnutrition. Available at: www.who.int/nutgrowthdb/en/.

TABLE 21. Classification of Latin American and Caribbean countries, according to the likelihood of reaching MDG child malnutrition reduction target.

Extent of progress			
On course to reach target	Insufficient progress to reach target	Regressing	Data unavailable
Bolivia	El Salvador	Argentina	Belize
Chile	Guatemala	Costa Rica	Brazil
Colombia	Honduras	Panama	Dominica
Dominican Republic	Nicaragua		Ecuador
Guyana			Grenada
Haiti			Paraguay
Jamaica			Saint Kitts and Nevis
Mexico			Saint Lucia
Peru			Saint Vincent and the Grenadines
Venezuela			Suriname
			Trinidad and Tobago
			Uruguay

Source: World Bank. Repositioning Nutrition as Central to Development, a Strategy for Large-scale Action. Washington, D.C.: World Bank; 2006.

Towards a Regional Initiative

According to information gathered by the World Bank (*88*), of 17 countries in Latin America and the Caribbean that have data available from surveys or sequential studies to analyze trends, only 10 have a possibility of reaching the target of decreasing the percentage of children under age 5 who are underweight for their age (undernutrition) by 2015 (see Table 21).

According to an ECLAC publication (*89*), based on data from various United Nations specialized agencies, by the end of the 1990s, a reduction of approximately 55% had been achieved in undernutrition, according to the indicator for low-weight-for-age, higher than the 40% estimate originally anticipated for that period. Although the pace of progress in the Region suggests that the target will be reached by 2015, the prospects vary by country. According to the ECLAC publication, the goal has already been attained in the Dominican Republic, and in Bolivia, Mexico, Peru, and Venezuela it has been achieved by more than 75%. On the other hand, there are 17 countries whose achievement level is below 75%. Nine of these—Brazil, Chile, Colombia, El Salvador, Guatemala, Guyana, Haiti, Nicaragua, and Uruguay—show the minimum anticipated progress, or slightly above (i.e., progress of between 31% and 71%), and they will only be able to reach the target if policies and programs are maintained and no economic or environmental crises arise. Analysis of progress in Honduras, Jamaica, Panama, and Trinidad and Tobago seems to indicate that these countries are less likely to reach this target. Finally, the situation in Argentina, Costa Rica, Ecuador, and Paraguay shows a reversal.

In response to the persistence of the problems of malnutrition due to caloric, protein, and micronutrient deficiencies and the rapid appearance of new problems due to caloric excesses and other nutritional imbalances, the Governments of Latin America have signed declarations that call for implementation of collaborative efforts in the short, medium, and long term between nongovernmental organizations, public sector agencies, local governments, regional and international institutions, and civil society to address the issues of food and nutritional insecurity.

Based on these considerations, PAHO has drafted a Regional Strategy and Plan of Action on Nutrition in Health and Development aimed at responding jointly to health and nutrition issues in the Americas. The Strategy's objective is to contribute to the promotion of equity in health to fight disease and improve quality of life in the Region through adequate nutrition throughout the life cycle, especially among the poorest and most vulnerable groups, and by encouraging strategic and collaborative efforts among Member States and other partners to reach the MDGs. All of this points to a comprehensive evidence-based political nutrition agenda by 2015 that fosters and implements improvement regionally, subregionally, and nationally in the collective population's food security.

The proposed Strategy and its Action Plan, designed to garner participation at different levels to improve the Region's dietary situation, will focus on three dimensions that promote significant measurable and sustainable changes: food and nutrition in health and development; less-than-optimal nutrition and nutritional deficiencies; and the relationship between inadequate nutrition, physical inactivity, and noncommunicable diseases.

DISEASES AFFECTING FOOD SAFETY

The relationship between health and agriculture is of great importance for the well-being and quality of life of the peoples of

the Americas. The sustainable production of food and achieving food and nutritional safety in the Region's countries are essential elements for eliminating hunger and reducing poverty. By enhancing food production, it is possible to increase the availability of animal protein, fruits, and vegetables, as well as increase family incomes and rural job opportunities, thereby improving overall living conditions and the population's health. The eradication of extreme poverty and hunger in Latin America and the Caribbean, in particular the elimination of chronic malnutrition in children under 5 years of age, constitute MDG commitments and are linked to the strategies for primary health care and local development (*90*).

Human health and animal health are closely interlinked. The emergence of infectious diseases such as HIV/AIDS over the last 20 years, and recent outbreaks of diseases such as bovine spongiform encephalopathy (BSE), variant Creutzfeldt-Jakob disease (vCJD), severe acute respiratory syndrome (SARS), and type A avian influenza (H5N1) have captured public attention, particularly given their ability to spread among different species, including humans. The globalization of trade in food, animals, and their derivative products, and the large number of people constantly traveling the world facilitate the rapid spread of infections (*91*). This not only causes direct economic losses to the livestock industry but also contributes to creating a global state of alert for public health risks. It is estimated that the increase in outbreaks of emerging and reemerging livestock diseases worldwide since the mid-1990s, including BSE, foot-and-mouth disease, avian influenza, and swine fever, has cost the world US$ 80 billion. Since 1968, PAHO has been driving the dialogue between the two sectors through its Inter-American Meetings, at the Ministerial Level, on Health and Agriculture (known as RIMSA, for its Spanish acronym) (*92*) as a mechanism to strengthen integrated actions on matters related to the interrelationship between human and animal health.

The following sections present the situation of the primary diseases that place animal production at risk and that, consequently, could affect food safety and cause major losses to the Region's national economies.

Foot-and-Mouth Disease

The 2001–2005 period witnessed major changes in the recording of foot-and-mouth disease in the Region. The year 2001 was characterized by an emergency situation in the Southern Cone, with 4,198 outbreaks of the type A virus in Argentina, Uruguay, and the State of Río Grande do Sul (Brazil). The situation was controlled with the firm intervention of these countries' animal health services, which focused on sacrificing infected animals and those in contact with them, controlling animal transit, strategic vaccinations, and seroepidemiological research. Simultaneously, the disease intensified in some regions and was reintroduced into others previously considered free of the disease both with and without vaccination. Nevertheless, South America made progress in terms of zones and countries free of foot-and-mouth disease. Ecuador and Venezuela maintained their endemic status, with some epidemic situations between 2002 and 2004 (*93–95*). This situation of contrasts caused economic and social impacts in the productive sector, particularly due to the loss of international markets and the repercussions on labor relations and on businesses in the affected countries.

In 2002, an outbreak of the type O virus was recorded on a farm in the Department of Canindeyú, Paraguay, causing the country to lose its status as free of foot-and-mouth disease with vaccination. In 2003, the disease was recorded in the Gran Chaco region shared by Bolivia and Paraguay, and, after a year without outbreaks, in Argentina. Phylogenetic analysis conducted on samples of the O virus, isolated in the Southern Cone, demonstrated the existence of a pool of very similar viruses, according to biomolecular characterization studies, which has been perpetuated in the Region. PAHO's Pan American Foot-and-Mouth Disease Center (PANAFTOSA) led multinational technical cooperation missions to support the affected countries in identifying regional problems and proposing actions to mitigate the situation within the framework of a zone-based program with harmonized strategies to eradicate the disease.

In 2004, isolated outbreaks were recorded in Colombia, Brazil's Amazon region, and Peru, and control actions were taken (sacrifice of livestock, strategic vaccinations, and sanitary control of animals in transit). In all cases, seroepidemiological studies were conducted to demonstrate the absence of viral circulation. Colombia experienced an outbreak along its border with Venezuela, a country that suffered an epidemic, and subsequently, in early 2005, another outbreak appeared in the Department of Cundinamarca, in the country's central region, allegedly originating from a laboratory strain of the virus.

As a result of the 2001 emergencies, the Ministers of Health of the Southern Cone countries took the joint decision to establish a cycle of audits, to be coordinated by PANAFTOSA, of foot-and-mouth disease programs in the subregion with respect to regulatory structures and veterinary care services. Two cycles were executed: one in 2001 and another in 2002. Auditing is considered a strategic activity in the Hemispheric Program for the Eradication of Foot-and-Mouth Disease (PHEFA) for the 2005–2009 period (*96*).

PHEFA is the focal point for policies to eradicate foot-and-mouth disease in the Americas, and since 1988 this entity has prioritized the strengthening of national programs to eradicate the disease to eliminate the endemic situation in critical zones. Its strategies are based on a regional risk characterization, the development of efficient epidemiological oversight, and the strengthening of biosafety in handling the foot-and-mouth disease virus, both in production of the vaccine and in diagnostics.

To focus national and regional efforts on the goal of eradicating foot-and-mouth disease in the Americas by 2009, in March 2004,

"Economic progress in developing countries in recent years has brought about a dramatic increase in highway traffic. Despite the lack of reliable data, there are indications that, after communicable diseases, accidents are becoming the largest single cause of morbidity and mortality in many of the Region's developing countries."

Héctor Acuña, 1982

the Hemispheric Conference on the Eradication of Foot-and-Mouth Disease was held in Houston, Texas. The Inter-American Group for the Eradication of Foot-and-Mouth Disease, which was established at this gathering and is made up of public and private representatives from throughout the Americas, defined new guidelines to combat the disease in the Hemisphere.

In 2005, investments made in foot-and-mouth disease eradication programs were evaluated and it was noted that the direct expenditures of the countries and the private sector on national programs totaled approximately US$ 580 million in 2005 alone. Controlling the 2005 emergency in Brazil's central-western region cost approximately US$ 15 million in direct expenses alone. These amounts may be significant, but the country's foreign trade in meat products for 2004–2005 was approximately US$ 3 billion. The determining factors in the appearance of epidemic outbreaks of foot-and-mouth disease continue to be the weakening of national programs, especially in terms of the fragility of controls at international and regional borders, the low coverage of the epidemiological oversight systems, and the lack of harmonization of control and eradication actions, a responsibility of the national programs (*97*).

The effect of foot-and-mouth disease outbreaks on food safety may be evaluated at two points: the decline in production and productivity caused by the disease, and the direct and indirect losses due to the lack of competitiveness on the global market of the countries considered endemic. In addition, the lack of political will and of coordination between the public and private sectors, and the reluctance of the private sector to actively participate in national programs, could be reasons for the continued endemism in some countries, which in turn compromises overall progress in the Region toward achieving the disease's eradication.

Bovine Spongiform Encephalopathy

BSE, commonly known as "mad cow disease," is a foodborne, communicable, neurodegenerative, progressive, and fatal disease of the bovine nervous system, caused by an abnormal self-replicating protein known as a prion. The disease was first diagnosed in 1986 in the United Kingdom, where it spread epizootically and peaked in 1992–1993, with an average of 36,185 cases per year and an annual incidence of 6,445.08 per million bovines over 24 months old. The most widely accepted theory regarding the origin of the BSE epidemic is the recycling of proteins from ruminants infected with the disease. By May 2006, 189,854 cases had been reported in 25 countries, 97.11% of which occurred in the United Kingdom. Nevertheless, the epidemic curve is currently declining in this country, with only 225 cases being reported in 2005 (*98*). The public health significance of BSE arises from the appearance of human cases associated with a new variant of Creutzfeldt-Jakob disease (vCJD), a rare and fatal neurodegenerative disease related to the consumption of food products from cattle contaminated with BSE. Unlike traditional forms of CJD, vCJD affects younger patients (average age of 29, compared with 65 for CJD) and has a longer relative duration (averaging 14 months, compared with 4.5 months for CJD). This new human disease was first described in March 1996; since then, 129 cases have been reported in the United Kingdom, six in France, and one each in Canada, Ireland, Italy, and the United States. Of these cases, three in France and those in Canada and the United States are considered to be the result of exposure to the causal agent in the United Kingdom (*99*).

During 2000 and 2001, indigenous cases of BSE were detected in several European countries and in Japan. The 2003 detection of indigenous cases in Canada and the United States, countries previously considered free of this disease, continues to cause concern among public health authorities and consumers. According to available scientific and technical information, the Region of the Americas from Mexico southward is free of indigenous cases of BSE. In response to the recommendations made at regional meetings, PAHO has taken various actions to keep the Region free of BSE, thus avoiding the restrictions on global trade that have, in part, affected the availability of food products of animal origin. A risk self-evaluation guide has been drafted and training activities have been undertaken (*100*). Epidemiological oversight activities have also been undertaken and national professionals have been trained in immunohistochemical techniques for BSE diagnosis (*101*).

Avian Influenza

Global Situation

Avian influenza is a disease caused by type A strains of the influenza virus. It can naturally infect a wide variety of species, including humans, swine, horses, marine mammals, and birds. All known variants of the type A influenza virus have been isolated from birds, and only a few from mammals. Phylogenetic and ecological studies of the type A influenza virus show that wild aquatic birds are the natural reservoir and source of these viruses for the other species. Occasionally, devastating influenza epidemics have occurred in humans (most recently in 1918, 1957, and 1968). These have emerged from genetic modifications of the type A influenza virus from animals. There is also conclusive evidence of

the risk of zoonotic infections from the type A influenza virus in animals (*102*).

Given that aquatic birds may be the source of all type A influenza viruses in other species, it is thought that the human pandemic strains emerged through one of three possible mechanisms: 1) a genetic rearrangement (occurring as a result of segmentation of the virus' genome) of type A influenza viruses from birds and humans infecting the same host; 2) a direct transfer of the entire virus from other species; or 3) reemergence of the virus that caused an epidemic long ago.

In the 20th century, the rapid emergence of antigenically different strains in human beings was recorded four times: in 1918 (H1N1), 1957 (H2N2), 1968 (H3N2), and 1977 (H1N1). In each case, they caused a pandemic. Between the pandemics, frequent epidemics have appeared as a result of a process called antigenic shift, in which two different strains of influenza combine to form a new subtype having a mixture of the surface antigens of the two original strains. Since 1996, the H7N7, H5N1, and H9N2 viruses have been transmitted from birds to humans but have apparently failed to spread massively in the human population (*103*, *104*).

The influenza virus that infects birds can be divided into two groups differentiated on the basis of their pathogenic capacity. The most virulent viruses cause highly pathogenic avian influenza (HPAI), which can cause up to 100% mortality in the affected flocks. These viruses have been limited to the H5 and H7 subtypes, although not all of them cause HPAI. All the other subtypes cause a much milder disease, known as low pathogenic avian influenza (LPAI). Chickens and turkeys tend not to be natural hosts of the avian influenza viruses, but they do become infected when they come in contact with wild aquatic birds that are carriers (*105*).

Since 1996, transmission of the type A(H7N7), A(H5N1), and A(H9N2) viruses from birds to human beings has been detected, but there appears to have been no person-to-person transmission. In particular, the A(H5N1) virus has been causing an HPAI epizootic in domestic poultry and wild birds in various Asian countries since early 2003, with devastating consequences for poultry farming in the affected countries. More than 200 people have been infected, and of these, nearly one-half have died. Scientific reports warn of the potential appearance of a new influenza pandemic in humans, caused by H5N1. A(H5N1) outbreaks have also been reported in migratory birds in Asia, Europe, and Africa, some with an intercontinental migratory range; through June 2006, the epidemic had spread to 46 countries in Asia, Europe, and Africa (*98*, *106*, *107*).

The Importance of Poultry Production to Food Safety

Poultry production in the Americas is highly developed and represents a major economic activity due to its capacity to generate income and employment, in addition to providing high-quality, low-cost animal protein. According to FAO data (*106*), the Americas generate 46.9% of the 67 million tons of poultry produced and export 58.3% of the 7 million tons exported worldwide. Five countries in the Region produce 99% of the Region's exports (United States, Brazil, Canada, Argentina, and Chile), and 12 countries are responsible for 98% of the Hemisphere's production (United States, Brazil, Mexico, Canada, Argentina, Venezuela, Colombia, Peru, Chile, Ecuador, Guatemala, and Bolivia). Moreover, poultry meat and eggs are the most economical sources of animal protein and represent nearly 40% of the animal protein consumed per capita in the Region. There are also important activities highly dependent on poultry farming, such as grain production, trade, and the agricultural services and transport industry.

Industrial and semi-industrial poultry farming is a highly competitive economic activity in both domestic and export markets. In general, it has low profit margins per product unit, so companies require high levels of productive efficiency and low costs to be competitive, and they tend to be concentrated in order to leverage economies of scale. In this regard, health is one of the key factors for competitiveness because of the direct impact of disease on bioproduction indicators (an increase in costs and a decrease or loss of production), the consequences for the markets (both domestic and export) and consumption, and the impact on human health when infected poultry products enter a country. This is precisely the case with avian influenza, a disease with a great ability to spread and cause economic damage in addition to compromising human health.

The Regional Avian Influenza Situation

Avian influenza outbreaks of high and low pathogenicity have been recorded periodically in several countries in the Americas. In this Hemisphere, most of the known types of the influenza A virus have been found in wild aquatic birds.

Since 1959, cases of HPAI in domestic poultry have been reported in Canada, the United States, Mexico, and Chile. These outbreaks have caused direct losses to the affected countries of many tens of millions of dollars. It is important to note that the cases of HPAI have emerged from LPAI viruses. To date, all the HPAI outbreaks have been caused by H5 and H7 viruses.

In Canada and the United States, the presence of HPAI viruses has been reported in domestic poultry, primarily in commercial live bird establishments (for consumption or pets). Cases have also been recorded of HPAI caused by H5N2 in Mexico, Guatemala, and El Salvador, countries where oversight and control actions are undertaken with official systematic vaccination plans (*102*).

Risk of the Introduction and Spread of H5N1 Influenza in the Region

The rapid spread of the H5N1 virus in Asia since 2003 is due to the movement and legal and illegal trade of domestic birds and pets and to the movements of migratory birds. According to studies of avian migratory cycles, it is likely that the H5N1 virus will

arrive in the Region of the Americas through this mechanism, even before a potential pandemic is caused by the virus. The likely resulting epidemiological scenarios will depend on how it is introduced, the location and type of birds initially infected, and the detection capacity of the veterinary care systems (*98*).

The Region's domestic poultry production systems cover large areas with high concentrations of birds and are characterized by active population dynamics and a close epidemiological relationship among farms. These factors imply levels of risk of vulnerability and receptivity to the influenza virus sufficient for possible entry and establishment under conditions of endemism, inasmuch as the forms of control established are inadequate (*106*). A likely scenario after entry is that the infection would tend to take root (become endemic) in the poultry production systems with low biosecurity—that is, on small and medium-sized poultry farms, family poultry farms, and live bird establishments for consumption or pets. At this level, the impact would be greater, given that poultry farming generates direct food products for the rural family as well as economic income from the sale of the products (*106*).

The infection has also demonstrated a surprising level of aggressiveness, being capable of breaking through biosecurity mechanisms at poultry farms with the highest sanitary levels, and reaching the industrial poultry farming sector, affecting both meat and egg production. Given the level of integration and the number of birds in the sector, the potential for dissemination and the level of morbidity/mortality are quite high.

Based on this background, it can be estimated that the arrival of the infection in the Region could have a major impact on poultry farming, representing a true catastrophe in affected countries where it plays a major role in the national economy, with repercussions for the supply of low-cost animal protein for mass consumption to most of the population. The repercussions to the supply would be further aggravated by the impact of emergency control measures (flock destruction, quarantines) and trade restrictions, in addition to the impact on the environment caused by the need to dispose of thousands of tons of highly contaminated organic matter (*106*).

With respect to the risk the influenza virus poses to human health, as indicated earlier, transmission of the influenza virus between animals and humans has been confirmed, causing a wide range of disease (H7N7, H9N2, and H5N1). Occasionally, the influenza virus causes pandemics in humans when the following conditions are met: 1) the population lacks prior immunity against the pandemic virus; 2) the virus is transmitted from animals to humans; and 3) the virus acquires an efficient person-to-person transmission capacity. In the case of the H5N1 HPAI virus, it is considered to have acquired a high pandemic potential as it meets the first two conditions and has only to acquire the ability to be transmitted efficiently between persons to become a pandemic virus. It must be specified that the pre-pandemic conditions of the H5N1 HPAI virus have to date been met in the countries affected by it, primarily in Asia, where the HPAI epidemic coexists with a high exposure of persons by close contact with infected birds and the appearance of human cases (*107*, *108*).

The Political and Technical Response

The emergence of avian influenza caused by highly pathogenic strains that can be transmitted from birds to humans represents a serious public health problem, given the risk of contagion of workers who are in close contact with the birds and the technicians responsible for oversight, diagnostics, and control of outbreaks, as well as the possible impact on food safety caused by losses in animal protein and trade restrictions. To respond to these problems, PAHO veterinary public health experts are providing guidance to countries on biosecurity measures to be incorporated to protect local populations, such as vaccination against seasonal influenza, the use of personal protection equipment, and the training of workers on standardized hygiene procedures. Likewise, coordination between the health, agriculture, and environmental sectors is fundamental. PAHO has promoted this coordination through RIMSA. At RIMSA 14, held in Mexico City in April 2005, the Ministers issued a resolution on the global risk of new and emerging zoonoses that provides guidance to countries regarding PAHO's technical cooperation and intersectoral actions (*109*).

Clearly, there is a broad scientific, technical, and political consensus that avian influenza, and particularly the global scenario for H5N1, represent a serious public health problem and pose a formidable challenge to prevention systems in public health (risk of zoonoses and pandemics) and animal health (economic impact on poultry production). The challenge posed by avian influenza for food safety is particularly significant because of the need to protect rural populations from the impact caused by losses of animal protein, decreased revenues, and the loss of jobs, all of which increase this group's vulnerability and poverty.

TOBACCO

Tobacco-related Morbidity and Mortality

Tobacco use continues to be one of the most significant risk factors for death and disease worldwide and in the Region of the Americas in particular. WHO's *World Health Report 2002* (*110*) estimated that, as a preventable cause of death, only high blood pressure outpaces tobacco use, which causes 5 million deaths annually worldwide, 900,000 of them in the Region of the Americas, according to 2000 figures. It also considered that tobacco use ranked fourth in the global burden of disease, with approximately 60 million DALYs (*110*).

Since the vast majority of cases of lung cancer are caused by smoking (including exposure to secondhand smoke), the specific mortality rates constitute a reasonable indication of the damage to health caused by tobacco use. Nevertheless, it is important to

TABLE 22. Mortality rates[a] from malignant neoplasms of the trachea, bronchus, and lung,[b] by country, Region of the Americas, 2000–2004.

Country	Year	Men	Women	Total
Antigua and Barbuda	2002	0.0	3.7	2.2
Argentina	2004	34.1	8.6	19.8
Bahamas	2000	12.8	6.8	9.7
Barbados	2001	8.0	1.2	4.1
Belize	2001	17.0	4.5	10.8
Brazil	2002	19.8	8.0	13.4
Canada	2003	43.0	25.6	33.3
Chile	2003	17.9	7.7	12.2
Colombia	2001	16.5	9.1	12.4
Costa Rica	2004	10.4	5.4	7.8
Cuba	2004	41.3	18.8	29.5
Dominica	2003	20.8	10.7	15.6
Dominican Republic	2004	13.8	8.4	11.1
Ecuador	2004	7.5	4.9	6.1
El Salvador	2003	7.4	6.3	6.7
Guatemala	2003	6.8	4.6	5.7
Guyana	2003	5.9	2.0	3.7
Haiti	2003	6.2	6.0	6.1
Mexico	2004	13.5	5.4	9.1
Nicaragua	2003	7.4	6.3	6.8
Panama	2003	16.4	8.1	12.1
Paraguay	2003	27.6	6.4	16.1
Peru	2000	14.2	8.3	11.0
Saint Lucia	2002	6.1	4.5	5.2
Saint Vincent and the Grenadines	2003	17.1	10.2	13.5
Suriname	2000	17.9	5.2	11.1
Trinidad and Tobago	2000	13.7	3.1	8.1
United States	2002	45.3	26.9	35.0
Uruguay	2001	52.9	6.8	26.9
Venezuela	2004	17.2	9.1	13.1

[a]Per 100,000 population; adjusted for age (all ages).
[b]Includes ICD-10 codes C33–C34.
Source: Pan American Health Organization, Health Analysis and Statistics Unit. Mortality and Population Information System.

note that the mortality rates for lung cancer reflect the guidelines for past tobacco use but not necessarily current smoking rates. Table 22 (*111*) shows the Region's mortality rates for malignant neoplasms of the trachea, bronchus, and lung.

Smoking is the number two modifiable risk factor for heart disease and the top modifiable risk factor for cancer. The INTERHEART study, conducted between 1998 and 2003 in 52 countries, determined that smoking approximately triples the risk of acute myocardial infarction in both males and females. Worldwide, smoking represented 36.4% of the population attributable risk (PAR) of acute myocardial infarction (44.0% in males and 15.8% in females) and 38.3% of the PAR in South America (*112*). According to other studies, smoking causes one-fifth (21%) of all deaths by cancer in the world: 29% in high income countries and 18% in low and medium income countries (*113*).

Results published in 2005 and 2006 confirm prior findings that exposure to secondhand smoke increases the risk of disease in nonsmoking adults and children and also link this exposure to a greater risk of breast cancer in predominantly premenopausal nonsmoking young females (*114*, *115*).

Tobacco Use and Exposure to Secondhand Smoke

Prevalence of Tobacco Consumption among Adults

There is no standardized system to monitor the prevalence of tobacco use among adults, thus allowing for comparisons between countries in the Americas. There are also few countries that have comparable data on smoking trends among adults, due to year-to-year methodological differences. These limitations regarding comparability should be considered when examining

TABLE 23. Smoking prevalence in the general population, by sex, selected countries, Region of the Americas, 2000–2005.

Country	Year of survey	Age group	Sex	Active smokers[a] (%)
Argentina	2005	18+	Men	35.1
			Women	24.9
			Total	29.7
Brazil (Rio de Janeiro)	2002–2004	15+	Men	19.8
			Women	15.9
			Total	17.5
Brazil (São Paulo)	2002–2004	15+	Men	23.1
			Women	17.5
			Total	19.9
Canada	2005	15+	Men	22
			Women	16
			Total	19
Chile	2003	17+	Men	48.3
			Women	36.8
			Total	42.4
Costa Rica	2000	12–70	Men	23.3
			Women	8.2
			Total	15.8
Mexico	2001	18–65	Men	42.3
			Women	15.1
			Total	27
Nicaragua	2001	15–49	Women	5.3
Peru	2005	12–64	Total	31.8
United States	2003	18+	Men	24.1
			Women	19.2
			Total	21.6

[a]Definition of "active smoker":
Argentina: has smoked in the last 30 days and at least 100 cigarettes in his/her entire life.
Brazil: "regular" smoker, no definition available.
Canada: includes daily and occasional smokers.
Chile: includes daily and occasional smokers.
Costa Rica: has smoked in the last month.
Mexico: no definition available.
Nicaragua: no definition available.
Peru: has smoked in the last 30 days.
United States: has smoked at least 100 cigarettes in his/her entire life and currently smokes every day or some days.

Source: Country survey data.

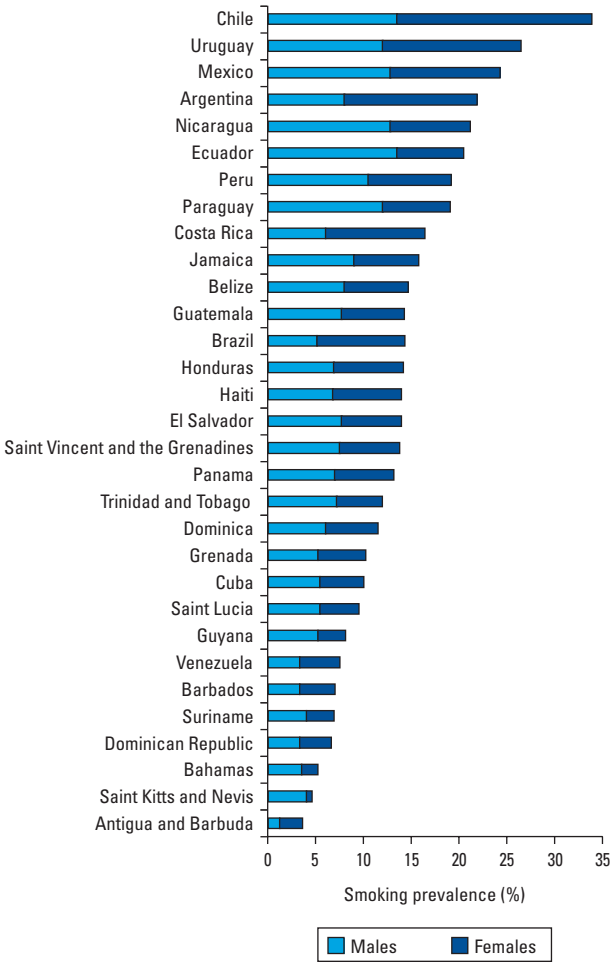
Table 23, which shows the most recent data available on smoking prevalence in the Americas between 2000 and 2005. As can be seen, the corresponding rates vary widely throughout the Region.

Prevalence of Smoking among Adolescents

The Global Youth Tobacco Survey presents comparable data on the prevalence of tobacco use among adolescents aged 13–15 (Figure 21). According to surveys conducted between 2000 and 2005, cigarette use (defined as the prevalence of having smoked cigarettes on one or more days during the previous month) was highest in Chile, with nearly 34% (figures for Santiago, 2003), and lowest in Antigua and Barbuda, with only 3.6% (national figures, 2004) (*116*). These values do not include the use of tobacco products other than cigarettes, although the use of these products may be significant in some countries.

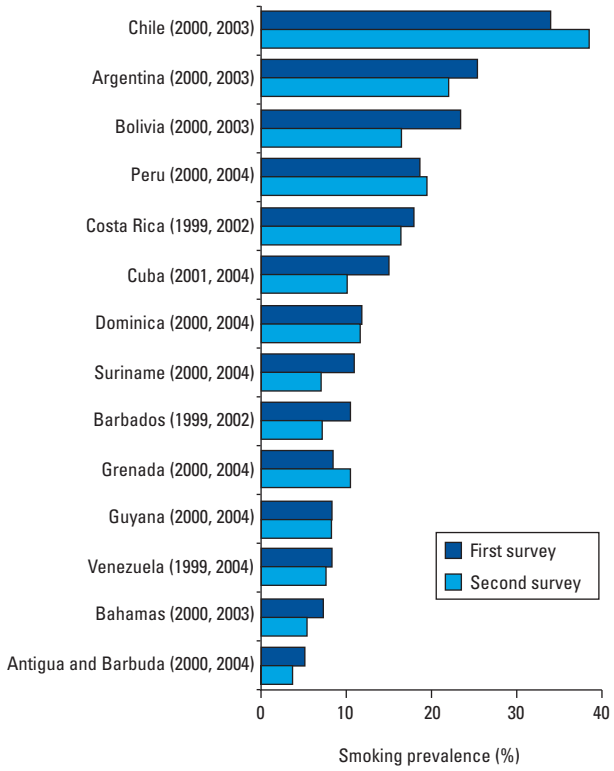
Except in Chile, Argentina, and Uruguay, where the rates for girls are higher than those for boys (Chile: boys, 27.6%, girls, 39.2%; Argentina: boys, 17.2%, girls, 26.8%; Uruguay: boys, 22.2%, girls, 29.6%), the prevalence of smoking in the Region continues to be higher among boys. Available data on trends indicated that, in most countries, the prevalence of smoking among young people has remained relatively stable (Figure 22), although in some Caribbean countries such as Cuba, Suriname, Barbados, Bahamas, and Antigua and Barbuda, it seems to be on the decline, while in others, such as Chile and Grenada, an upward trend is observed.

FIGURE 21. Smoking prevalence among adolescents 13–15 years old, by sex, Latin America and the Caribbean, 2001–2005.



Source: World Health Organization, U.S. Centers for Disease Control and Prevention. Global Youth Tobacco Survey data.

FIGURE 22. Trends in smoking prevalence among adolescents 13–15 years old, selected countries of the Americas, 1999–2004.



Note: The data represent national totals, except in the cases of the following countries, in which data were collected from a selected location (capital or another major city) and substituted: Argentina (Buenos Aires), Bolivia (La Paz), Chile (Metropolitan Santiago), Cuba (Havana), Peru (Lima), and Venezuela (Barinas).
Source: World Health Organization, U.S. Centers for Disease Control and Prevention. Global Youth Tobacco Survey data.

Per Capita Tobacco Consumption

Per capita consumption is estimated on the basis of tobacco production, import, and export data and can provide an idea of the trends in different countries over time (Figure 23). On the whole, per capita consumption is declining in the Region or is stable in almost all countries for which data are available, except Bolivia and Colombia.

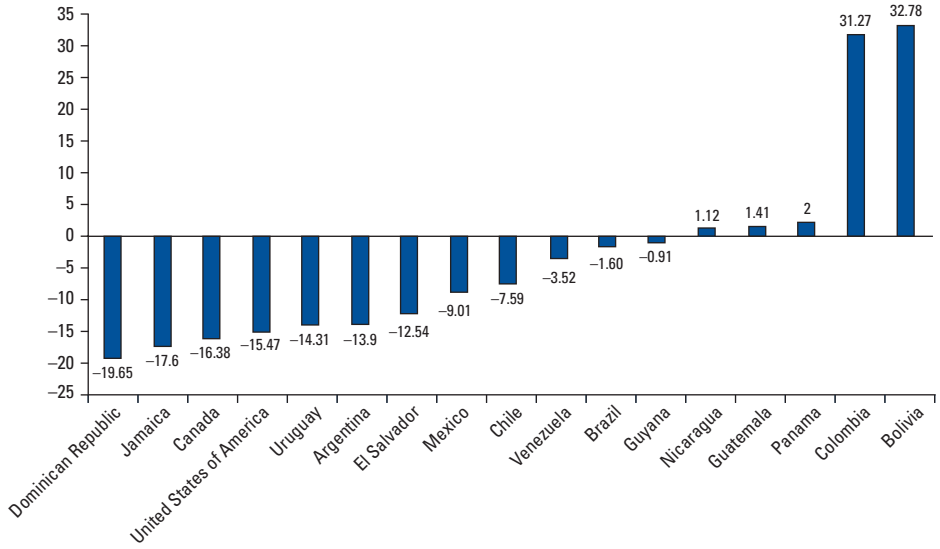
Nevertheless, it is appropriate to note the following observations when using per capita consumption data: they are influenced by income levels and the price of the tobacco products with respect to income, and these factors can have a negative impact on otherwise successful antismoking efforts in a given country. In general, these data do not take into account the consumption of illegal imports (contraband or counterfeit), in such a way that, where this consumption is high, the data may not be an accurate reflection of absolute consumption; the data included in Figure 23 represent three- or four-year averages. Year-to-year fluctuations can mask trends over longer terms (that could be the case, for example, in Brazil). It would be ideal to consider per capita consumption data together with prevalence data for a more complete picture of current tobacco use in the Region.

Exposure to Secondhand Smoke

The Global Youth Tobacco Survey determined that, in most countries, at least 30% of young people were exposed to tobacco smoke in the home at least once a week. Exposure was highest in Argentina (nearly 70%), Uruguay (65%), and Chile (56%). The lowest exposure rates were in El Salvador (15%), Saint Kitts and Nevis (17%), and Antigua and Barbuda (18%) (Figure 24) (*116*).

In an assessment of the concentration of nicotine in public places, airborne nicotine (which is a marker for exposure to environmental tobacco smoke) was found in 94% of the critical points

FIGURE 23. Cigarette consumption per capita (persons over 15 years old), selected countries of the Americas, 2000–2003 average compared to 1996–1999 average, percentage variation.[a]



[a]Exceptions: Nicaragua and Panama compare 2001–2004 data with 1997–2000; Uruguay compares 2001–2004 data with 1998–2000.
Source: Calculations based on data from Guindon GE, Boisclair D. Cigarette consumption dataset 1970–2004. Prepared for the American Cancer Society, August 2005.

surveyed in seven Latin American countries (Argentina, Brazil, Chile, Costa Rica, Paraguay, Peru, and Uruguay) (*117*). In all the countries, the highest concentrations of nicotine were found in bars. They were also very high in many nonsmoking areas in bars and restaurants, indicating that the designation of separate seating areas for nonsmokers is an inefficient, and even self-defeating, strategy to control exposure to secondhand smoke.

Economic Considerations

In a 1993 study by the World Bank, it was calculated that the international tobacco market represents an annual global loss of US$ 200 billion in health care costs and lost productivity (*118*). In the United States, it is estimated that tobacco use was responsible for an average US$ 76 billion annually for the 1995–1999 period in direct medical costs for treatment of smoking-related diseases, and US$ 82 billion more during this same period in productivity losses due to deaths caused by tobacco (*119*). Moreover, the U.S.-based Society of Actuaries estimated the annual cost of exposure to environmental tobacco smoke at US$ 10 billion (US$ 5 billion in direct medical costs and US$ 5 billion in lost productivity) (*120*). In studies relating to Canada, the direct health cost from exposure to environmental smoke in newborns and children was calculated at nearly US$ 250 million in 1997, and the cost of fires attributable to tobacco use was US$ 81.5 million that same year (*121*).

In response to the concerns frequently expressed by governments, tobacco cultivation and production in the Region of the Americas represent a very small part of most countries' agricultural and manufacturing activities. Studies undertaken by PAHO in the Southern Cone countries confirmed that the percentage of land planted with tobacco was less than 1% in Argentina, Bolivia, Chile, and Uruguay. Even in Brazil, which is the world's largest exporter of tobacco leaf, tobacco employs less than 5% of the agricultural workforce (*120–124*). Employment in the tobacco industry represents just 0.003% of the industrial workforce in Uruguay, 0.02% in Brazil, 0.09% in Chile, and 0.46% in Bolivia. Tobacco manufacturing employs a higher proportion of the industrial workforce in Argentina (4.23%), but this percentage still represents a small minority of the industrial workforce (*122–126*).

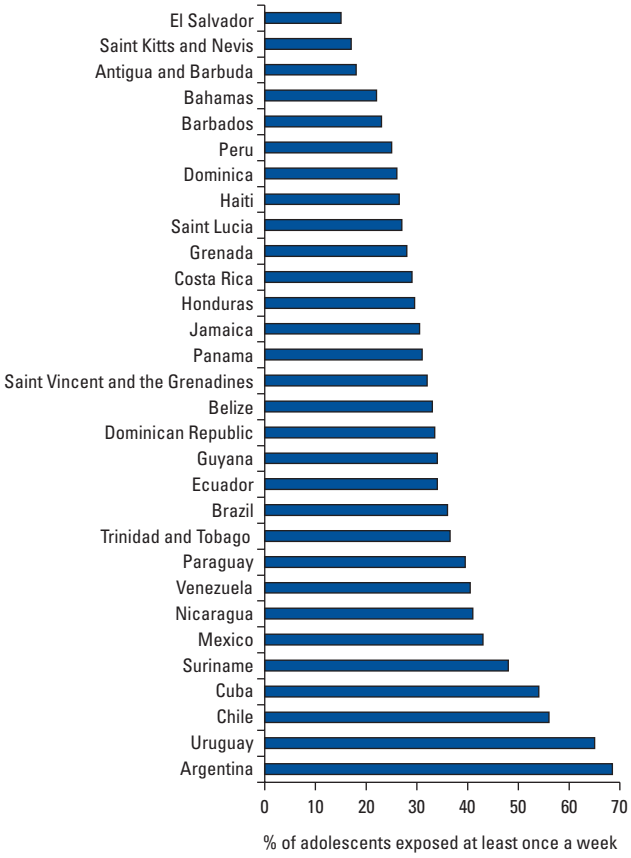
In most countries, nearly 100% of the market share belongs to subsidiaries of British American Tobacco or Philip Morris International (*127*). This means that the earnings from the sale of tobacco products are transferred out of the countries and represent a net currency loss.

Status of Interventions

WHO Framework Convention on Tobacco Control

The most significant contribution to tobacco control in recent years has been the 2003 adoption of the WHO Framework Con-

FIGURE 24. Exposure of adolescents 13–15 years old to tobacco smoke at home, selected countries of the Americas, 2000–2005.



Source: World Health Organization, U.S. Centers for Disease Control and Prevention. Global Youth Tobacco Survey data.

vention on Tobacco Control (FCTC) and its ratification by 142 Member States in December 2006 (*128*). The FCTC is legally binding, according to international law, in all signatory countries. It establishes specific regulations and obligations that cover a wide range of tobacco control policies and programs, including fiscal policy, legislation regulating tobacco use and its marketing, smoking cessation programs, control of the illegal trade, education and raising public awareness, and exchanging research and information.

As of December 2006, 21 PAHO Member States, together representing approximately half the population of the Americas, were signatories of the WHO FCTC. They are Antigua and Barbuda, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Dominica, Ecuador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Peru, Saint Lucia, Trinidad and Tobago, Uruguay, and Venezuela. Effective compliance with its provisions will have significant repercussions for tobacco use in the Region, and ultimately, for the morbidity and mortality caused by tobacco.

Smoke-free Environments

Smoke-free environments protect nonsmokers from the harmful effects of exposure to tobacco smoke. They also constitute, in terms of economic cost, one of the most effective measures for reducing tobacco use (*129*).

In March 2006, Uruguay became the first country in the Americas to impose an absolute ban on smoking in all indoor workplaces (including clubs, bars, and restaurants) and in all public establishments. Significant progress at various jurisdictional levels has also been made in Canada to prevent exposure to tobacco smoke (covering 74% of the population), the United States (45% of the total population), and Argentina (Santa Fe, Córdoba, and Tucumán, representing 21% of the entire country) (*130*, *131*).

Public information campaigns have been undertaken to further support the creation of smoke-free environments in several countries, including Argentina, Barbados, Brazil, Costa Rica, Guatemala, Honduras, Peru, and Trinidad and Tobago. In other countries, however, progress toward comprehensive legislation to protect workers from exposure to environmental tobacco smoke has been much slower.

PAHO recently analyzed exposure to environmental tobacco smoke within the context of the rights protected by international legal instruments of the United Nations and the inter-American systems (*132*). These instruments and their enforcement mechanisms or agencies, such as the Inter-American Commission on Human Rights, offer clear directions to governments on how to protect workers and the general population from exposure to environmental tobacco smoke and open an appropriate legal channel for individuals to defend their right to healthy, smoke-free environments.

Taxes on Tobacco Products and Price-setting

The relationship between the prices of tobacco products and the population's income (accessibility of tobacco), as well as the relationship between these prices and those of other consumer products, are among the primary factors determining their purchase (*133*). Between 1990 and 2001, there were more countries in the Americas where the price of cigarettes fell with respect to income than those where it increased. The cost of 100 packs of cigarettes as a percentage of the average per capita GDP for the period 1999–2001 was highest in Ecuador (nearly 9%) and lowest in the United States (less than 2%) (*134*). Currently, no detailed analysis of the most recent changes in the accessibility (relative price) of tobacco is available, but this should be an important monitoring priority for understanding changes in per capita consumption.

Most countries do not pay due attention to the impact of the relative price (accessibility) on tobacco use, and fiscal policy has not been sufficiently utilized in the Region as a tool to reduce consumption. A result is that tobacco often becomes more—rather than less—economical (or accessible) over time. Nevertheless, some countries, including Mexico and Uruguay, have implemented moderate tax increases on tobacco use in recent years as a

specific part of their antismoking efforts, or—as in the case of Jamaica—to finance medical costs. In 2006, Suriname significantly increased taxes on cigarettes, effectively doubling the sales price.

Health Risk Warnings on Tobacco Products

Conspicuous warnings on the risks to health printed on cigarette packs provide valuable information to smokers and motivate them to try to quit or reduce their consumption. Studies conducted in Brazil and Canada indicate that these warnings were very effective in communicating health risks and motivating smokers to try to quit and smoke outdoors, away from their families (*135, 136*).

Four countries in the Americas—Brazil, Canada, Uruguay, and Venezuela—currently require packs to carry printed warning images on them; Panama and several Caribbean countries also are considering the possibility of implementing this requirement.

Elimination of Tobacco Advertising and Promotion

Tobacco promotion has been correlated with an increase in consumption and the initiation of young people to smoking (*137*). Evidence exists that restrictions on promotion are effective only when they completely ban all or most forms of direct and indirect advertising (*138*). This is the case because when provisions restricting some form of tobacco advertising or its presentation in a given medium (e.g., radio, television) are approved, tobacco companies simply redirect their resources to types of promotion where the prohibition does not yet apply.

Although the FCTC requires countries to prohibit the promotion of tobacco within five years of the Convention's entry into force, in the Region of the Americas only Brazil (which allows promotion solely at points of sale), Canada (which allows some types of promotion), and Cuba impose restrictions on the promotion of tobacco use considered sufficiently broad to reduce consumption. Although in 2006 a law was approved in Chile banning many forms of tobacco advertising, its provisions fail to ban tobacco companies from advertising sponsorships and other forms of indirect advertising, and thus the law has not been effective. It is possible that the depiction of tobacco use in film has been the most important promotional vehicle in recent years. A great deal of research has confirmed that young nonsmokers exposed to such films are almost three times more likely to start smoking than those who are not exposed. The showing of tobacco use in films also increases young people's willingness to smoke (*139*). Public health agencies, including WHO, have provided their support to various principles that would reduce the impact of depicting tobacco use in films (*140*); to date, no major United States motion picture studio has agreed to apply these principles.

Tobacco Industry Activities

The Region's tobacco industry is an oligopoly controlled by the transnational corporations of British American Tobacco and Philip Morris International. PAHO and other agencies have documented the tobacco industry's strategies to counter effective tobacco control policies, using the tobacco companies' own allegedly probatory documents (*127*). One of the industry's most popular campaigns in the Region is the program called "Living Together in Harmony," which promotes smokers and nonsmokers sharing spaces as a tactic to neutralize laws requiring the establishment of smoke-free environments. This program was recently relaunched in Mexico (*141*), where there is growing community pressure to enforce laws that ban smoking. Another customary strategy is to use school smoking prevention programs aimed at young people. In fact, several governments in the Americas, through their health or education ministries, have contacted tobacco companies to have them cosponsor these programs, which have proven to be ineffective. British American Tobacco reports that it has sponsored health promotion programs for young people in Venezuela (*142*), and Philip Morris International has launched its "Yo tengo P.O.D.E.R." (I have POWER) program in schools in Uruguay. More recent initiatives by tobacco companies consist of voluntarily placing more conspicuous health warning messages on cigarette packs (*143*), to stay ahead of governments imposing stronger warnings.

The reactions of the tobacco companies reveal which control measures they perceive as most threatening to their sales and thus reinforce independent verifications to evaluate the efficacy of these measures on the reduction of tobacco use.

Tobacco in the Courtroom

In August 2006, in a civil lawsuit brought by the U.S. Department of Justice (*United States v. Philip Morris et al.*), the Federal Court for the District of Columbia found that several tobacco companies were guilty of illegal activities under the so-called RICO (Racketeer Influenced and Corrupt Organizations) statute, which pursues corrupt and criminal organizations, and ordered various measures including prohibiting the use of misleading terms such as "mild" and "low tar." The tobacco companies appealed, and the Federal Court of Appeals suspended the judgment and the above-mentioned prohibition, indicating that enforcement of the measures ordered by the lower court will not be required until the courts have ruled on all pending appeals (*144*).

Many legal class actions on behalf of a group of victims, individual claims, suits to recover medical expenses, and other legal actions remain pending in the United States and Canada. Nevertheless, British American Tobacco reports that the only other countries in the Region with more than five suits pending against the company are Argentina and Brazil (*145*).

Challenges and Priorities for the Future

The tobacco industry continues to be the principal obstacle to reducing the morbidity and mortality caused by tobacco in the

Americas. Second is the inability of public health systems in many countries to make prevention of tobacco use a high priority, rather than focusing on ineffective strategies in terms of cost, such as individual programs to quit smoking and school education programs (which do not work). Although some short-term studies monitoring school programs have reported a lower prevalence of tobacco use among young people, the evaluation of long-term efficacy provides convincing indications that they are not effective (*146*). Perhaps they can improve students' knowledge of the risks of smoking, but over the long term they do not reduce smoking in young people. The logical appeal of these programs, combined with their lack of efficacy in actually reducing smoking, explains why the tobacco industry has been supporting them for so long. Nevertheless, the situation is changing: the entry into force of the WHO FCTC has mobilized governments and nongovernmental organizations to strengthen actions to reduce tobacco use, placing greater emphasis on measures that have proven their cost-effectiveness and have a greater impact on the population.

A central achievement of the FCTC is the recognition by governments of the need to collaborate globally to ensure the exchange of success stories and the support of wealthy countries for the application of the FCTC in developing countries. The pending challenge rests on ensuring that the spirit of the FCTC is translated into action, providing more resources to the countries that need them most.

ALCOHOL

Worldwide, alcohol consumption has become one of the most significant risks to health. According to the *World Health Report 2002* (*147*), 4.0% of the burden of disease should be attributed to alcohol, equivalent to 58.3 million lost DALYs, and 1.8 million deaths, or 3.2% of all deaths in the world. Alcohol is the leading risk to health in developing countries with low mortality, where it is the cause of 6.2% of lost DALYs, and the number three risk in developed countries, where it represents 9.2% of lost DALYs. In the Region of the Americas, it is the leading risk factor among the 27 different factors evaluated for the burden of disease (*148*), as shown in Table 24.

The burden of disease caused by alcohol consumption in the Region is significant and exceeds global figures: 4.8% of deaths and 9.7% of DALYs in 2000 (compared with 3.2% and 4.0% worldwide, respectively) are attributable to alcohol consumption, and most occur in the Central and South American countries (*149*). It is estimated to have caused at least 279,000 deaths that year, a number proportionally higher than European and global averages (*148*). Intentional and unintentional injuries represented nearly 60% of all alcohol-related deaths and nearly 40% of the morbidity due to the same cause. Most of the burden of disease affects males (83.3%); 77.4% of morbidity affects the population aged 15–44, indicating that it primarily affects young peo-

TABLE 24. Primary risk factors for the burden of disease and percentage of total DALYs, Region of the Americas, 2000.

Amr-D[a]		Amr-B[a]		Amr-A[a]	
High mortality	%	Low mortality	%	Very low mortality	%
Alcohol	11.4	Alcohol	11.4	Tobacco	13.3
Low birthweight	5.3	Overweight	4.2	Alcohol	7.8
Unprotected sex	4.8	High blood pressure	4.0	Overweight	7.5
Lack of sanitation	4.3	Tobacco	3.7	High blood pressure	6.0
Overweight	2.4	High cholesterol	2.3	Low cholesterol	5.3
High blood pressure	2.2	Unprotected sex	2.1	Low intake of fruits and vegetables	2.9
Iron deficiency	1.9	Lead exposure	2.1	Physical inactivity	2.7
Smoke in the home (use of fuel)	1.9	Low intake of fruits and vegetables	1.8	Unprotected sex	2.6
High cholesterol	1.1	Lack of sanitation	1.6	Unprotected sex	1.1
Low intake of fruits and vegetables	0.8	Physical inactivity	1.4	Iron deficiency	1.0

[a]To facilitate cause-of-death and burden-of-disease analyses, the 192 Member States of WHO have been divided into five mortality strata on the basis of their levels of mortality in children under 5 years of age and in males ages 15–59. The Amr-D classification refers to developing countries in the Region of the Americas with high child mortality and high adult mortality, Amr-B to developing countries in the Region with low child mortality and low adult mortality, and Amr-A to developed countries in the Region of the Americas with very low child mortality and low adult mortality. Table 5 in this chapter lists the Region's countries by their corresponding A, B, and D mortality strata.

Source: Pan American Health Organization, Sustainable Development and Environmental Health Area, based on data from Rehm J, Room R, Monteiro M, Gmel G, Graham K, Rehn N et al. Alcohol use. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. Comparative qualification of health risks: global and regional burden of disease due to selected risk factors (Vol 1). Geneva: WHO; 2004, pp. 959–1108.

TABLE 25. Comparison of mortality attributable to alcohol, by absolute number and percentage, Region of the Americas and worldwide, 2002.

	Region of the Americas		Worldwide	
	No. of deaths	Percentage of total attributable to alcohol	No. of deaths	Percentage of total deaths attributable to alcohol
Perinatal and maternal morbidity	203	0.1	3,057	0.2
Cancer	37,006	14.0	377,968	21.2
Neuropsychiatric morbidity	27,492	10.4	113,603	6.4
Cardiovascular diseases	–3,249[a]	–1.2[a]	196,646	11.0
Other noncommunicable diseases	46,657	17.6	237,985	13.3
Unintentional injuries	88,409	33.4	585,553	32.8
Intentional injuries	68,180	25.8	269,155	15.1
Total alcohol-related deaths	264,697	100.0	1,783,567	100.0
Percentage of deaths attributable to alcohol with respect to all deaths	4.4		3.1	

[a]The negative figures correspond to the number of lives saved by reduced alcohol consumption and its beneficial effects on cardiovascular diseases.

Source: Pan American Health Organization, Sustainable Development and Environmental Health Area, based on data from Rehm J, Room R, Monteiro M, Gmel G, Graham K, Rehm N et al. Alcohol use. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. Comparative qualification of health risks: global and regional burden of disease due to selected risk factors (Vol 1). Geneva: WHO; 2004, pp. 959–1108.

ple and young adults during their most productive years. Table 25 summarizes alcohol-related mortality results for 2002, comparing the Region of the Americas with global figures, yielding very similar burden-of-disease results to those from 2000.

Alcohol Consumption, Health, and Social Problems

Alcohol consumption is widespread in most countries in the Americas, despite the fact that it is not free of risks. It is essentially an intoxicating drug that causes dependency and is primarily consumed for its psychoactive effects that alter perception and behavior. Alcohol addiction (usually called alcoholism) is a behavioral disorder characterized by dependence, involving deficient personal control of its consumption, growing tolerance to its effects, withdrawal, a desire to drink, and constant consumption, in addition to the numerous health and social problems that afflict drinkers.

Despite large subregional variations in per capita alcohol consumption, the average in the Americas, weighted by population, is 8.9 liters, well above the global average of 5.8 liters (*148*) (Table 26). Figure 25 shows alcohol consumption trends, by type of beverage, in Central and South America over the last 40 years. These trends reflect only recorded alcohol consumption and do not include home or clandestine production of alcoholic beverages, which are considered significant in the Region. The figures show that beer consumption is undergoing sustained growth, while wine consumption has fallen or stabilized. The consumption of distilled spirits has also increased over the years.

Several nations in the Region are major producers of alcoholic beverages, and the taxes on their sale represent a significant source of revenue for the respective national economies. Nevertheless, in countries such as the United States and Canada, where earnings from alcohol are enormous, analysis of the costs of alcohol consumption indicates that they far exceed the revenues they generate. In the United States, the estimated economic cost of alcohol consumption in 1992 was US$ 148 billion, including more than US$ 19 billion spent on health care, but in 1998 it grew 25% to US$ 184.6 billion (*150*)—that is, approximately US$ 638 per capita. In Canada, the economic costs of alcohol consumption represent 2.7% of the GDP, equivalent to US$ 18.4 billion in 1992 (*151*). There are no similar studies available for the Region's developing countries.

It is estimated that in many of these latter countries, the consumption of alcohol produced or distilled illegally in the home, or smuggled as contraband, is on par with the consumption of commercially produced alcoholic beverages. This represents a challenge, both from an information perspective, since this consumption is difficult to record, and also from a public health perspective, since noncommercial alcohol production and its quality are not subject to any control. It is estimated that in most Latin American countries, 11%–55% of total alcohol consumption goes unrecorded (*152*).

Several interrelated factors combine to cause the harmful effects of alcohol. Alcohol consumption is characterized and measured by three important elements: the amount of alcohol consumed in one year, the amount consumed on a single occasion, and the context and circumstances under which it is consumed (*153*). In the Region, occasional excessive alcohol consumption is quite common. This represents a harmful pattern of consumption that damages health and translates into problems related to intentional and unintentional injuries, including homicides, traffic accidents, violence, drowning, falls, burns, poisoning, and suicides. At the same time, a significant proportion of people who have alcohol-related disorders, particularly dependence, over time present

TABLE 26. Alcohol consumption characteristics, by country, Region of the Americas, 2000.

Country	Per capita consumption[a]	Unrecorded consumption[b]	Drinking patterns[c]	Abstainers (%)		Per capita consumption per drinker[d]
				Men	Women	
Argentina	16.3	1.0	2	7	21	19.0
Barbados	7.4	–0.5	2	29	70	14.8
Belize	6.4	2.0	4	24	44	9.7
Bolivia	5.7	3.0	3	24	45	8.7
Brazil	8.6	3.0	3	13	31	11.1
Canada	9.4	1.0	2	17	28	12.1
Chile	8.3	1.0	3	31	47	13.6
Colombia	8.3	2.0	3	31	47	13.6
Costa Rica	6.7	2.0	3	45	70	15.9
Cuba	5.7	2.0	2	29	70	11.4
Dominican Republic	5.7	1.0	2	12	35	7.5
Ecuador	5.5	3.7	3	41	67	12.0
El Salvador	4.6	2.0	4	9	38	6.0
Guatemala	3.7	2.0	4	49	84	11.2
Guyana	12.1	2.0	3	20	40	17.3
Haiti	5.4	0.0	2	58	62	13.5
Honduras	4.2	2.0	4	9	38	5.5
Jamaica	4.3	1.0	2	29	70	8.6
Mexico	8.2	4.0	4	36	65	16.7
Nicaragua	3.7	1.0	4	9	38	4.9
Paraguay	9.6	1.5	3	9	33	12.2
Peru	5.4	1.0	3	17	24	6.8
Suriname	6.0	0.0	3	30	55	10.5
Trinidad and Tobago	2.4	0.0	2	29	70	4.8
United States	9.5	1.0	2	28	43	14.8
Uruguay	9.5	2.0	3	25	43	14.4
Venezuela	9.6	2.0	3	30	55	16.8

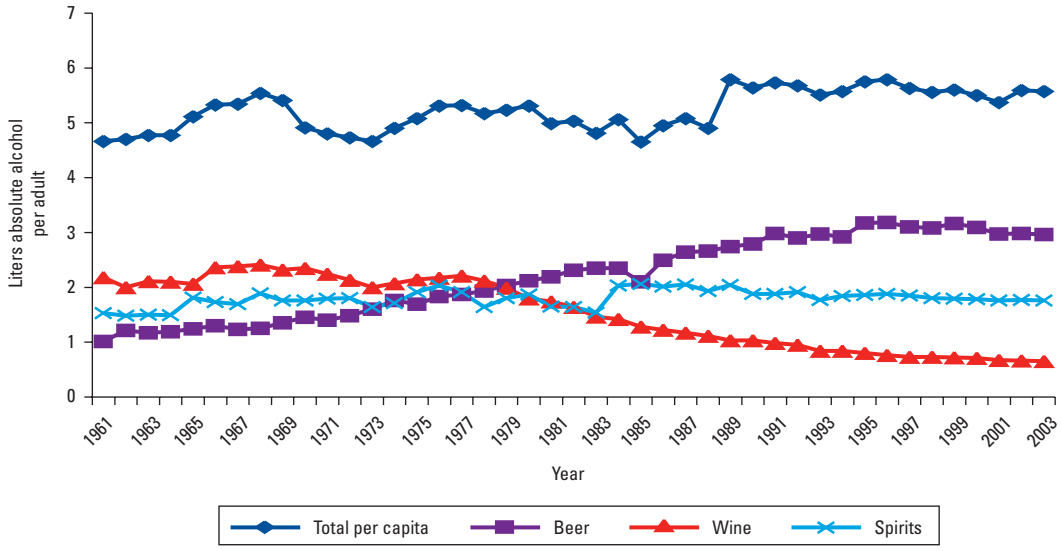
[a]Liters of pure alcohol, including unrecorded consumption.
[b]Liters of pure alcohol.
[c]Hazardous drinking score, where 1 = least detrimental and 4 = most detrimental.
[d]Per capita consumption per drinker, in liters of pure alcohol, including unrecorded consumption.
Source: Rehm J, Monteiro M. Alcohol consumption and burden of disease in the Americas: implications for alcohol policy. Rev Panam Salud Pública 2005; 18(4/5): 241–248.

chronic health problems that ultimately translate into many years of life lost due to disability. All of this represents more than 50% of the total burden of disease related to alcohol. It is estimated that in Latin America and the Caribbean, more than 30 million people could be diagnosed with alcohol-related disorders, and more than 75% of this group have not received any medical care (*154*).

The widespread consumption of alcoholic beverages is associated with another wide range of consequences both for health and for society, including injuries related to sports and leisure activities, reduction of work productivity, various types of cancer, chronic liver disease, heart disease, and diseases of the central and peripheral nervous system. Alcohol-related problems also extend to other people, as occurs in domestic violence, child abuse, violent behavior, and the injuries or deaths of passengers in automobiles or of pedestrians caused by drivers under the influence of alcohol.

Drinking to the point of inebriation is a significant cause of alcohol-related injuries, causing the highest percentage of DALYs lost in all Latin American and Caribbean countries; it is also highly associated with unintentional injuries, negative social consequences, and a drop in industrial productivity. These negative consequences tend to have a particular impact on young people. While per capita alcohol consumption has decreased or stabilized in Canada and the United States, binge drinking, especially among young people, is on the rise in many of the Region's countries, including Mexico, Brazil, Peru, Bolivia, Uruguay, and Chile (*152*). In developing countries, young drinkers are adopting the consumption habits of their counterparts in developed countries (*155*). Young people run a higher risk than other age groups of being involved in accidents while driving under the influence of alcohol as well as engaging in violent behavior and having alcohol-related family problems.

FIGURE 25. Alcohol consumption among persons over age 15, by year and type of beverage, Central and South American countries, 1961–2003.



Source: Rehm J, Monteiro M. Alcohol consumption and burden of disease in the Americas: implications for alcohol policy. *Rev Panam Salud Pública* 2005; 18(4/5): 241–248.

Alcohol consumption is also associated with other high-risk behaviors, such as unprotected sexual relations or the use of other psychoactive substances. For this reason, alcohol use presents a high level of comorbidity with disorders caused by the use of other problem-causing substances, such as nicotine and illegal drugs. Recent studies also suggest an association between disorders caused by alcohol and HIV/AIDS and other sexually transmitted infections.

Finally, many of the social problems related to alcohol cannot be calculated precisely, but their repercussions are considered to have a very high cost for society in terms of neglect, suffering, destruction of the family environment, loss of family income (in addition to that caused by the loss of work productivity), psychological trauma in children of alcoholic parents, the long-term consequences of domestic violence, disruptions in community life, and academic failure, among others.

The Cultural Significance of Alcohol and Its Consumption in Indigenous Communities

In ancient civilizations throughout most of the Region of the Americas, alcoholic beverages were already known and consumed before contact with Europeans during the early 16th century. During their thousands of years of history, alcoholic beverages have been primarily produced locally, on a domestic scale or in small communities, using raw materials of local origin and traditional techniques passed from one generation to the next. These beverages, produced by the fermentation of grains, fruits, or other organic substances, contained at most a low percentage of ethanol. They included wine, beer, hard cider, fermented yeast, and a variety of other beverages with ethyl alcohol content produced in specific geographical areas.

Beer, hard cider, *chicha* (a beverage made with fermented maize, traditionally consumed in Peru), and fermented yeast could not be preserved for long periods of time and means of transportation were limited, so what was produced locally was consumed relatively quickly. For the most part, these beverages were not sold in public marketplaces, but rather were consumed in the home, presented as symbols of generosity or hospitality, or shared in community festivals and religious celebrations and within the local trade circuits, to mark the end of the agricultural harvest or the completion of other types of collective undertakings. Alcohol production presupposes the existence of an agricultural surplus above the minimum necessary for subsistence. For this reason, and also given its potential to intoxicate, in many societies alcoholic beverages were considered special products: their consumption tended to be restricted to specific social classes of the population and certain political observances and religious ceremonies (*156*).

Later on during the 16th century, when distillation was discovered and spread on a commercial scale, the availability of alcoholic beverages increased substantially, and they could be accessed at any time of year, regardless of the season. Distilled beverages became a major part of colonial trade (*157*): rum flowed from the Caribbean to North America, and less expensive varieties of industrial alcohol, called commercial distilled spirits,

BOX 1. Brazilian City Reduces Alcohol-related Social Problems through Effective Legislation

The mayor of Diadema, an industrial city of nearly 400,000 inhabitants in the greater São Paulo area, submitted a bill in 2002 to require the city's 4,800 bars and restaurants to suspend sales of alcoholic beverages between the hours of 11 p.m. and 6 a.m. Since passage of this law, the number of homicides has dropped 47.4%; traffic accidents, 30%; violence against women, 55%; and the number of alcohol-related hospital admissions, 80%. Contrary to popular belief, after approval of the law, business activity intensified, investments increased, and job creation was stimulated. At least 120 additional municipalities have followed Diadema's example, and a similar law was recently passed in the State of Pernambuco. The Brazilian Federal Government is now offering additional financing for public order maintenance to municipalities that limit alcohol consumption and actively address urban violence issues (*162*).

were brought from Europe. Many of these beverages were distilled in the Region, including *aguardiente*, *cachaça* (a distilled beverage made from sugarcane, traditionally consumed in Brazil), *pulque*, and *pisco*.

Measures were frequently adopted to restrict and control the availability of alcohol: in tribal or rural societies, the consumption of alcoholic beverages tended to be limited to specific cultural celebrations and specific social hierarchies, as earlier noted. During colonization, alcohol was also used as a means of exploitation, so that the consumption of fermented beverages lost most of its cultural significance.

Over the intervening centuries, acculturation and close contact with nonindigenous and urban populations have led to widespread consumption of alcoholic beverages by indigenous groups, as well as serious social and health problems related to alcohol abuse and further aggravated by poverty. In 2002, Seale et al. (*158*) reported very high rates of alcohol use in an indigenous community in Venezuela—86.5% of males and 7.5% of females indicated that they drank excessively—while group discussions on this issue revealed that "traditional patterns of festive drinking of corn liquor had gradually been replaced by consumption of commercial beer and rum at more frequent intervals and with more negative social consequences."

In the indigenous communities of Bolivia, Brazil, Mexico, Nicaragua, and Panama, it has been reported that the consumption of alcohol was a long-established tradition, even before colonization (*159*), above all for therapeutic, medicinal, or ritual purposes, or together with food in certain celebrations. However, after colonization, the traditional beverages consumed by indigenous populations were gradually replaced by distilled beverages. Over time, alcohol consumption has increased and spread in indigenous communities, particularly among young males, who often drink until inebriated. The greater accessibility and availability of alcohol, as well as the lack of health, education, and other public services to address their basic needs, has combined with deficient living and working conditions to produce high alcohol-related morbidity and mortality in these native communities (*160*).

In conclusion, cultural and social issues associated with alcohol have transcended its importance beyond the realm of being merely a commercial commodity (*161*), and although many people associate its consumption with pleasure and socializing, its use involves serious risks to personal health and social relationships (*152*). To address the risk posed to public health by the harmful effects of alcohol consumption, the development and implementation of coordinated, comprehensive, and effective strategies are required.

The Path Forward

Socioeconomic development tends to be associated with higher levels of alcohol consumption and the damages it causes, to the extent that people with higher disposable incomes will spend more on alcoholic beverages and drink excessively as accessibility and availability of alcoholic beverages increase (*161*). For those who live in poverty, the expenses represented by alcohol consumption can bankrupt the family's economy and greatly compromise opportunities for its members to obtain an adequate education, housing, nutrition, health care, and access to other goods and services (*160*). The advertising of alcohol and the low awareness level of the negative consequences of excessive drinking, combined with the absence of effective policies restricting the availability of alcoholic beverages and the lack of health services, leave those who abuse alcohol without the means to have their health needs addressed or choose healthier alternatives.

The information available is limited, but there is sufficient evidence that action must be taken both nationally and regionally. Prevention of the harmful effects related to alcohol, therefore, must be a public health priority in the Americas, and effective policies exist, as proven in countries in the Region and around the world (Box 1).

Effective policies to reduce alcohol-related mortality and disability also aim to reduce all forms of alcohol consumption through taxes and price controls and to limit alcohol's availability (e.g., times and points of sale, sales to minors). Policies can also focus on reducing specific types of cases, including legislation to prevent operating vehicles under the influence of alcohol, short interventions for young drinkers, and implementation of training programs to promote responsible alcoholic beverage service in public venues. Controlling the sale of alcoholic beverages to young people would support these policies and would help change the social norms related to alcohol consumption and abuse.

The following interventions are crucial for addressing the availability of and demand for alcoholic beverages, appropriate responses for treating the harmful social and health effects caused by alcohol abuse, and the need to create mechanisms to facilitate and consolidate efforts aimed at reducing its negative effects. These strategies are based on the latest data proving the efficacy of a wide range of policies against alcohol abuse, sponsored by WHO and published by Oxford University Press (*161*), and on an analysis of the cost-effectiveness of the various interventions in reducing alcohol-related mortality and morbidity (*163*).

- Create a system of taxes on alcohol expressly aimed at reducing the damages caused by its consumption and based on the products' alcohol content in order to provide a practical tool for increasing the cost of beverages in direct relation to their potential to produce harmful effects.
- Establish legal and regulatory mechanisms for the production, importation, retail sale, availability, and consumption of alcoholic beverages, including a minimum age for the consumption and purchase of alcoholic beverages; restrictions related to times, days, and points of sale; a license concession system to regulate wholesale and retail sales of alcoholic beverages, providing mechanisms to sanction those who sell them for any action that promotes or encourages damage to health and the negative social consequences of alcohol abuse; importation permits; control of illegal sales; and quality standards for production of alcoholic beverages.
- Appropriately strengthen agencies responsible for enforcing the laws and regulations regarding alcohol consumption.
- Consider alcoholic beverages as goods subject to special treatment in international trade agreements in order to reinforce national and local capacity in public health matters and control of alcohol markets.
- Use marketing campaigns to better inform the general public regarding the dangers of inebriation, driving under the influence of alcohol, and excessive consumption during pregnancy, among other things.
- Entrust a governmental or independent agency with the responsibility of monitoring and enforcing regulations and prohibitions related to advertising and promoting alcoholic beverages in the print media and on radio, television, the Internet, and public signage, as well as at cultural, youth, and sporting events, paying particular attention to messages targeted to young people.
- Develop integrated interventions for the early detection of drinking problems and how to effectively address them and disseminate these at all primary health care services.
- Develop treatment methods for the various types of alcohol-related problems and integrate these into the general health system, ensuring their accessibility to vulnerable populations.
- Discourage driving under the influence of alcohol by measuring blood alcohol concentration (BAC) and establishing a low ceiling (BAC from 0%–0.05%) for drivers, adopting zero tolerance policies for new drivers who drink, as well as random blood alcohol testing, sobriety checkpoints, and suspension of drivers' licenses by simple administrative order.
- Develop information systems to monitor alcohol consumption and related problems as a way to provide input for the implementation of policy changes and enable an evaluation of their effectiveness.
- Support and finance local organizations in defining community-level social action strategies to address alcohol-related problems.

VIOLENCE

Intentional and Unintentional Injuries

In the Region of the Americas, violence and unintentional injuries entail particularly high costs associated with mortality, morbidity, and injuries. Intentional injuries, or injuries related to violence, may be interpersonal (homicide), self-inflicted (suicide), or collective. Unintentional injuries include those caused by traffic accidents, drowning, falls, burns, and poisoning.

The WHO *World Report on Violence and Health*, in broad terms, defines violence as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation" (*164*). This includes physical, sexual, or psychological harm, as well as that caused by deprivation, and is applied to domestic violence, primarily against children, women, and the elderly; violence inflicted by and against young people; and the various forms of group violence carried out for political, economic, or social reasons. A complex interaction of individual, relational, social, cultural, and environmental factors makes the Region of the Americas one of the most violent in the world. The ecological model included in the *World Report* aims to identify risk factors, including the high level of cultural tolerance for violence, the weakness of court systems, and social inequalities. In the area of individual and family relations, a history of having been a victim or witness to violence, family violence, and peer pressure are well-known risk factors for future violent behavior.

According to official figures, in the last decade there were between 110,000 and 120,000 homicides and between 55,000 and 58,000 suicides in the Region (*165*). Various studies have shed light on the factors that contribute to creating a climate that incites violence. Specialized studies indicate that the risk of women becoming victims of violence increases when they have five or more children, a family history of violence, economic problems, a lack of work, lack of education, or live in marginal, unsafe neighborhoods in urban areas (*166*). With respect to youth violence, the factors that increase the risk of young people engaging in violent behavior include dropping out of primary school, a lack of job opportunities, having a dysfunctional family, and having been victim or witness to violence in the family environment (*167*, *168*). Moreover, while most victims of homicide are males aged 15–44 (*169*, *170*), victims of nonfatal violence are generally women, children, and the elderly. At the individual, family, community, and national levels, violence has become the norm, and since violence is to a large extent a learned behavior, the cycle continues from one generation to the next.

In general, public financial resources to combat violence tend to be used to fight crime. The costs related to violence represent more than 12% of the GDP annually, exceeding the percentage of investments in health and education (*171, 172*).

Homicides

Homicide is a crime that consists of killing another person. The WHO definition expands this concept, which is described in the *International Classification of Diseases and Related Health Problems, Tenth Revision* (ICD-10) as "injuries inflicted by another person with the intent to injure or kill, by any means" and excludes injuries due to legal intervention and operations of war (*173*). Although there are a significant number of unrecorded cases, according to the data considered, in the Americas, Colombia has the highest reported rate per 100,000 population in the last two decades. However, rates have fallen significantly in recent years, from 64 per 100,000 in 2001 to 50 per 100,000 in 2003 and, finally, to 38 per 100,000 in 2005. Most of the victims and perpetrators were males from urban areas, and many of the violent deaths were the result of the ongoing armed conflict (*170*, *174*). The decrease in deaths is due primarily to two factors: first, the Government's initiative to advance negotiations aimed at demobilizing the paramilitary organizations, and thus reducing politically related homicides; and second, the implementation of sustainable urban programs that promote peaceful coexistence and mutual respect, especially in Bogotá and Medellín, where intensive programs have been undertaken to improve city culture, reduce crime and violence, and reestablish coexistence and the urban infrastructure (*175*, *176*). This series of violence prevention programs and projects resulted in a marked decline in the homicide rates per 100,000 population, which went from 80 per 100,000 in 1995 to 21 per 100,000 in 2005 (*177*).

> ***"Air, water, and soil pollution and the exposure to toxic substances are the principal environmental health risk factors associated with development."***
>
> **Carlyle Guerra de Macedo, 1988**

The homicide rates in Brazil, which increased from 11.4 to 28.4 per 100,000 population between 1980 and 2002, are among the highest in the Region. In 2000, 28% of all homicides in the Americas took place in Brazil. Young and adult males are the most frequent victims. In general, in the most populous cities, the homicide rates tend to be higher than the rate for the entire country. Thus, for example, while in the 1980–2002 period the homicide rate per 100,000 population more than doubled in all of Brazil, in São Paulo it tripled (*178*).

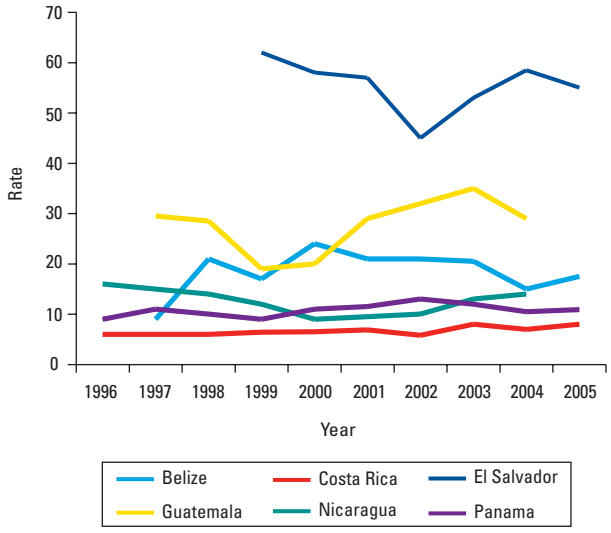
In Puerto Rico, homicides constitute the 12th leading cause of death, but the fifth among males. Between 1999 and 2003 the homicide rate per 100,000 population was 47.7 for males and 3.5 for females. Urban areas are the most frequent venues, and firearms the most common means. Contributing factors include high population density and urbanization, illicit drug use, drug trafficking, political violence, and organized crime. Trends in the homicide rate vary among countries. While homicide rates in the 15–29-year-old age group have fallen in the United States from 21.6 to 13.4 per 100,000 population, in Puerto Rico they have surged from 49.8 in 1999 to 54.1 in 2003. The Puerto Rican Government and the Center for Hispanic Youth Violence Prevention are working to address this problem by improving law enforcement and implementing educational programs (*179*).

In Central America, El Salvador and Guatemala have homicide rates above 30 per 100,000 population (Figure 26). In recent years, these countries have implemented "firm hand" or "iron hand" policies aimed at controlling and reducing crime, more specifically that of the youth gangs known as *maras*. However, these policies have not achieved the expected effect, since between 2000 and 2005 the homicide rates in Guatemala increased from 20.0 to 27.0 per 100,000 population (*180*). El Salvador experienced a decrease from 62.5 to 54.9 by 2005 (*181*). Despite problems in data collection systems, Honduras reported a homicide rate of nearly 53 per 100,000 population for 2005.

In contrast, other Central American countries have lower homicide rates. Between 2001 and 2005, Costa Rica's rates ranged between 5.6 and 7.2 (*182*); in Belize they fell from 21.0 to 15.4 (*183*); in Panama they fluctuated between 10.3 and 11.9 (*184*); and in Nicaragua they increased from 7.3 to 9.5.

Over the last 30 years, in Jamaica, the homicide rate has undergone sustained growth, reaching 45 per 100,000 population in 2004 (*185*); most victims were males aged 15–44 and residents of urban areas, and firearms and sharp objects were the methods most commonly used. It is important to point out that the homi-

FIGURE 26. Homicide rates per 100,000 inhabitants, selected Central American countries, 1996–2005.



Source: Based on data from references 179–183 from this chapter.

cides were primarily related to fights or revenge rather than gang violence or assaults. In Jamaica, the cost of violence is enormous, with approximately US$ 10 million lost due to injuries related to violence and US$ 225 million lost due to all consequences of violence (*186*). In Venezuela, the homicide rate per 100,000 population increased from 19.4 in 1998 to 50.9 in 2003. Young males, particularly those living in the most vulnerable areas, are the most affected (*187*).

Youth Violence

Gang violence is currently one of the most visible forms of youth violence in the Region of the Americas. Between 20% and 50% of all violent crimes are attributed to gangs (*164*, *181*), with gang-related homicide rates in El Salvador reaching nearly 50 per 100,000 population. Gangs generally display violent and criminal behavior, and their members are not concerned with concealing their identity or about the consequences of their actions (*188*).

In general, gang members are young, poor, and marginalized, from urban areas, outside the school system, have no work, and have experienced violence in the past (*169*, *189*, *190*). Migration to large cities, the lack of social options and of gun control, the inefficiency of security forces, corruption, and drug trafficking are factors that contribute to the growth and increased activity of youth gangs.

The increased violence of gangs seems to coincide with the end of the armed conflicts in Central America during the 1990s (*191*, *192*). The epicenter of gang activity is El Salvador, Guatemala, and Honduras. However, the increased complexity of youth gangs' organization, transnational and cross-border implications, migration, and the Region's deportation criteria make this an international issue. Police estimate that there are between 25,000 and 70,000 active gang members, whose sphere of influence extends beyond their urban zones to the most remote corners of Central America (*193*).

In response to the growing problem of youth violence, PAHO, with the support of the German Agency for Technical Cooperation, has executed the Promotion of Youth Development and Violence Prevention project in six Latin American countries: Argentina, Colombia, El Salvador, Honduras, Nicaragua, and Peru. This project proposed lines of action based on the following five governing principles: developing and executing interventions based on confirmed data and theoretical concepts, and evaluating them; stressing the promotion of health and well-being in the prevention of violence; leveraging human and material resources already existing in the respective countries and at the local level; using a gender-based perspective; and including the participation of young people and the entire community in the development of policies and programs. There is already significant documentation on the national and regional scale showing the progress of this initiative and the problems it is addressing (*194*).

Internal Population Displacement due to Violence

Colombia is the only country in the Region where massive internal population displacements are occurring (close to 2 million people over the last decade) as a result of the extended armed conflict that has affected the country for more than 40 years. The "displaced by violence" category was legally adopted by the Colombian Government in 1997 with Law 387, which defined a displaced person as "any person who has been forced to migrate within the national territory . . . because his or her life, physical integrity, security, or personal freedom has been violated or is directly threatened by domestic armed conflict, domestic disturbances and tension, widespread violence, massive violations of human rights, violations of international humanitarian law, or other circumstances" (*195*). The number of people displaced by violence reached its peak in 2004, when 424,863 persons were forced to abandon their homes (*196*). The PAHO/WHO Country Office in Colombia has created a "Health and Displacement" Web site (*197*), where it provides health situation information about the displaced population.

Information Systems on Violence and Injuries

The need for regional data on the magnitude of violence, its trends, and the effectiveness of prevention strategies is increasingly important, yet acquiring reliable information remains a challenge. As is the case with many reports on disease, data related to violence tend to be quite limited, contradictory, and, depending on the sector and the source, of relatively low quality.

Despite these deficiencies, existing data systems present several positive characteristics. For violence and injuries mortality data, there is general agreement to classify them by systematically applying the *International Classification of Diseases*. Several countries have become leaders in the field of data collection, with initiatives ranging from the use of a detailed, Internet-based notification results dissemination system, being monitored by El Salvador with the help of PAHO, to the use by police in Costa Rica of a satellite positioning system to locate the exact point where a traffic accident took place. Other countries, such as Brazil, have long had complex data collection systems providing information on traffic accident victims to a classification and distribution center. Finally, in many of the Region's countries, constructive dialogue and collective information systems have been established among the various agencies that collect data on injuries, including the local ministries of health and transportation and the police, to improve the quality and interpretation of the data included in them. It is encouraging that a growing number of countries recognize the need to have broad data systems, and political decision-makers should take these aspects into consideration when preparing new plans to address the issue of injuries.

Information Systems of Injuries from External Causes: Successful Initiatives

Surveillance Systems in Hospital Emergency Departments in Colombia, El Salvador, and Nicaragua

Since 2001, PAHO, together with the U.S. National Center for Injury Prevention and Control of the CDC, has been working with health authorities in Colombia, El Salvador, and Nicaragua to implement injury surveillance systems in hospital emergency departments. To do this, they are following WHO and CDC guidelines (*198*), based on the International Classification of Causes of Injury (*199*). The objective is to highlight the magnitude and impact of these injuries on health services. The information is used to promote the development of evidence-based injury prevention strategies. The surveillance system is being applied in 16 hospitals in Colombia, eight in El Salvador, and six in Nicaragua. Argentina, Brazil, Honduras, Jamaica, Peru, and Trinidad and Tobago also have hospital surveillance systems that apply similar methodologies and processes.

In hospital emergencies, a form is used to record the patient's medical history, and on it demographic data and other circumstances related to the event are collected daily, such as the intentionality, modus operandi, where the event took place, and what the victim was doing at the time. It contains three modules with variables for injuries related to 1) traffic accidents (information regarding the person(s) and vehicle involved), 2) interpersonal violence (relationship of the perpetrator to the victim), and 3) self-inflicted violence (triggering factors). Clinical information (location and seriousness of the injuries) and the assignment of the patient within the institution are also entered on the form. There is also space to record whether there are suspicions about alcohol or drug abuse. The flowchart presented in Figure 27 shows the steps taken in emergency rooms to gather and monitor patient data.

This system has determined that between 10% and 50% of all emergencies treated in national- and departmental-level hospitals are for injuries from external causes. It has also highlighted that injuries from external causes constitute a major public health problem and has raised awareness among the health authorities regarding the need to adopt public policies aimed at preventing them. In Nicaragua, in the summer, when large segments of the population travel to vacation in beach locales, the "Happy, Safe, and Healthy Summer" plan is implemented, and an intersectoral coordination committee made up of public and private entities and community organizations monitors injuries and supports preventive measures. The PAHO/WHO Country Office in El Salvador, in coordination with the Ministry of Public Health and Social Welfare, has created a computerized information program on injuries from external causes that is linked to a Web-based morbidity-mortality system into which the country's hospitals input information daily.

Observatories on Mortality Caused by External Injuries

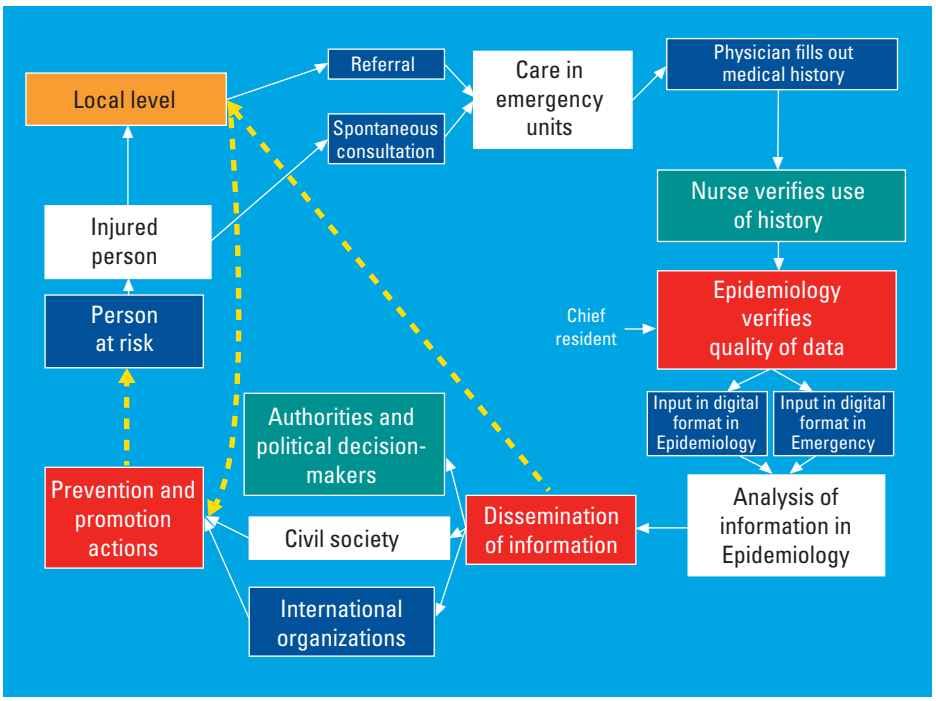
Based on a model developed in 1993 in Cali, Colombia, where an intersectoral committee consisting of representatives of institutions that routinely recorded data on mortality caused by injuries from external causes met to share, unify, analyze, and disseminate relevant information about each victim of homicide, suicide, a traffic accident, or other unintentional causes, a series of violence observatories have been established, currently the responsibility of Instituto CISALVA (*200*) of Universidad del Valle, a PAHO/WHO Collaboration Center. The observatory operating in Pasto, Colombia, also records data on domestic violence from various sources as well as hospital surveillance. The Colombian model is also being implemented in various municipalities in El Salvador, Panama, and Nicaragua.

ROAD SAFETY

Since 1896, when the world's first fatality caused by a motor vehicle was reported, there is no doubt that human mobility has undergone a major transformation. While technological advances have improved the population's living conditions by cutting travel times and distances, they have also greatly increased the number and types of risks to human life, often resulting in injuries and death.

Among unintentional injuries, those caused by motor vehicles are at the top of the list. Globally, according to the *World Report on Road Traffic Injury Prevention* by WHO and the World Bank, "in 2002, nearly 1.2 million people died worldwide as a result of road traffic injuries, which represents an average of 3,242 persons

FIGURE 27. Flowchart for the hospital emergency injury surveillance system.



Source: Pan American Health Organization, Area of Sustainable Development and Environmental Health.

dying each day around the world from road traffic injuries" (*201*). In the Americas, approximately 130,000 individuals die each year, more than 1.2 million are injured, and hundreds of thousands are disabled as a result of collisions, crashes, or road accidents (*202*).

In 2002, the Region recorded 2,055,000 traffic-related injuries, with an average mortality rate of 16 per 100,000 population, ranging from 6.8 per 100,000 in Bolivia to 24.0 per 100,000 in Guatemala (*203*) (Table 27). Although most are avoidable, the lack of permanent, consistent policies compatible with the situation of each country further aggravates the problem. The existence of road infrastructure and vehicles in poor condition; inadequate knowledge and inappropriate conduct by drivers; alcohol abuse and other pervasive, risky social norms and behaviors; and lack of efficient emergency medical services are contributing factors.

Each road traffic injury generates short-, medium-, and long-term repercussions. The costs to society, families, and the health sector are considerable. Reports from some Latin American countries show the tremendous costs linked to roadway crashes.

At the family level, the aftereffects are oftentimes more acute. Injuries or death can bring about the total loss of a family's means of economic support, in addition to emotional pain. In Mexico, the loss of parents to accidents is the second leading cause of children being orphaned (*204*). Injuries caused by transit also constitute a source of stress on the legal system, a manifestation of the deterioration of public safety.

Who Has Accidents?

Users of public roads. Injuries caused by motor vehicles affect four categories of users of public roadways: pedestrians, occupants of motor vehicles (drivers and passengers), bicyclists, and motorcyclists. There are marked regional and national differences in the distribution of injuries (Figure 28). Low income countries in Latin America have a particularly complex mix of public roadway users; pedestrians and high-technology motor vehicles share the road with old and poorly maintained vehicles, in addition to bicycles, motorcycles, pushcarts, and vehicles drawn by animals. Roadway design is focused more on the needs of the motor vehicle traffic flow than on those of nonmotorized users. There are no legal regulations or social norms that facilitate sharing the streets and roads. This results in pedestrians, bicyclists, and motorcyclists becoming the most frequent victims of traffic accidents in developing countries.

Country data on the distribution of deaths by type of roadway user show the vulnerability of pedestrians in Latin America and the Caribbean, while the problem in Canada and the United States revolves largely around vehicle occupants.

Gender. In accordance with global trends, road collisions have a disproportionate impact on males throughout the Americas: in the last decade, between 75% and 80% of deaths were among

TABLE 27. Mortality caused by traffic accidents, selected countries, Region of the Americas, 2000–2006.

Country	Rate (per 100,000 population)	Year
Argentina	9.5	2002
Belize	26.7	2006
Bolivia	6.8	2003
Brazil	19.9	2004
Canada	9.0	2003
Chile	9.9	2002
Colombia	11.8	2005
Costa Rica	14.2	2004
Cuba	10.6	2003
Ecuador	15.6	2000
El Salvador	16.9	2005
Guatemala	24.0	2005
Jamaica	14.8	2003
Mexico	15.0	2001
Nicaragua	9.1	2005
Panama	13.2	2006
Peru	10.5	2003
Trinidad and Tobago	14.9	2003
United States of America	14.6	2000
Venezuela	22.7	2002

Sources: Argentina, Ministerio de Salud, Dirección de Estadísticas e Información de Salud. (Argentina)

Taller de Sistemas de Vigilancia de Lesiones de Causa Externa con énfasis en el Tránsito. El Salvador, 30–31 January 2007. (Belize, El Salvador, Guatemala, Panama)

Seminario Internacional sobre Seguridad Vial, Organización Panamericana de la Salud, Brasilia, 28–30 June 2004. (Bolivia, Brazil, Colombia, Costa Rica, Cuba, Jamaica, Mexico, Nicaragua, Peru)

Canada, Statistics Canada. Age-standardized mortality rates by selected causes, by sex. Available from: http://www40.statcan.ca/l01/cst01/health30a.htm. Accessed on 27 February 2007. (Canada)

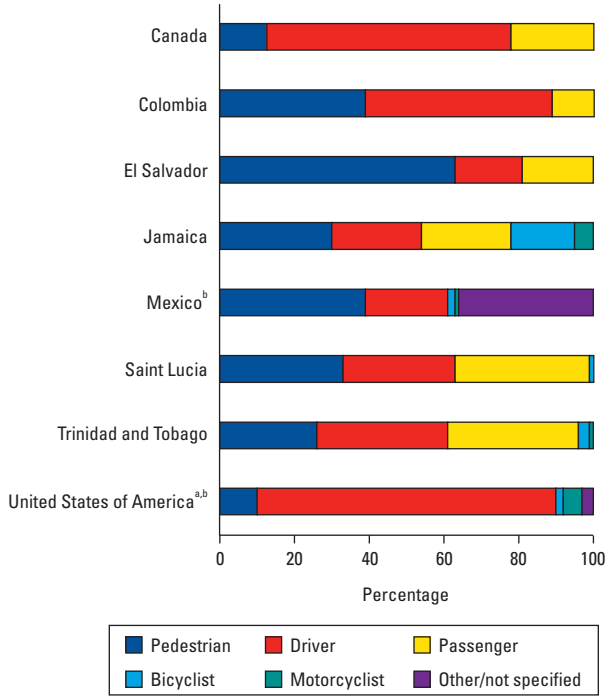
Chile, Comisión Nacional de Seguridad de Tránsito; Instituto Nacional de Estadística (INE). (Chile)

Ecuador, Instituto Nacional de Estadística y Censos. 2001. (Ecuador)

Trinidad and Tobago, Ministry of Planning and Development, Central Statistical Office. Available from: http://www.cso.gov.tt/statistics/psvs/default.asp. Accessed on 11 June 2004. (Trinidad and Tobago)

Maynard M. Death rate on highways rises, and motorcycles are blamed. The New York Times. 23 August 2006. (United States)

FIGURE 28. Traffic accident mortality, by type of road user,[a] selected countries, Region of the Americas, 2000–2003.



[a]Roadway user categories are not homogeneous for all countries.
[b]The data from Mexico and the United States do not differentiate between drivers and passengers; therefore, the portion of the bars for these two countries representing drivers corresponds to the total number of drivers and passengers deceased.
Sources: Canada, 2002: Canadian Motor Vehicle Traffic Collision Statistics, 2002, http://www.tc.gc.ca/roadsafety/tp/tp3322/2002/page3.htm.
Colombia, 2002: National Institute of Legal Medicine.
El Salvador, 2003: National policy registry.
Jamaica, 2003: Ministry of Health and Jamaica Constabulary Force.
Mexico, 2000: Consejo Nacional de Prevención de Accidentes.
Saint Lucia, 2001: Traffic Department, Royal Saint Lucia Police Force.
Trinidad and Tobago, 2003: Carr BA. Spotlight on motor vehicle injury and deaths in Trinidad and Tobago (1998–2003). PAHO; 2004.
United States, 2002: National Highway Traffic Safety Administration.

males, and between 20% and 25% were among women. Injuries caused by traffic accidents were the eighth leading cause of death among males and the 14th among females, and the roadway mortality rate was 23.9 per 100,000 population for males, three times higher than the rate for females of 7.7 per 100,000 population. Furthermore, in 2002, these injuries were the sixth leading cause of DALYs lost among males (3,109,083) and the 14th among females (1,141,861) (*201*).

Age distribution. In the distribution of deaths caused by road traffic in the Americas by age group in 2002, adults aged 15–29 represented 32% of the burden of mortality caused by road traffic accidents, followed by adults aged 30–44, with 25%. In Argentina, adults aged 15–24 had the highest proportion (one in five) of traffic-related deaths during the 1993–2002 period (*205*). In Colombia, the higher rates of traffic-related deaths corresponded to adults aged 60 and older. Among females, those 60 and older were also the most affected (23% of total deaths), followed by females aged 25–34 (15%) (*206*). In Venezuela, adults aged 20–44 represented more than 50% of all traffic-related deaths between 1993 and 2002. The proportion of deaths among children aged 0–14 in Venezuela fell slightly, from 13% in 1993 to 10% in 2003; at the same time, the proportion of deaths among adults aged 45–59 increased (*207*).

In Cuba, more than half the traffic-related deaths between 1993 and 2002 were adults aged 19–44 (*208*). In Trinidad and To-

bago, traffic accidents were the second leading cause of death among adults aged 15–34 in 1999 (*209*). In Costa Rica, the proportion of traffic-related deaths for adults aged 60 and older has fallen since the early 1990s from 22% of all deaths in 1993 to 15% in 2002 (after experiencing a slight upturn in 1999 and 2000) (*210*). This trend in the Americas is consistent with global trends. Despite the fact that the population aged 15–59 are the most economically productive, and, consequently, their death or disability has major repercussions on each country's economic and social costs, the highest mortality rates in the Region in 2002 were for the population over age 60: for males, 35.2 per 100,000 population, and for females, 14.4 per 100,000 (*211*).

Strategies for Improving Road Safety

Traffic-planning strategies to address this problem have followed the traditional methods used in developed countries already familiar with this serious phenomenon. The persistence of deficient road safety conditions, however, highlights the inadequacy of the prevailing available strategies.

New ideas and interventions are required to make road traffic more equitable and safe. To find the most appropriate solutions, rather than considering the primary factors in isolation (the public road user, roadway, and vehicles), it is essential to consider the broad physical, political, institutional, technical, and law enforcement context as a whole as well as its influence on road safety.

In developing countries, in terms of road safety, the entire road traffic context is dangerous for all forms of transportation but primarily for pedestrians, bicyclists, and motorcyclists, and this fact has a profound influence on the nature and number of traffic accidents. The political context also affects road traffic safety, since the decision-making process and the policies adopted tend to favor motor vehicles. The institutional context, characterized by its placing of responsibility for roadway policy in the hands of the regional authority and not municipal administrators, has represented an obstacle for local investment and the adoption of solutions more closely linked to local problems and needs. The technical context also plays an important role. Transportation and road traffic planners belong to agencies with a strict technical tradition and often neglect broader social approaches to problems; they are not required to prioritize safety and cannot be held legally responsible for the safety consequences of the plans they develop.

Another problem for improving traffic planning is the lack of reliable data relating to accidents and their victims, from various sectors, such as transportation, police, and health care. The conditions under which laws and regulations are or are not enforced also contribute to maintaining high rates of accidents and traffic-related deaths. Traffic laws and regulations are applied, above all, with an emphasis on optimizing traffic flow, but this can in no way imply negligence in their strict enforcement and in the effective punishment of offenders (*212*).

Intervention and Prevention

PAHO's work to prevent injuries caused by traffic accidents is based on the primary recommendations of the earlier-mentioned WHO report (*201*) as well as those arising from international conferences and consultations. In summary, these recommendations are to identify a governing body; evaluate the problem, the policies, and the institutional environment; prepare a national strategy and plan of action; allocate human and financial resources to address the problem; take specific actions and support the development of national capacity and international cooperation; define objectives; improve legislation and insurance coverage for the most vulnerable; and effectively ensure that public spaces (e.g., streets and roads) respond to the population's needs and ensure care for the victims. In October 2005, the United Nations General Assembly approved a resolution establishing the organization, between 23 and 29 April 2007, of activities around the world aimed at demonstrating the need to develop and apply plans aimed at reducing road traffic injuries.

Immediate professional care of road traffic victims saves lives. In Venezuela, the Interministerial Commission for Road Traffic Care, Prevention, and Education; the Ministry of Health and Social Development; and the Venezuelan Society of Public Health coordinate the Program to Prevent Accidents and Other Violent Acts, one objective of which is to improve the care for victims (*207*). In Mexico, the National Accident Prevention Council has developed a prehospital care model, with an Emergency Medical Management Center serving as the base for organizing, standardizing, categorizing, providing, and evaluating quality, equitable emergency medical care (*213*). Peru has organized emergency care networks and is making progress on the recording and epidemiological surveillance system that provides valuable data to improve care and prevention strategies (*214*).

Thus, there is a body of knowledge on successful experiences, as well as others that have failed, that must be considered when defining policies to address these problems. It is clear that successful experiences can be replicated if the context and situation in which they will be implemented are taken into account. Road safety is one component of public safety, and its objective is to protect all people, including tourists. Consequently, road safety issues concern both government officials and the general population. People feel safe not only when their life, well-being, property, and dignity are not threatened by acts of crime and violence, but also when they can enjoy public spaces without the risk of road traffic injuries.

HEALTH PROMOTION

Recognition of the need to address the social determinants of health, the renewal of the primary care strategy, and new currents in thought on public health have revolutionized the debate on so-

cial processes and their effects on health and facilitated the emergence of an approach that promotes health through public policy formulation (*215*).

The Ottawa Charter for Health Promotion (Canada, 1986) (*216*), by reinforcing the principles adopted in 1978 at the International Conference on Primary Health Care in Alma-Ata (Kazakhstan) and the theories on the determining social factors for health, had a positive influence on health policies and programs (*217*). PAHO's concept of health promotion is based on the Ottawa Charter, which is defined as "the process of enabling people to increase control over, and to improve, their health." Therefore, health promotion actions must be oriented toward the various areas of daily life and must be supported by public policies that influence social conditions and lifestyles, which, in turn, take shape as healthy behaviors. The conceptual framework of health promotion is based on the principles established in the Ottawa Charter and further developed by subsequent international and regional summits, such as the Adelaide Recommendations on Healthy Public Policy (Australia, 1988), the Sundsvall Statement on Supportive Environments for Health (Sweden, 1991), the Bogotá Declaration on Health Promotion and Equity (Colombia, 1992), the Caribbean Charter for Health Promotion (Trinidad and Tobago, 1993), the Jakarta Declaration on Leading Health Promotion into the Twenty-first Century (Indonesia, 1997), the Mexico Ministerial Statement for the Promotion of Health: From Ideas to Action (2000), the Health Promotion Forum in the Americas (Chile, 2002), and the Bangkok Charter for Health Promotion in a Globalized World (Thailand, 2005).

The health promotion strategy has been placed on the agenda of the PAHO Governing Bodies by Resolution CD37.R14 (PAHO 1994) and the Regional Plan of Action for Health Promotion in the Americas CE113/15 (PAHO 1994), as well as Resolution CD43.R11 and the accompanying document CD43/14 (PAHO 2001). The issue of health promotion has also been established within the subregional integration processes, through RESSCAD and the health ministers of Central America and the Dominican Republic, and REMSAA, its counterpart in the Andean subregion.

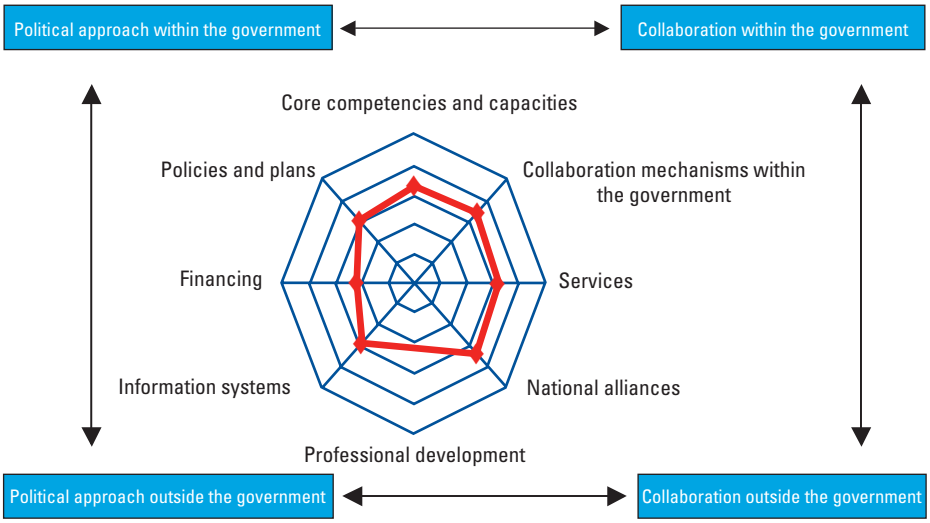
Diseases whose origins are more associated with people's behaviors and lifestyles are the leading causes of morbidity and mortality. Addictions, obesity, sedentary lifestyles, inadequate nutrition, and domestic violence are some of the risk factors whose effects are being felt with growing intensity. Few countries have adopted effective health policies and measures to modify these risky behaviors, despite numerous health education programs and various social communications campaigns undertaken in many nations. The scant positive results are due in part to the persistence of approaches based on programs operating in vertical and linear health services focused on a single factor and having little community participation. The medicalized model continues to have a disproportionate influence, based on an approach focused on the disease and on the individual risk factors which fails to consider the influence of the social conditions and determinants of health. Health interventions must consider the increased complexity of today's problems and strengthen intersectoral work.

The health promotion movement faces a complex context in the Region of the Americas. On the one hand is the conceptual development of a new approach to public health, and on the other is a context of social development in countries with profound inequalities. The integration of health promotion was initially based on experiences and proposals that arise in developed countries faced with a reality of poverty and inequalities. This contradiction with the reality of the systems became even more profound during the 1990s in countries undergoing structural changes in their health services. Nevertheless, the new social perspective on health has influenced academic thought and some health policies and programs with various methods and levels of depth.

The Bogotá Declaration (1992) (*218*) highlighted the aspects of equity and violence and was aimed at a proposal of intersectoral health management with the leadership of the health sector. Since that time, countries such as Argentina, Brazil, Costa Rica, Chile, Cuba, Mexico, and Peru have developed more integrated care models and adopted a more preventive approach in public health interventions (*219*). The health situation in the Caribbean laid the groundwork for the Caribbean Charter (1993), which underscores the importance of the strategy of chronic diseases prevention and maintenance of healthy lifestyles. The core issue addressed in the Mexico Ministerial Statement (2000) encourages governments to take active leadership with vision, ensuring the commitment of the public and private sectors and civil society in the development of public policies and plans for activities that benefit health, all with the objective of undertaking public health interventions that strengthen the potential for people's health with an ecological approach and applying the principles of equity, justice, democracy, the creation of conditions for full social participation, and intersectoral cooperation (*220*). The Mexico Ministerial Statement established a commitment to place health promotion on international political and development agendas, a commitment reaffirmed in the Bangkok Charter and in various WHO and PAHO resolutions.

In fulfillment of the Mexico Statement and the 2001 PAHO Resolution CD43.R11, a progress report was drafted on health promotion in the Region of the Americas. The preliminary version of this analysis was presented at the Health Promotion Forum in the Americas, held in Santiago, Chile, in 2002. Subsequently, a survey was conducted to assess the institutional capacity for health promotion development, organized into parts I and II, in which 28 and 27 countries in the Region participated, respectively. The results of these surveys were presented at the 6th Global Conference on Health Promotion, held in Bangkok, Thailand, in 2005. In part I, the survey proposes eight key fields or areas for monitoring national capacity in health promotion: 1) policies and plans; 2) core competencies and capacities; 3) cooperation mechanisms within the government; 4) services (pro-

FIGURE 29. Profile of institutional capacity for health promotion development in the Region of the Americas, 2005.



Source: Institutional capacity map for health promotion development. Part I of survey; *N* = 28 countries.

gram execution); 5) alliances between the government, the private sector, and nongovernmental organizations; 6) professional development; 7) information systems; and 8) financing for health promotion. In general terms, the results of this preliminary analysis are heterogeneous and show that some countries have weaknesses related to policies and plans, professional development, information systems, and financing. Figure 29 shows the general profile of the institutional capacity for health promotion in the Region. The analysis of the data and results of part II permitted a more detailed mapping of national capacity in health promotion in critical areas, including plans of action, public policies, reorientation of health services, civic participation, and advocacy networks.

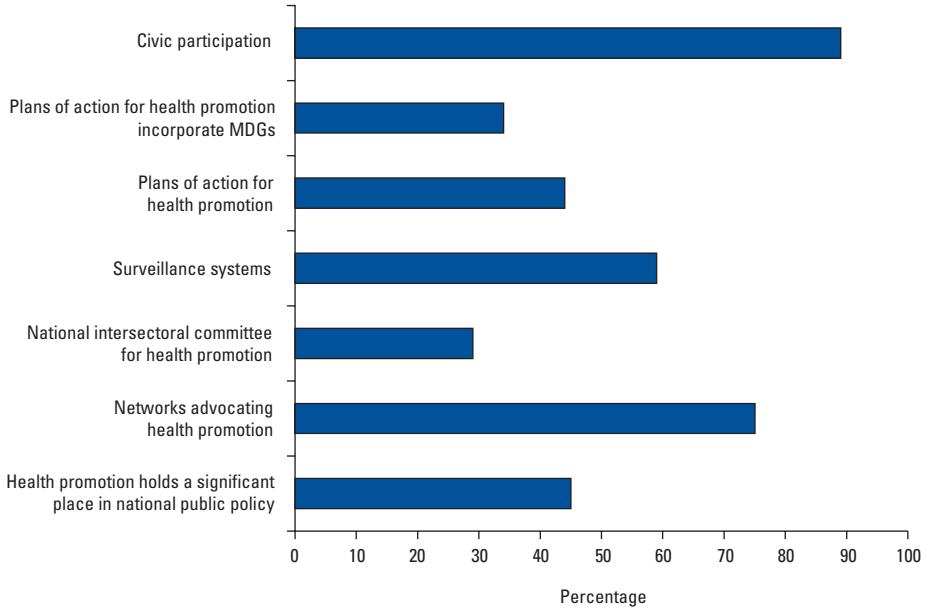
The results of part II of the survey indicated that in about 45% of the countries, health promotion holds a relevant position in national public policy and that fewer than half the countries have a political or legal framework that supports health promotion (Figure 30).

This analysis also shows that the countries in the Region have used different approaches for the development and application of healthy public policies and that the approaches respond to different social, political, and economic circumstances. For example, Brazil has adopted the participatory budget model and has taken actions to adapt and implement public health policy demonstration areas at the municipal level, with the support of the municipal and state health boards. Argentina has stimulated a profound debate on the impact of the economy on health determinants, which has strengthened its social policies and furthered tobacco control policies and the training of health care personnel in health promotion competencies. Chile has implemented the health promotion policy known as Vida Chile, with an intersectoral approach aimed at improving health determinants. Brazil, Canada, Paraguay, and Uruguay have developed specific policies to address the health risks posed by tobacco, alcohol, and the lack of road safety. Barbados has established social participation mechanisms for the establishment of policies through public consultations at the national and community levels. The United States has encouraged civic participation through the establishment of its Healthy People 2010 public policy. In Trinidad and Tobago, acts and national policies were approved to promote health with broad-based community involvement.

The creation of environments that favor health has gained enormous momentum over the past decade. In 95% of the countries surveyed, some initiative is under way to create healthy environments, and in 70% of the countries there are strategic plans at the municipal level. The initiative is based on both the political commitment of mayors and other local authorities and on the active participation of citizens to define their collective needs and establish local plans to address them (*221*). Nevertheless, although most healthy cities and municipalities have intersectoral plans and full community participation, the monitoring, development, and evaluation of evidence regarding these issues continue to represent a major challenge. Only 35% of the countries reported that the initiatives to create healthy environments have been evaluated (*222*).

The establishment of networks and alliances has been a key factor in the dissemination and exchange of experiences between municipalities and countries. In 75% of the countries surveyed,

FIGURE 30. Distribution of thematic areas of health promotion, Region of the Americas.



Source: Institutional capacity map and comparative analysis 2002–2005. Part II of survey; *N* = 27 countries.

there are health promotion advocacy networks (Figure 30). Networks promoting the creation of healthy cities and municipalities are one example of best practices, since through intersectoral work they have improved health conditions in many urban areas. While the regional network has been difficult to sustain, national networks in Argentina, Chile, Costa Rica, Cuba, Mexico, Paraguay, and Peru have proven their sustainability over time. The Safe and Healthy Sister Cities initiative implemented along the U.S.-Mexico border area is an example of cooperation to resolve problems requiring a bilateral approach. This network of cities, formed out of the building of alliances between local governments with the social participation of stakeholders from a variety of sectors, has had great success. The action plans are structured based on binational agreements and are planned and evaluated by the community.

Complementing and enhancing the healthy cities and municipalities concept are the health-promoting schools and healthy housing strategies, which similarly have been the fruit of the work of networks and alliances and effective community participation.

The health-promoting schools (HPS) strategy promotes the development of knowledge, abilities, and skills in the school environment aimed at minimizing risky behaviors and supporting the adoption of healthy lifestyles. Based on the results of a survey conducted in 2001 in 19 countries in the Region, 53% of the participating countries reported having adopted this strategy. Among them, Canada, Chile, Colombia, El Salvador, and Mexico are implementing the initiative nationally. Based on the information obtained in the survey, the Plan of Action 2003–2012 for the Health-Promoting Schools Regional Initiative was developed and adopted by HPS networks at their third annual meeting in Quito, Ecuador, in 2002 (*223*). The countries participating in this initiative are now moving forward to develop procedural guides for HPS certification and accreditation.

The healthy housing initiative has helped to promote and protect the health of the Region's most vulnerable populations from environmental hazards in the home and has contributed to the integrated local development of communities. It is estimated that the housing deficit in Latin America and the Caribbean is approximately 23 to 28 million units. This precarious housing situation affects the population's health, particularly the poorest and most vulnerable segments, such as children, the disabled, and the elderly, who spend much of their time at home. The Inter-American Healthy Housing Network (VIVSALUD), made up of 12 countries, disseminates, together with the United Nations Human Settlement Program and ECLAC, guidelines for national and local authorities on the primary components of the healthy housing strategy. Regional implementation of the community program started in Colombia called "Toward healthy housing: Long live my home!" has been promoted, and for this, more than 300 professionals and technicians have been trained in bioclimatic architecture, sustainable construction, vector elimination, and healthy housing. The Canada Mortgage and Housing Corporation promotes the concept of healthy housing and publishes guides and pamphlets on housing-related health issues.

Analysis of the map of institutional capacities for health promotion (Figure 30) also shows that nearly 90% of the countries surveyed reported having mechanisms and opportunities for ac-

> *"Accelerated urban growth, industrial expansion, and agricultural development in Latin American and Caribbean countries in recent years have triggered a sharp rise in environmental contamination in the Region, which has, in turn, resulted in heightened environmental hazards to human health."*
>
> **George A.O. Alleyne, 1994**

tive civic participation. The most common forms of civic participation are public consultations and forums. Social and community participation represents a fundamental strategy for health promotion, and it is achieved by building networks in which representatives of multiple sectors and nongovernmental organizations participate.

Moreover, 90% of the countries have some policy to reorient health services beyond preventing and treating disease. For example, in Nicaragua and Costa Rica, as well as in Mexico City, Mexico, and Bogotá, Colombia, integrated care models are being incorporated into health and social development plans. Mexico has an operational model and is establishing an integrated health promotion service throughout the country. The principle of comprehensive care is guiding health reform in Brazil and is the focus of the family health strategy. Programa Puente, in Chile, and the recently started Programa Juntos, in Peru, integrate primary health care services with other social services targeting the family. FOROSALUD, a broad federation of civil society organizations in Peru, and the Congresses for Health and Life in Ecuador, are actively demanding the reorientation of health services with an intersectoral and integrated vision. Argentina has also redirected its services, particularly through its social and community health programs. But these processes still face multiple challenges, from a lack of adequate resources to a profound operational fragmentation of services in many uncoordinated, parallel, duplicate, and overlapping subnetworks, in a context in which the institutional and organizational segmentation of the Region's health systems is on the rise.

Building intersectoral consensus is fundamental for health promotion. Of the countries that participated in the surveys on institutional capacity for health promotion, approximately 30% have an intersectoral council or committee at the national level (Figure 30). The experiences of Argentina, Brazil, Chile, Canada, Costa Rica, Cuba, Mexico, Peru, and the United States, among others, offer examples of committees, consortia, and other forms of collaboration and alliances between social organizations and government agencies to implement public policies and other strategic actions for health promotion (*224*, *225*). Despite the progress made, intersectoral collaboration still faces significant challenges in many countries, due in part to public administration segmentation (lack of communication between sectors) and coordination with their provincial or departmental jurisdictions, the verticality of many programs, and professional training, which tends not to favor the interdisciplinary approach.

The results of the analysis of the institutional capacities show that, in 60% of the Region's countries, there is a system of surveillance related to health risk factors (Figure 30). For example, in Canada, Chile, Colombia, Ecuador, Guatemala, the United States, and Venezuela, work is being done to establish a surveillance system for social and epidemiological indicators of the social determinants of health as well as the social and behavioral risk factors.

In addition to strengthening surveillance, the Global Program on Health Promotion Effectiveness, a joint initiative of PAHO/WHO, the International Union for Health Promotion and Education, and the CDC, has given a significant boost to strengthening the capacity to evaluate health promotion initiatives and has facilitated the dissemination of best practices in health promotion. Argentina, Brazil, Cuba, Mexico, and Peru have adopted methodologies and developed initiatives to evaluate health promotion.

PAHO has collaborated with various countries in developing public policies through strengthening technical working groups and the exchange of information between them through the networks of institutions involved in healthy settings—municipalities, schools, housing, the network of health promotion collaboration centers, and centers of excellence, such as the Inter-American Consortium of Universities—to strengthen the training and development of professionals in this field. The development of methodological guides for the strategic planning and evaluation of health promotion interventions and activities has been a point of collaboration between countries, as has the evaluation of institutional capacities for health promotion undertaken in 2002 and 2005. PAHO is also working jointly with other organizations to execute health promotion initiatives. In this regard, UNICEF, FAO, and the World Food Program have collaborated on the dissemination and strengthening of the HPS initiative. The United Nations Educational, Scientific, and Cultural Organization (UNESCO), together with PAHO, through an established agreement, has contributed to the training of instructors to improve health education and the teaching of life skills in schools in the Region's countries. UNDP has contributed to strengthening community action and has supported local development. Likewise, UNEP contributed to improving basic sanitation and environmental health. Alliances have also been forged with the CDC, the European Union, the Canadian International Development Agency, the U.S. Agency for International Development, the Kellogg Foundation, and other organizations to strengthen health promotion in the Region.

In the two decades since the approval of the Ottawa Charter, considerable progress has been made in assessing health promotion as an essential public health function and strategy. Nevertheless, putting the issue of health promotion on the agenda of the health sector itself and in development plans remains a chal-

lenge. Some countries are making major efforts to develop national health promotion plans, agreed on in the Mexico Ministerial Statement. In Chile, the national action plan for health promotion, coordinated by the Consejo Intersectorial Vida Chile, is a good example. Many provinces in Canada have health promotion plans, with very creative, comprehensive programs and resources. Other countries, such as Peru, have established national health promotion policies as a strategic framework for developing a wide range of health promotion activities.

Since the holding of the 4th International Conference on Health Promotion in Jakarta, Indonesia, in 1997 (*226*), efforts to forge intersectoral alliances to increase the efficacy of health promotion initiatives have multiplied, especially with respect to the adoption of intersectoral approaches that involve the government as a whole, given their impact on economic and social policies. In the spirit of commitments made at the 5th Global Conference on Health Promotion held in Mexico City, Mexico, in 2000, PAHO has promoted numerous initiatives to evaluate the effectiveness of health promotion and the impact of public policies on health. Continuing to strengthen evidence of the efficacy and cost-effectiveness of health promotion and determining the most appropriate combination of strategic actions are urgent needs. The visibility of public opinion as a tool to change living conditions and lifestyles has been strengthened, and social participation has been stimulated to implement education and communication initiatives aimed at promoting the adoption of healthy behaviors (*227*). Collaboration has also been undertaken on the reorientation of health services to incorporate health promotion concepts and strategies and on strengthening leadership in the health sector regarding this area.

The progress of health promotion in the Region highlights the importance of all the initiatives that have grown out of the Ottawa Charter as well as the diversity of results, depending on the context of each country. Nevertheless, there are limits and problems that must be examined in depth to establish strategies and mechanisms to ensure the continued consolidation and sustainability of health promotion in the Region. Health promotion faces various challenges. On the one hand, the broader concept of health promotion must be disseminated as a public health strategy that addresses the gamut of social determinants of health. Based on this understanding, it is essential for governments to exercise their leadership and ensure the commitment of all sectors to work on the social determinants of health and develop public policies that promote solidarity and increase the well-being of the population. On the other hand, strengthening the health sector's role in the development of health promotion is key, given its ability to enlist support and its capacity to coordinate with other sectors to carry out health promotion actions, thus reducing social inequities and improving the quality of life.

States' commitment to the MDGs represents an excellent opportunity to invest additional needed resources in health promotion activities. Going back to the surveys on institutional capacity for health promotion, in 45% of the participating countries there is a plan of action to promote health that is being applied nationwide. Of these countries, 35% report having a health promotion action plan that incorporates the MDGs (Figure 30).

While it is true that multiple initiatives have been undertaken and resolutions adopted to address the social determinants of health (poverty, education, nutrition, and basic services) in the Region, it is also true that the social, economic, cultural, environmental, and political conditions, as well as inequities, continue to represent a major challenge for all countries. The recent establishment of the global Commission on Social Determinants of Health represents a unique opportunity to fight inequity and design and implement public policies in line with the Ottawa Charter and the documents that have followed it through the Bangkok Conference in 2005.

HEALTHY SPACES

In recent years, there has been a significant increase in interventions addressing the determinants of health. Nevertheless, social and economic inequities continue to erode the health conditions of many population groups. The establishment of healthy settings is an effective health promotion strategy to protect and improve the health and quality of life of the Region's population. Municipal and local governments can address the factors determining poverty and inequity, and their influence on health, by creating healthy, sustainable public policies; implementing healthy settings; forging alliances between the public and private sectors; strengthening support networks; mobilizing the media; and adopting an active role in promoting health.

The Region's rapid urbanization in recent decades poses a major challenge for health promotion. Various factors act on today's urban settings and affect the health and quality of life of their inhabitants. Among others, the chaotic growth of cities, disorganized industrial development, and high rates of rural-to-urban migration contribute to the formation of marginal areas as well as the proliferation of makeshift housing, increased poverty, environmental contamination, and increasing rates of disease and violence.

Data provided by the United Nations for monitoring MDG Target 11 ("by 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers") show concern about trends in the lack of housing security in the Region's urban areas. While the percentage of the Region's urban population living in makeshift settlements fell from 35% in 1990 to 32% in 2001, the number of inhabitants increased from 111 million to 127 million (*228*). In other words, although the proportion of the total population living in makeshift urban settlements fell, this did not reduce the total number of people living in them. There are also great disparities among countries. In Belize, Bolivia, Guatemala, Haiti, Nicaragua, and Peru, more than one-half of the

BOX 2. Agreements and Strategies for a Healthy Community

PAHO/WHO believes that a community begins to be healthy when its political leaders, local organizations, and citizens commit and organize to continuously and progressively improve the conditions of health and well-being of all their inhabitants; when a social contract is established between the local authorities, community organizations, and public and private sector institutions; and when local planning is used as a basic tool, including social participation in management, evaluation, and decision-making.

The healthy municipalities and communities strategy is a process that reflects the commitment undertaken by the local government to prioritize health promotion through:

— the establishment of healthy public policies;
— the creation of settings that support and benefit health;
— the strengthening of community action;
— the development of personal skills in health issues; and
— the reorientation of health care services toward health promotion.

urban population lives in makeshift settlements, while in Antigua and Barbuda, Aruba, the Bahamas, Barbados, Bermuda, Chile, Cuba, Grenada, Guyana, the Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Suriname, and Uruguay, less than 10% of the urban population lives in such conditions (*228*).

The creation of healthy municipalities and communities is a strategy that contributes to improving the social, economic, and environmental factors that influence the quality of life, health, and human development of the Region's urban populations. To create healthy municipalities, various cities and communities have agreed to push health promotion actions, to utilize a community and multisectoral approach, and to prioritize public health in the development of municipal plans and policies (Box 2). Since the 1980s, this initiative has been an effective strategy for participatory health promotion at the local level. As its benefits have become visible, the healthy municipalities and cities movement in the Region has grown significantly (Table 28). Countries such as Argentina, Brazil, Canada, Chile, Costa Rica, Cuba, El Salvador, Mexico, Paraguay, Peru, and the United States have established national networks (in addition to integrating many of them into the Healthy Municipalities, Cities, and Communities Network of the Americas) and are contributing to the strategy's consolidation in the Region by including healthy spaces initiatives in their work programs. Within the framework of the healthy municipalities and cities strategy, PANAFTOSA initiated a special line of technical cooperation for local development beginning in 2000. The focus of this technical cooperation, called productive municipalities, includes primarily national zoonoses programs, since many of the actions on this issue are decentralized and fall on municipal agencies.

Examples in the Americas of Healthy Municipalities and Communities

In Argentina, the National Healthy Municipalities and Communities Network has undergone sustained growth since 2002,

TABLE 28. Growth of the healthy municipalities and communities (HMC) movement in selected countries of the Americas, 2000–2005.

Country	Total municipalities in the country	Healthy municipalities				National or regional HMC network
		2000	%	2005	%	
Argentina	2,171	4	0.2	182	7.4	Yes
Costa Rica	81	40	49.4	56	70.0	Yes
Cuba	169	79	46.8	98	58.0	Yes
Mexico	2,438	1,000	41.0	1,875	77.0	Yes
Paraguay	600	10	1.7	35	6.0	Yes
Peru	1,800	30	1.7	574	32.0	Yes
Uruguay	19	0	0	10	52.0	No

Source: Pan American Health Organization, Sustainable Development and Environmental Health Area, country reports.

favoring the development of local promotion and prevention projects, the implementation of healthy public policies, and the strengthening of community participation. The Argentine network is made up of 216 municipalities (of a total of 2,171). One of the focuses of its actions has been to raise the awareness of local governments regarding the importance of integrating all civil society stakeholders, as well as different areas of the government, into healthy municipalities and communities projects. The Argentine network has major political support, as expressed at the National Healthy Municipalities and Communities Conference held in August 2006 with the presence of the country's Vice President, several federal cabinet ministers, 24 provincial health ministers, more than 200 mayors from around the nation, PAHO representatives, and members of the Argentine Federation of Municipalities. At the Conference, the Statement entitled "Toward a National Plan for Healthy Living" was signed, whereby the signatories committed to promote the implementation of public policies that emphasize the social determinants of health and strengthen disease prevention and health promotion actions at the local level. The issues most commonly addressed in the healthy municipalities framework in Argentina are physical activity, healthy nutrition, smoke-free environments, solid waste management, and addiction prevention (*229*).

In Bolivia, the Productive and Healthy Communities strategy, launched in 2004, has contributed to economic development in small communities, and thus to reducing internal migration and poverty. Farmers in the Chacaltaya community increased sales of their agricultural and livestock products (mainly vegetables) and thereby generated more revenue for the community. Community members were also trained in economic management and the cost-effectiveness of solar heating. In 2004, PAHO/WHO and the Chacaltaya community signed a series of letter agreements to perform ecotourism, agricultural, and livestock activities. The objectives achieved include establishing a community pharmacy, constructing solar heating greenhouses for the community's own use and sale, installing solar-powered hot-water showers, establishing health services for the local school, constructing a small plant to produce llama jerky (fresh meat, dried in the sun, in areas built for this purpose), and farming trout for their own consumption and for sale in the capital city of La Paz. Community members were also trained in economic and financial analysis, as well as in marketing in La Paz supermarkets, so as to obtain fair prices to contribute to the community's sustainability. As a result of this activity, the municipality of La Paz and the communities won a competitive bid with the IDB to build a hotel and tourism enclave at an estimated value of US$ 100,000 that is expected to be operational in late 2007. Currently, the Ministry of Rural Development, Agriculture, and the Environment and other national and international institutions are implementing this model in other highly vulnerable areas of the country.

In Brazil, the states of Ceará, Goiânia, Mato Grosso do Sul, Paraná, Pernambuco, Rio de Janeiro, Rio Grande do Sul, Rio Grande do Norte, São Paulo, and Tocantins are participating in the healthy municipalities and communities initiative. Brazil does not have a national healthy municipalities and communities network, but does have several regional networks. The Network of Potentially Healthy Municipalities in the region of Campinas started with six municipalities and now has 30, representing 2 million inhabitants. The Brazilian healthy municipalities and communities strategy is being implemented jointly with various social agendas that share the same values and principles, such as Programa 21, the environmental primary care program, the participatory budget, and the productive municipalities movement. The major challenge is to coordinate the efforts around networks that consider social inclusion, participation, solidarity, equity, sustainability, and intersectoral cooperation. In Rio de Janeiro's Vila Paciencia district, between 2002 and 2004, 25 projects were implemented, including such activities as health fairs, children's recreation, training in nutrition, and mobilization for cleaning up the community, directly benefiting more than 1,000 people. In Curitiba, Paraná, as of 2005, the healthy environments initiative had mobilized 143 local institutions to develop and implement health promotion activities (*230*).

Canada was one of the first countries in the Americas to apply the healthy municipalities and communities strategy. The Ontario Healthy Communities Coalition was established in 1992, with the mission of working with Ontario's diverse communities to strengthen their social, environmental, and economic well-being (*231*). The Québec Network of Healthy Cities and Towns was established in 1988 and now includes 140 member municipalities, representing more than 50% of Québec's population (*232*).

Costa Rica's healthy, ecological cantons initiative has benefited from great popular support. The country's national network, founded in 1996, includes 56 municipalities (70% of the national total). An annual contest that is held to select the best healthy, ecological canton initiatives and the subsequent publication of results and information on the initiatives have served to stimulate growing interest and strengthen the national network.

The first healthy municipality in Latin America was officially declared in Cuba in 1989, within the framework of the Global Project of Cienfuegos. In 2006, the 14 provinces and the special municipality of the Isle of Youth were incorporated into the movement. The Cuban National Network of Municipalities for Health, established in 1994 with 14 municipalities, now includes 98, representing 58% of the country's total of 169. This country is promoting the Productive Municipality Atlas initiative to expand analytical and management capacities in municipal contexts by using the Geographic Information System in Epidemiology developed by PAHO health analysis and information systems experts. The initiative's primary achievements include developing local case-treatment capacity, consensus-building for health promotion actions, strengthening intersectoral strategic alliances, and exchanging experiences.

The experience of the United States began in 1988, with the California Healthy Cities and Communities project, covering more than 70 communities. This initiative's achievements include es-

tablishing community gardens for 140 families; implementing a road safety program for bicyclists and pedestrians, resulting in an increase in helmet use from 26% to 53% in one year; and a clean-up campaign, obtaining a 45% reduction in community garbage (*233*). Since 1991, Indiana University's center for the establishment of healthy cities has laid the foundation for promoting healthy municipalities and communities programs, research, and resources in the country (*234*). Members of the Indiana Healthy Cities network work on constructing nature trails, drafting anti-tobacco ordinances, improving health services coverage, and reducing violence.

The Mexican Network of Municipalities for Health was established in 1993 with 13 municipalities. Since then, it has managed to consolidate the 31 state networks grouped into regional networks. It currently includes more than 1,800 municipalities out of a total of 2,438 (77%). Most of the network's municipalities are also part of the National Healthy Communities Program. The network has held 13 annual national meetings in which mayors, the health sector, and other sectors have exchanged knowledge and best practices and national and international experts have presented novel methods and successful experiences for modifying determinants of health at the municipal level. The involvement of various sectors in municipal health promotion projects and the participation of municipalities in a contest to obtain federal resources for the program resulted in the financing of 1,059 municipal health projects between 2002 and 2006. The projects' focuses include healthy communities, zoonosis control, care and improvement of the environment, prevention and control of vector-borne diseases, solid waste management, drivers' education, addiction prevention, health education, healthy markets, child and adolescent health, adult and older adult health, reproductive health, basic sanitation, HIV/AIDS, tuberculosis, proper water use and consumption, and oral health. The Healthy Municipalities Network and Program constitute effective strategies for promoting public policies and intersectoral actions aimed at a greater commitment to health by the population and various levels of the government through political activities, programs, services, research, and training.

In Paraguay in 2002, 24 municipalities established the Healthy Municipalities Network; currently it includes 35 municipalities (15% of the country's 230 municipalities) that jointly undertake activities aimed at creating healthy and productive settings. In 2002, a novel collaborative experience called Healthy Borders was implemented between two municipalities in Paraguay and one in Argentina (Nanawa, Falcón, and Clorinda) to provide drinking water to all three municipalities. Another success story is the Emboscada project, which combines improvements in health protection for workers through the Healthy Quarries project with proposals for alternatives to the only source of employment (worm farming and family garden projects) and improvements in waste management, school settings, and child and maternal health care. In 2004 an agreement was signed between the Ministry of Public Health and Social Welfare, the Ministry of Education and Culture, and the Government of Misiones for the joint implementation of health-promoting schools initiatives and healthy municipalities and communities in all the province's municipalities. Today, 22 schools are receiving assistance to obtain their HPS accreditation. In 2005, the municipalities in the network performed a wide range of activities aimed at creating healthy and productive environmental settings, including waste removal in exchange for milk or baskets of goods, separation of contaminated waters, and tree planting and ecological garden projects.

In Peru, communities, together with local government, the public sector, and nongovernmental organizations, have been actively working on the healthy municipalities and communities strategy since 1996. The Ministry of Health's General Directorate of Health Promotion is investing in provincial and local training to carry out healthy settings initiatives. The National Network of Healthy Municipalities and Communities includes 574 municipalities and 10 regional networks (Arequipa, Ayacucho, Huancavelica, Andahuaylas, Callao, Lambayeque, La Libertad, Cusco, Cajamarca, and Loreto) (*235*). The Ministry of Health is implementing the Healthy Municipalities and Communities Program, which includes 757 municipalities (41% of the nation's total). These municipalities are carrying out activities related to maternal health, child nutrition, education, gender, road safety, smoke-free environments, physical activity, immunizations, and dengue prevention, among others. Various health public policy workshops have been held on specific issues of municipal interest, resulting in various publications. The Ministry of Health has organized several regional workshops and meetings to raise the awareness of mayors and disseminate experiences. Concrete results and achievements of the healthy municipalities initiatives include:

- the sectoral political will that led to the establishment of a General Directorate of Health Promotion in the Ministry of Health, with related resources, interventions, and policies, to promote the healthy municipalities and communities strategy;
- the strengthening and growth of the Peruvian Network of Healthy Municipalities and Communities;
- a strategic alliance between the Peruvian Network of Healthy Municipalities and Communities, PAHO, the Ministry of Health, and the AMARES (Support for Health Sector Modernization) project to drive the healthy municipalities process in the country;
- the incorporation of the healthy municipalities and communities initiative into established local development plans and the municipalities' participatory budget; and
- the approval of municipal ordinances and resolutions favoring the creation of healthy municipalities and communities.

In Trinidad and Tobago, the healthy municipalities and communities movement began in 2002, with the development of a multisectoral team proposal called the Healthy Spaces Initiative. Promotion workshops were held for each regional health authority

to design initiatives to support the healthy communities. Through this initiative, some rural communities began to work on issues of food safety, sanitation, youth capacity-building, and improvement of health services, among others. In the Plum Mitan community, specific results obtained include the construction of water tanks while a technical study was conducted to determine a permanent source, access to health services by providing transportation to the health center in another town, training in fish farming and personal care, and basic computer literacy. It also increased women's involvement in the community's decision-making processes. The community's quality of life has improved with sustainable interventions supported by governmental and technical cooperation agencies, but the most important outcome is that the community has learned and is mobilizing resources for its own improvement.

With the support of local governments, the Ministry of Health has incorporated the initiative into its institutional framework, thus promoting the development of competencies to strengthen planning, monitoring, and evaluation of health promotion activities at the regional health authority and local levels, and the establishment of collaboration with civil society. Forums have also been established for community participation, and the community council is involved in national forums and conducts local development interventions. The initiative has allowed the experience to be shared with nongovernmental organizations, community organizations, government agencies, and private entities inside and outside the Caribbean subregion.

In Uruguay, the Ministries of Public Health, and of Livestock, Agriculture, and Fisheries, in collaboration with municipal administrations, other national organizations, and PAHO/WHO, launched the productive and healthy communities project, which combines assistance with the creation of jobs and other microenterprise activities rooted in community initiatives. It is important to note that the Uruguayan municipalities and departments cover a territory that includes both large urban areas (cities) and small population centers (towns and villages). In 10 municipalities (of a total of 19), there are one or more communities participating in this project. The activities undertaken include the coordination and enhancement of the production of rural traditional cheese makers, the creation of spaces to market local agricultural and livestock production, productive development and ecocultural tourism, and the implementation of food safety programs. The concrete achievements of the productive and healthy communities initiative include training and information on the various aspects of the strategy for 646 people; the consolidation and strengthening of 52 microenterprise projects; and the carrying out of 73 health program activities.

Healthy Housing Initiatives

Housing conditions have been recognized for some time as one of the primary factors determining human health. Healthy housing alludes to a residential space that promotes the health of its dwellers. This space includes the house (the physical shelter where the people reside), the home (the group of people living under the same roof), the setting (the physical and psychosocial environment immediately outside the house), and the community (the group of people identified as neighbors by the residents). Healthy housing poses no risk factors, or makes them controllable or preventable, and includes agents that promote health and well-being (*236*).

Although the housing deficit in Latin America and the Caribbean is difficult to calculate because of the lack of standardized methodologies and information to measure it, it is estimated to range between 23 and 28 million units, while the qualitative deficit is approximately 26 million units.

The proportion of homes with access to secure tenure (that is, the right of all individuals and the group to the effective protection of the State against eviction from the land or residence) improved in relative terms regionally between 1990 and 2000 and represents approximately 80% of owners and tenants. Nevertheless, in countries such as Colombia, Costa Rica, Guatemala, Mexico, Nicaragua, and Paraguay, a reduction in the percentage of homes with secure tenure has been observed. Durability of construction materials improved in 70%–76% of housing between 1990 and 2000, which in absolute terms means an improvement for more than 17 million housing units in the 15 Latin American and Caribbean countries considered. In some cases, however, such as those of Ecuador and Paraguay, the situation has worsened. The lack of housing security in the Region could affect the health of millions of people, particularly the poorest and most vulnerable, such as children under age 5, those suffering from chronic diseases such as HIV/AIDS, the disabled, and older adults (*228*). Since 1995, the healthy housing strategy has contributed to strengthening activities that promote and protect the health of these populations and contribute to integrated local community development. The strategy includes strong political commitment, solid technical and intercultural expertise, ongoing intersectoral collaboration, the adoption of a multidisciplinary approach, and a high level of community participation. For these reasons, an effective mechanism for implementing the strategy is the establishment of national, intersectoral, and multidisciplinary healthy housing networks associated with VIVSALUD. In 2005, the VIVSALUD network developed its plan of activities for the next two years with the following lines of action (*236*): evaluation of the impact of health policies, plans, programs, and projects with a focus on equity; strengthening surveillance systems for risk factors and protective factors for health; research on the relationship between housing and health; the implementation of evaluation-action-participation projects; capacity-building and development; and institutional development of the network.

HEALTH-PROMOTING SCHOOLS

Health promotion and primary health care are fundamental strategies for addressing the social determinants of health and

"Millions of families in the world exist—or struggle to survive—in wretched, overcrowded, and unsafe slums, shacks, tents, ghettoes, and settlements. They are exposed to harsh weather. Rats and insects bring diseases to their homes. Poor ventilation, little light, and the need for constant repair aggravate the tragedy. These conditions are especially oppressive for children—their bodies, their growth and development, and their dreams. They live with no clean water, decent sanitation, or basic services that many in the world enjoy daily and take for granted. Yet they are our fellow human beings, a precious human capital, and we have the mission to reduce the environmental hazards they face in order to improve their health."

Mirta Roses, 2007

therefore promote the achievement of the MDGs under a commitment to equity. The school is conceived as an engine of health and community development, and therefore any approach to health at the various levels, from early to vocational education, strengthens the school-based approach to respond to the various challenges in its life cycle, while also strengthening the links between the health and education sectors.

PAHO's Health-Promoting Schools Initiative has been working at the preschool, primary, and secondary levels of education and has confirmed the need to work on health promotion interventions focused on the family-schools-health center triangle. The incorporation of HPS into early education involves greater collaboration between the first level of health care and early education centers. This approach opens the possibility of working with mothers from the first months of pregnancy, supporting the processes of early stimulation that will result in better conditions for the intellectual development of children. Recent studies in neuroscience (*237*) confirm the need to develop educational and health programs that, together with adequate nutrition, prioritize care to boys and girls in vulnerable situations to provide more equitable conditions. Starting with early education, the health-promoting school constitutes a privileged educational space for working with the mother and her child to modify behavior patterns leading to greater stimuli for learning and to ensure that healthier settings are established. Health education from an early level also has an impact on reducing infant morbidity and mortality.

The Health-Promoting Schools Regional Initiative (*238*) in the Americas, which grew out of multiple international consultations, was officially launched by PAHO in 1995. The purpose of the Initiative is to train future generations to have the knowledge, abilities, and skills necessary to promote and care for their own, their families', and their communities' health as well as to create and maintain healthy environments for study, work, and coexistence. Through this Initiative, PAHO/WHO is supporting Member States in the development and execution of health promotion activities, consensus-building, and forging alliances between the health, education, and other sectors, and through associations of parents, students, and other pertinent organizations. The Initiative is focused on three main components: 1) an integrated approach to health education including the teaching of life skills; 2) the creation and maintenance of healthy physical and psychosocial environments; and 3) providing health services and healthy foods choices, psychological guidance, and opportunities for physical activity and the development of active lifestyles.

The first component provides students with the knowledge they need to recognize, adopt, develop, and cultivate the skills necessary to achieve and maintain an optimum level of well-being and quality of life. These skills are built on personal, family, and community values and by considering the individual, social, and cultural needs and characteristics of the students. Thus, this component strengthens self-esteem and the capacity to acquire and maintain hygienic habits and healthy lifestyles. The information facilitates the development of knowledge, skills, and abilities aimed at establishing and maintaining healthy behaviors through participatory interventions, including group discussions and community work projects.

Life-skills education and the acquisition of psychosocial competencies promote the adoption and maintenance of behaviors, attitudes, and habits that allow students to respond to life's demands and challenges, including creative, thinking, and communication skills. Students learn to value personal relationships, effectively utilize the resources of their immediate community, and adopt and maintain healthy behaviors. HPS promotes a sense of responsibility and enhances the ability to resolve often-problematic situations through dialogue and negotiation, as factors that prevent violence and tools for peaceful coexistence. This, in turn, facilitates integrated human development and a sense of civic responsibility.

The second component develops the capacity to create and maintain schools and school-related facilities in proper conditions of cleanliness and security, including basic sanitation facilities, the water supply, and the various physical spaces used as well as a psychosocial environment free of physical, verbal, and psychological aggression, or any other form of violence. This component devotes special attention to the emotional climate of the school and to the social interactions that affect the well-being and productivity of students and school staff as well as to the ongoing training of the faculty and the implementation of health promotion strategies aimed at family members within the framework of parents' associations and community organizations.

The third component facilitates the strengthening of the relationship between teams in the health, education, and other pertinent sectors and their capacity to complement and strengthen each other. Through this component, health problems can be detected and prevented, including risk factors and harmful habits.

BOX 3. What Do Health-promoting Schools Do?

- *They implement policies* that support individual and collective dignity and well-being and offer multiple growth and development opportunities for children and adolescents in a context of learning and strengthening the school community, with the participation of faculty, students, and their families.
- *They define strategies that promote and support learning and health,* using all available means and resources to do so and involving personnel in the health and education sectors and community leaders in the performance of planned school activities (e.g., comprehensive education for health and life-skills training, strengthening of protective factors, reduction of risk behaviors, facilitating access to school health services and nutrition and physical education programs).
- *They involve all members of the school and community,* including teachers, parents, leaders, and nongovernmental organizations, in decision-making and the implementation of interventions to promote learning, healthy lifestyles, and community health projects.
- *They have a working plan* to improve the physical and psychosocial environment in the school and its surrounding area (including rules and regulations for environments that are free of smoke, drugs, and any form of violence and that ensure access to clean drinking water, healthy foods, and sanitary facilities), and try to set an example by creating healthy school environments and activities that extend beyond the school itself.
- *They implement actions* to evaluate and improve the health of students, teachers and other school personnel, families, and community members in general and work with local leaders to ensure access to health and referral, social work, nutrition, and other services as well as spaces for physical and other recreational activities.
- *They provide adequate, effective training* and educational materials to teachers and students.
- *They have a local education and health committee* in which parents' associations, nongovernmental organizations, and other community organizations actively participate.

Access to health services and healthy food also facilitates the early detection of nutritional deficiencies or diseases.

The principal functions and tasks of health-promoting schools are summarized in Box 3.

Progress of the Initiative

The Health-Promoting Schools Regional Initiative is in full development in the countries of Latin America and the Caribbean, as noted by 90% of the participants in the first regional survey on HPS carried out in 2001 (*239*), the results of which appear in Table 29.

The survey confirms that most of the Region's countries have school health promotion initiatives, ranging from the use of educational space to increase vaccination coverage or the identification of vision problems to comprehensive health promotion activities at three levels: classroom, school, and school-community relations. However, most of these programs are the responsibility of the respective ministries of health, who use the educational spaces to oversee student health with school doctors or nurses. The coverage of such experiences is quite heterogeneous among the countries, but for the most part they focus on urban and public institutions versus schools in rural and marginal urban areas where the social determinants of health are more accentuated.

PAHO Member States are currently defining criteria and procedures for HPS accreditation and certification, as well as standards and minimum requirements for accreditation and certification by ministries of health and education, HPS monitoring activities, information requirements, and the frequency with which the accreditation and certification processes should take place. These activities are being undertaken within the context of the Health-Promoting Schools Regional Initiative and with the participation of school directors, faculty, and administrative staff; other organizations in the educational community; students; and parents.

The role of joint national health and education commissions is significant, given their capacity to promote the mobilization of all necessary participants and material resources. Technical collaboration for implementation of this strategy consists of disseminating the knowledge and the methodology and promoting the exchange of experiences between countries. For this purpose, regional and subregional meetings have been held in which the establishment and extension of Latin American and Caribbean Networks of Health-Promoting Schools have been supported.

The creation and strengthening of these networks have provided a forum for the exchange of ideas, resources, and experiences between countries, in order to feed the motivation and enthusiasm of participating teachers, students, and parents as well

TABLE 29. Results of first regional survey of health-promoting schools (HPS) in Latin America and the Caribbean, 2001.

Level of dissemination of HPS approach	Ninety-four percent of the countries are developing the HPS Initiative. The proportion of HPS with respect to all schools is very heterogeneous country-to-country, depending on the level of the strategy's implementation. In 90% of the cases, the strategy is applied in public elementary schools in urban areas; in 60% of the cases, it is executed in preschools, and also in 60% of the cases, in secondary schools.
National health promotion policies and plans for the school population	Ninety-four percent of the countries have a broad legislative and political framework regarding school health. Eighty-two percent of the countries have specific policies or legislation on HPS. Most policies pertinent to this initiative emerged beginning in 1997, and in 82% of the cases, between 1999 and 2001, coinciding with the official launch of the PAHO/WHO regional initiative in 1995.
Multisectoral coordination mechanisms to support health promotion in the schools	Sixty-five percent of countries have formed joint national commissions on health and education, and when cases of other forms of collaborative work are taken into account, this figure reaches 75%.
Health education	All countries have incorporated health education into their school curriculum programs. The most commonly used method consists of including it as a cross-cutting objective. The prevailing trend of incorporating it as a cross-cutting objective coincides with and is related to educational (curriculum) reform processes.
Formation of and participation in national and international HPS networks	Forty-seven percent of the countries have some sort of participation in the Latin American Network of Health-Promoting Schools (LANHPS). In most cases, this participation consists of attending network meetings. Twenty-nine percent of countries have formed national HPS networks. In 2004, almost all Latin American countries participated in the fourth LANHPS meeting.
Financing of school health programs and activities	Thirty percent of the countries have a budget allocated to school health.

Source: Ippolito-Shepherd J. Las escuelas promotoras de la salud en América Latina. Resultados de la Primera Encuesta Regional. Serie Promoción de la Salud No. 3. Washington, D.C.: OPS; 2005.

as advocates of health promotion in schools. The Latin American and Caribbean Networks of Health-Promoting Schools were created from multiple regional consultations over the past decade.

The first meeting of the Latin American Network of Health-Promoting Schools (LANHPS) was held in 1996 in San José, Costa Rica, with an initial membership of 10 countries, and the first meeting of the Caribbean Network of Health-Promoting Schools (CNHPS) was held in 2001 in Bridgetown, Barbados, with an initial membership of 14 countries. The second LANHPS gathering took place in 1998 in Mexico City, and the third in Quito, Ecuador, in 2002. This provided the opportunity to share experiences and strengthen the joint national commissions of the participating countries.

The fourth LANHPS meeting took place in San Juan, Puerto Rico, in 2004 (*240*) and included official health and education delegates from Argentina, Brazil, Chile, Costa Rica, Cuba, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, and

BOX 4. Successes of the Health-promoting Schools Initiative in Various Countries of the Americas

Argentina. The HPS program was established in the province of Salta in 1998 by the Interministerial Health and Education Team, whose work is aimed at decentralization through the training of interdisciplinary teams and the strengthening of networks with intersectoral collaboration between government ministries. A project is currently under way that will add 100 schools and health services in the province to the 52 that already exist.

Bolivia. A program focusing on reproductive health with a gender perspective, prevention of HIV/AIDS and other sexually transmitted infections, avoidance of teen pregnancy, and prevention of sexual abuse of children and gender violence was implemented nationally in 14 municipalities, benefiting 177 schools and 57,691 students and involving 1,407 teachers.

Brazil. In response to the need to develop health education interventions and activities in the school environment, to define intra- and intersectoral strategies for implementing health actions for basic public education, and to engage social stakeholders in these processes, in 2005 the Intersectoral Chamber of Education for Health in the School was created with the joint participation of the Ministries of Health and Education. The institutionalization of health promotion in schools as a public policy strengthens the possibilities for integrating the issue into Brazil's National Health Policy. Successful examples include the following:

- In Rio de Janeiro, diagnostic studies, identification of key stakeholders, production of educational materials, and partnerships with universities and nongovernmental organizations are stimulating decentralized and intersectoral activities that facilitate greater access by the school community to health services.
- In the municipality of Embu, São Paulo, in 2002, the HPS strategy was implemented as an intersectoral project in partnership with the Federal University of São Paulo. The education-for-health activities have three priority themes: the environment, sexuality, and promoting peace.
- In the State of Tocantins, the school is a formal educational setting, but it is also an institutional, social, and political environment affected by culture. These aspects are important for the support and sustainability of health promotion strategies. In this context, the interdependence between management, training, and the teaching-learning process is highlighted for intersectoral collaboration and the results and impacts obtained. The HPS strategy in Tocantins considers these dimensions indivisible focal structures.

Chile. Since 1997, the HPS strategy has been developed jointly between the education and health sectors. Since 1999, the work has been strengthened by the incorporation of the institutions responsible for kindergarten-level education. In 2004, institutions linked to the environment and drug prevention joined the efforts under way. That year, effective intersectoral work took place in more than 3,000 schools across the country (nearly 30% of the national total) at the preschool, elementary, and secondary levels. In 2001, an accreditation process began and by 2004, 2,554 institutions had been granted HPS status.

Colombia. The Healthy Schools for Peace Program is a strategy that strives to integrate activities of the health and education sectors with the community to promote healthy lifestyles in the school setting. The program's first phase is to raise community awareness, followed by a diagnostic phase to define the specific health promotion and prevention activities to be implemented. The program incorporates a three-pronged rights-based approach: the right of a child to freedom from violence, the right to health care, and the right to healthy coexistence.

Cuba. In Cuba, the objective of the *Seminternado de Primaria-Agustín Farabundo Martí* initiative is motivation and stimulation to enhance the quality of life of the educational community. "My happy, healthy house" diplomas are presented to students whose families do not engage in the harmful habits of smoking and alcohol use; "Learning to grow" diplomas are awarded for reflective, creative achievements; and "Nature is my friend" diplomas are given for proper caring for plants, animals, and water and promoting their appropriate use in human nutrition.

(continued)

BOX 4. (*continued*).

El Salvador. The Healthy School Program focuses on the provision of school meals as a tool to satisfy students' immediate nutritional needs, increase their concentration and learning capacity, and thus maximize their education opportunities while in the classroom. In addition, 300 schools have planted school gardens to increase students' knowledge of healthy, wholesome food choices and improve their nutritional status.

Mexico. In Mazatlán, Sinaloa, the Intersectoral Healthy Education Program aims to strengthen self-health care among 778 students and raise their awareness about environmental protection. The school community, health personnel, and municipal authorities jointly developed a program that focuses on health education, prevention and detection of health problems, and healthy environments.

Peru. In the national capital of Lima, the HPS strategy builds leadership qualities in students by encouraging their participation in activities based on their own personal interests and motivations. The Clean Hands, Happy Faces project promotes personal hygiene and sanitation practices to improve student health; in 2004, a government agreement was signed calling for the project's educational materials and methodology to be disseminated nationwide to 2,000 additional schools. In Belén, Department of Loreto, health promotion activities focus on the maintenance of clean schoolyards and classrooms and on the incorporation of education modules (hygiene, nutrition, dengue and malaria prevention) into the school curricula.

Venezuela. In Aragua, in order for a educational center to be HPS-certified, it must meet such specific criteria as having a minimum of two trained health-promoting teachers among its faculty, implementing a health promotion plan based on the results of health diagnostics conducted in the school, ensuring that the school cafeteria offers healthy food choices, having an operational oral health program, designing and carrying out integrated community health projects, and maintaining a school emergency safety system. In Miranda, play activities are used to train new readers and future blood donors. Through the composition of stories and the painting of group murals, students learn about the importance and usefulness of blood donation in a creative and stimulating environment.

Venezuela as well as participants from Aruba, Australia, Canada, Colombia, Ecuador, Italy, Spain, the United States, and Trinidad and Tobago. The event also included the active involvement of representatives of Comprehensive Primary Health Care Programs; of the Industrial University of Santander, Colombia (PROINAPSA), a PAHO/ WHO Collaborating Center; as well as nongovernmental organizations and representatives of the private sector, academic institutions, and international organizations, for a total of 115 participants from 26 countries. Seven working committees were created that discussed seven key issues for strengthening HPS: 1) the organization, structure, and management of LANHPS; 2) human resources training for health promotion in the schools; 3) research, evaluation, and surveillance of protective and risk factors; 4) development of materials and educational tools for health promotion and education for a healthy life in the school setting; 5) HPS accreditation and certification; 6) strategic alliances and horizontal cooperation mechanisms between countries to strengthen health promotion in the schools; and 7) curriculum reform for the inclusion of health promotion and education for a healthy life in the schools. The meeting also facilitated the technical validation of the document *Dadores de vida: Guía Metodológica para Educadores* (Givers of Life: A Methodological Guide for Educators). After the fourth meeting of LANHPS, the Puerto Rican Network of Health-Promoting Schools was established in Puerto Rico.

In its Plan of Action 2003–2012, PAHO highlights the importance of promoting the Latin American and Caribbean networks to strengthen and expand HPS throughout the Americas. Its primary objectives are to disseminate the HPS concept; to mobilize political will and multisectoral and multidisciplinary work, particularly in the health and education sectors; to create forums in which schools can share their experiences, thus ensuring enrichment from processes that are under way; to develop training programs for health and education personnel; to promote the preparation of educational material with novel approaches and the use of participatory methodologies; to disseminate evaluation methodologies and good practices; to promote the use of electronic media between network participants; and to strengthen institutional capacity to implement school health programs with a comprehensive approach incorporating gender equality principles. Box 4 describes the variety of HPS activities being undertaken in the Region.

Regionally, the HPS Initiative has allowed technical collaboration and the development of specific activities (*223*). The success of the training and committee work is evident in the ongoing commitment demonstrated by the seven committees and their

members, who are currently finalizing proposals for a series of Regional Guides to be presented at the Fifth Meeting of LANHPS. Other noteworthy activities include:

- The promotion and strengthening of school health programs with an integrated approach, disseminating the HPS concept among the Region's countries, through regional and subregional meetings, the distribution of informational and promotional material, and participation in pertinent national and international forums.
- Technical collaboration with member countries to consolidate intersectoral coordination mechanisms; to analyze and update public policies; to strengthen institutional capacity; to support dissemination and inclusion of the life-skills approach; to develop, disseminate, and promote the use of instruments for rapid diagnosis and analysis; and to create strategic alliances.

HPS provides the opportunity to improve the health of children and adolescents, who represent the countries' most valuable human resource. Ensuring the physical and mental growth and development of the school-age population is essential for securing sustainable improvements in the population's quality of life and a social responsibility assumed by all governments committed to achieving the Millennium Development Goals.

References

1. Prüss-Üstün A, Corvalán C. Preventing disease through health environments. Towards an estimate of the environmental burden of disease. Geneva: WHO; 2006.
2. Zimmerman R. Social equity and environmental risk. Risk Anal 1993;13(6): 649–66.
3. Organización Panamericana de la Salud/Programa de las Naciones Unidas para el Medio Ambiente; Fundación Oswaldo Cruz. Proyecto GEO Salud. En búsqueda de herramientas y soluciones integrales a los problemas de medio ambiente y salud en América Latina y el Caribe. Mexico City: OPS; PNUMA; FIOCRUZ; 2005.
4. Firpo de Souza M. Public health and environmental justice in Brazil: joint perspectives (Presented at the International Colloquium on Environmental Justice, Work, and Citizenship). September 2001, Universidade Federal Fluminense, Niterói, Brazil.
5. Roque JA Environmental equity: reducing risk for all communities. Environ 1993;35(5): 25–28.
6. Pan American Health Organization. Water for Life. Equity and Quality of Services. International Decade for Action: 2005–2015. Available at: http://www.bvsde.paho.org/bvsadiaa/DIAA/docs/materiales/folletoeng2005.pdf.
7. Ramírez GL. La visión de políticas sobre el derecho humano al agua potable en el Perú. Preliminary document. 2004.
8. World Water Council. Fourth World Water Forum. Mexico City, March 2006. Available at: http://www.worldwaterforum4. org.mx/home/home.asp.
9. Nicaragua, Ministerio de Salud. Informe final de la evaluación rápida de la calidad del agua en Nicaragua. Managua: Ministerio de Salud; 2005.
10. Pan American Health Organization. Report on the Regional Evaluation of Municipal Solid Waste Management Services in Latin America. Washington, DC: PAHO; 2005.
11. World Health Organization; United Nations Children's Fund. Mid-term Evaluation of the Joint Monitoring Program on Water Supply and Sanitation. WHO/UNICEF; 2006.
12. Pan American Health Organization. Health, Drinking Water, and Sanitation in Sustainable Human Development. Washington, DC: PAHO; 2001. (Document cd43/10). Available at: http://www.paho.org/English/GOV/CD/cd43_10-e.pdf.
13. United Nations Human Settlements Program. The Challenge of Slums: Global Report on Human Settlements. UN-HABITAT; 2003. Available at: http://hq.unhabitat.org/mediacentre/documents/whd/GRHSB6.pdf.
14. Pan American Health Organization, Virtual Library of Sustainable Development and Environmental Health. BVSDE: Assessment 2000. Drinking Water and Sanitation: sector information. Available at: http://www.cepis.org.pe/sde/ops-sde/eva2000.html.
15. Meeting of the Ministers of Health of the Americas. Ottawa Declaration on Tobacco and Sustainable Development. Ottawa, Canada; 2002.
16. Meeting of the Ministers of Health of the Americas. Declaration of Mar del Plata. Mar del Plata, Argentina, 2005.
17. Costa Moreira J, Oliveira da Silva AL, Meyer A, de Esparza MLC. Improving environmental and health laboratories in Latin America and the Caribbean countries: diagnosis of the analytical capabilities and identification of the most important problems. CEPIS/PAHO; CDC; 2003.
18. International Atomic Energy Agency; Pan American Center for Sanitary Engineering and Environmental Sciences; Pan American Health Organization. Interlaboratory test comparison for environmental analytical laboratories of Latin America and the Caribbean (ARCAL RLA 8031 and RLA 2021 projects). IAEA; PAHO; CEPIS; 2004. Available at: http://www.iaea.org/programmes/aqcs/int1054/download/arcal_pt.pdf.
19. Jouravlev AS. El abastecimiento de agua y saneamiento en las ciudades de Iberoamérica. III Congreso Ibérico sobre Gestión y Planificación del Agua. La directiva marco del agua: realidades y futuros. CEPAL; 2002.
20. Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection. A sea of troubles [research report]. GESAMP; 2001.
21. World Health Organization. Guidelines for safe recreational water environments. Vol. 1. Coastal and fresh waters. Vol. 2.

Swimming pools and similar recreational-water environments. Geneva: WHO; 2003.
22. Pan American Health Organization. Inter-American Water Day 2004: Water and Disasters [brochure]. Available at: http://www.bvsde.paho.org/bvsadiaa/diaa04/diaa2004/folleto.pdf.
23. Organización Panamericana de la Salud. Crónicas de desastres: huracanes George y Mitch. Washington, DC: OPS; 1999.
24. Comisión Económica para América Latina y el Caribe. El terremoto del 13 de enero de 2001 en El Salvador. Impacto socioeconómico y ambiental. Mexico City: CEPAL; 2001.
25. Comisión Económica para América Latina y el Caribe. El impacto socioeconómico y ambiental de la sequía de 2001 en Centroamérica. Mexico City: CEPAL; 2002.
26. United Nations. Kyoto Protocol to the United Nations Framework Convention on Climate Change. New York: UN; 1998. Available at: http://unfccc.int/resource/docs/convkp/kpeng.pdf. Accessed January 2007.
27. United Nations Environment Program. Montreal Protocol on Substances that Deplete the Ozone Layer. Geneva: UNEP; 2000.
28. Economic Commission for Latin America and the Caribbean. Millennium Development Goals: A Latin American and Caribbean Perspective. Santiago: ECLAC; 2005.
29. Pan American Health Organization. An Assessment of Health Effects of Ambient Air Pollution in Latin America and the Caribbean. Washington, DC: PAHO; 2005.
30. Cohen AJ, Anderson HR, Ostro B, Pandey KD, Krzyzanowski M, Kuenzli N, et al. Mortality impacts of urban air pollution. In: Ezzati M, López AD, Rodgers A, Murray CJL (eds.). Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors. Vol. 2. Geneva: WHO; 2004. pp. 1353–1433.
31. World Health Organization. WHO Air Quality Guidelines Global Update 2005. Report on a working group meeting, Bonn, Germany, 18–20 October 2005. Copenhagen: WHO; 2006.
32. Maisonet M, Correa A, Misra D, Jaakkola J. A review of the literature on the effects of ambient air pollution on fetal growth. Environ Res. 2004;95:106–15.
33. Câmara VM, Tambellini AT. Considerações sobre o uso da Epidemiología em saúde ambiental. Rev Bras Epidemiol. 2003;6(2):95–104.
34. Brazil, Ministério da Saúde, Coordenação Geral de Vigilância em Saúde Ambiental, Secretaria de Vigilância em Saúde. Avanços e perspectivas da vigilância em saúde ambiental no Brasil. Brasilia: CGVAM/SVS; 2006. Unpublished.
35. Commission for Environmental Cooperation. Children's Health and the Environment in North America: A First Report on Available Indicators and Measures. Montreal: CEC; 2006.
36. Santos ECO, Cámara VM, Jesús IM, et al. A contribution to the establishment of references values for total mercury levels in hair and fish in Amazonia. Environ Res. 2002; 90(1):6–11.
37. Pan American Health Organization. Sanitary Surveillance of Pesticides: experience of PLAGSALUD in Central America. Washington, DC: PAHO; 2004.
38. Pan American Health Organization. Epidemiol Bul. 2001; 22 (4). Available at: http://www.paho.org/spanish/sha/EB_V22n4.pdf.
39. Pan American Health Organization; United Nations Environment Program; Global Environmental Facility. Regional Program of Action and Demonstration of Sustainable Alternatives to DDT for Malaria Vector Control in Mexico and Central America. Washington, DC: PAHO; 2002.
40. United Nations Environment Program. Minimizing hazardous wastes: a simplified guide to the Basel Convention. Geneva: UNEP; 2002.
41. United Nations Environment Program; Food and Agriculture Organization of the United Nations. Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. Geneva: UNEP; 2005.
42. United Nations Environment Program. Stockholm Convention on Persistent Organic Pollutants (POPs). Geneva: UNEP; 2002.
43. Kosek M, Bern C, Guerrant RL. The magnitude of the global problem of diarrheal disease from studies published 1992–2000. Bull World Health Organ 2003;81(3):197–204.
44. Binsztein N, Fernández A, Caffer MI, Agudelo CI, Arias MI, Ugarte C, et al. WHO Global Salm-Surv (WHO GSS) in the South American Region: five years (2000–2004) of Salmonella surveillance. International Conference on Emerging Infectious Diseases, Atlanta, Georgia, 21 March 2006.
45. World Health Organization. WHO Consultation to Develop a Strategy to Estimate the Global Burden of Foodborne Diseases. Geneva, 25–27 September 2006. Available at: http://www.who.int/foodsafety/publications/foodborne_disease/burden_sept06/en/.
46. Diemert DJ. Prevention and self-treatment of traveler's diarrhea. Clin Microbiol Rev. 2006;19:583–94.
47. Torres R, Skillicorn P. Montezuma's revenge: how sanitation concerns may injure Mexico's tourist industry. Cornell Hotel and Restaurant Administration Quarterly. 2004;45(2): 132–44.
48. Pan American Institute for Food Protection and Zoonoses. Assessment of the Food Safety Systems in the America Region. INPAZ/PAHO; 2004. Available at: http://www.panalimentos.org/evaluacion/evaluacion.sia.ingles/index.html.
49. Flint JA, Van Duynhoven YT, Angulo FJ, DeLong SM, Braun P, Kirk M, et al. Estimating the burden of acute gastroenteritis, foodborne disease, and pathogens commonly transmitted by food: an international review. Clin Infec Dis. 2005;41:698–704.

50. Aguiar Prieto PH, Castro Domínguez A, Pérez E, Coutin Marie G, Triana Rodríguez T, et al. Carga de la shigelosis en tres sitios centinelas de Cuba. 2005. Available at: http://www.sld.cu/galerias/pdf/sitios/vigilancia/rtv0405.pdf.
51. Economic Commission for Latin America and the Caribbean. Social Panorama of Latin America. Santiago de Chile: ECLAC; 2006.
52. Castro G. Los riesgos del trabajo en América Latina. International Social Security Review. 2005;58(2–3):125–39.
53. International Labor Organization, Policy Integration Department, Bureau of Statistics. LABORSTA: online statistics. Geneva: ILO; 2006.
54. Dong C, Platner J. Occupational fatalities of Hispanic construction workers from 1992 to 2000. Am J Ind Med. 2003; 45(1):45–54.
55. International Labor Organization. Labor Overview 2005. Geneva: ILO; 2005.
56. World Bank. Regional activities: Latin America and the Caribbean [Web site]. World Bank; 2006.
57. Bullinger HJ. The changing world of work: prospects and challenges for health and safety. Magazine of the European Agency for Safety and Health at Work. 2000;2:8–13.
58. International Labor Organization. The End of Child Labor: Within Reach. Geneva: ILO; 2006.
59. International Labor Organization. Global employment trends brief. Geneva: ILO; 2007.
60. Fundación Iberoamericana de Seguridad y Salud Ocupacional; Inter-American Development Bank. Survey on the Regional Workers' Health Plan. FISO/IDB; 2002.
61. International Labor Organization. Labor Overview 2005: Latin America and the Caribbean (First Semester Advance Report). Geneva: ILO; 2005.
62. Eijkemans G. WHO occupational health fact sheet. Geneva: WHO; 2007.
63. Fingerhut M, Nelson DI, Driscoll T, Concha-Barrientos M, Steenland K, Punnett L, et al. The contribution of occupational risks to the global burden of disease: summary and next steps. Med Lav. 2006;97(2):313–21.
64. Chile, Ministerio de Salud. Equidad en salud ocupacional, la salud de los trabajadores de Chile [PowerPoint presentation by the Minister of Health]. 2005.
65. Chile, Dirección de Trabajo, Departamento de Estudios. Encuesta Laboral 2004. Relaciones de trabajo y empleo en Chile. Resultados de la Cuarta Encuesta Laboral. Santiago de Chile; 2005.
66. Colombia, Ministerio de la Protección Social. Estadísticas del sistema general de riesgos profesionales; 2005. Available at: http://www.minproteccionsocial.gov.co/MseContent/images/news/DocNewsNo658301.pdf.
67. Argentina, Superintendencia de Riesgos del Trabajo. Anuario estadístico 2003. Accidentes de trabajo y enfermedades profesionales. Buenos Aires: SRT; 2004. Available at: http://www.srt.gov.ar/nvaweb/data/data2003.htm.
68. Heiremans E. Las mutualidades de empleadores en Chile. In: Federación de Aseguradores Colombianos. Memorias del Primer Encuentro Internacional de Riesgos Profesionales. Bogotá: FASECOLDA; June 2001.
69. Colombia, Ministerio de la Protección Social. Estadísticas del sistema general de riesgos profesionales; 2005. Available at: http://www.minproteccionsocial.gov.co/MseContent/images/news/DocNewsNo658301.pdf.
70. Wesseling C, Aragón A, Morgado H, Elgstrand K, Hogstedt C, Partanen T. Occupational health in Central America. Int J Occup Environ Health. 2002;8:125–36.
71. IV Summit of the Americas. Declaration of Mar del Plata. Mar del Plata, Argentina, November 2005.
72. Amador-Rodezno R. An overview to CERSSO's self evaluation of the cost-benefit on the investment in occupational safety and health in the textile factories: a step by step methodology. Pan American Health Organization; Regional Center for Occupational Safety and Health; 2005.
73. United Nations. Report on the United Nations Conference on Environment and Development. Earth Summit. Rio de Janeiro, June 1992.
74. United Nations. Resolution adopted by the General Assembly. 55/2. United Nations Millennium Declaration. New York: UN; 2000. Available at: http://www.un.org/millennium/declaration/ares552e.htm.
75. World Health Organization. Johannesburg Declaration on Sustainable Development. Johannesburg: WHO; 2002.
76. Meeting of the Ministers of Health of the Americas, Mar del Plata, Argentina, 16–17 June 2005.
77. Pan American Health Organization. Report on the Workshop on Environmental Threats to the Health of Children in the Americas. Lima: CEPIS; 2003.
78. Pan American Health Organization. Healthy environments: healthy children [toolkit for the classroom]. Washington, DC: PAHO; 2004.
79. Commission for Environmental Cooperation. Children's Health and the Environment in North America. A First Report on Available Indicators and Measures. Montreal: CEC; 2006.
80. Ruiz A, Henao S, Galvão L. Indicadores de salud ambiental: una herramienta para lograr la salud de los niños. Washington, DC: OPS; 2004.
81. Ruiz A. Taller sobre indicadores de salud ambiental para los niños de América Latina y el Caribe. Informe final. San José: OPS; 2004.
82. Partanen T, Wesselin C. Efectos sobre la salud humana de los contaminantes orgánicos persistentes: aldrín, dieldrín, endrín, clordano, DDT, toxafeno, mirex, heptacloro, hexaclorobenceno, los bifenilos policlorados, Dioxins-Para-Dibenzo policlorados y dibenzofuranos policlorados. Un examen. Costa Rica; 2004.
83. Pan American Health Organization. An Assessment of Health Effects of Ambient Air Pollution in Latin America and the Caribbean. Washington, DC: PAHO; 2005.

84. Delgado HL, Palma P, Palmieri, M. La iniciativa de seguridad alimentaria nutricional en Centroamérica. Guatemala: INCAP/OPS; 1999.
85. Bermúdez O, Tucker L. Trends in dietary patterns of Latin American populations. Cad Saúde Pública. 2003;19 Sup. 1:S87–S99.
86. World Health Organization. Physical status: The use and interpretation of anthropometry. Report of a WHO Expert Committee. WHO Technical Report Series 854. Geneva: WHO; 1995.
87. Popkin BM. An overview on the nutrition transition and its health implications: the Bellagio meeting. Public Health Nutrition. 2002;5(1A): 93–103.
88. World Bank. Repositioning Nutrition as Central to Development, A Strategy for Large-Scale Action. Washington, DC: International Bank for Reconstruction and Development/World Bank; 2006.
89. Economic Commission for Latin America and the Caribbean. The Millennium Development Goals: A Latin American and Caribbean Perspective, 2005. Santiago de Chile: ECLAC; 2005.
90. Roses M. Integración entre salud y agricultura para el bienestar y la calidad de vida. Available at: http://mirtaroses.paho.org/index.php?language=es-es en 13/0906.
91. Gibbs EPJ. Emerging zoonotic epidemics in the interconnected global community. Veterinary Record. 2005;157: 673–79.
92. Pan American Health Organization. 13th Inter-American Meeting, at the Ministerial Level, on Health and Agriculture (RIMSA 13). Final report. Washington, DC: OPS; 2003. Available at: http://bvs.panaftosa.org.br/textoc/rimsa13-fr-2003ing.pdf.
93. Organización Panamericana de la Salud. Informe de situación de los países presentado por el Centro Panamericano de Fiebre Aftosa a la COSALFA XXVIII. OPS; 2002.
94. Pan American Health Organization, Pan American Foot-and-Mouth Disease Center. South American Commission for the Fight against Foot-and-Mouth Disease (COSALFA) XXIX. Final Report. Rio de Janeiro: PANAFTOSA; 2003.
95. Pan American Health Organization, Pan American Foot-and-Mouth Disease Center. South American Commission for the Fight against Foot-and-Mouth Disease (COSALFA) XXX. Final Report. Rio de Janeiro: PANAFTOSA; 2004.
96. Pan American Health Organization, Pan American Foot-and-Mouth Disease Center. Action Plan Hemispheric Program for Eradication of Foot-and-Mouth Disease (PHEFA), 2005–2009. Washington, DC: PAHO; 2004.
97. Organización Panamericana de la Salud. Informe de situación de los países a la COSALFA XXXIII. Centro Panamericano de Fiebre Aftosa. OPS; 2006.
98. World Organization for Animal Health. Geographical distribution of countries that reported BSE confirmed cases since 1989. Paris: OIE; 2006. Available at: http://www.oie.int/eng/info/en_esb.htm.
99. World Health Organization. Variant Creutzfeldt-Jakob disease. WHO; 2006. Available at: http://www.who.int/zoonoses/diseases/variantcjd/en/.
100. Organización Panamericana de la Salud, Centro Panamericano de Fiebre Aftosa. Listado de verificación de los sistemas de prevención y vigilancia de las encefalopatías espongiformes bovinas. PANAFTOSA/OPS; 2003. Available at: http://www.panaftosa.org.br/inst/DOWNLOAD/evaluacion_EEB.pdf.
101. Organización Panamericana de la Salud, Centro Panamericano de Fiebre Aftosa. Los recursos de diagnóstico para EEB identificados por PANAFTOSA. OPS; 2006. Available at: http://www.panaftosa.org.br.
102. Organización Panamericana de la Salud, Centro Panamericano de Fiebre Aftosa. Situación actual y perspectivas de acción en relación a influenza aviar (IA) en América. Documento de trabajo. Conferencia Hemisférica de Vigilancia y Prevención de la Influenza Aviar. Brasilia: OPS; 2005.
103. Webster R. Influenza: an emerging disease. Emerg Infect Dis. 1998;4(3):437–41.
104. Horimoto T, Kawaoka Y. Pandemic threat posed by avian influenza A viruses. Clin Microbiol Rev. 2001 Jan:129–49.
105. Swayne DE, Suárez DL. Highly pathogenic avian influenza. Rev Sci Tech Off Int Epiz. 2000;19(2): 463–82.
106. Food and Agriculture Organization of the United Nations. Livestock statistics. Rome: FAO; 2006. Available at: http://faostat.fao.org/site/568/default.aspx.
107. World Health Organization. Cumulative number of confirmed human cases of avian influenza A/(H5N1) reported to WHO. September 2006. Available at: http://www.who.int/csr/disease/avian_influenza/country/cases_table_2006_09_30/en/index.html.
108. World Health Organization. Avian influenza: assessing the pandemic threat. January 2005. Available at: http://www.who. int/entity/csr/disease/influenza/H5N1-9reduit.pdf.
109. Pan American Health Organization. Report on the 14th Inter-American Meeting, at the Ministerial Level, on Health and Agriculture (RIMSA 14). Washington, DC: PAHO; 2005. Available at: http://www.ops-oms.org/English/GOV/CD/cd46-14-e.pdf.
110. World Health Organization. The World Health Report 2002. Reducing Risks, Promoting Healthy Life. Geneva: WHO; 2002.
111. Pan American Health Organization. Health Statistics from the Americas. Washington, DC: PAHO; 2006.
112. Teo KK, Ounpuu S, Hawken S, Pandey MR, Valentin V, Hunt D, et al. Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study: a case-control study. Lancet. 2006 Aug 19;368(9536):647–58.

113. Danaei G, Vander Hoorn S, López AD, Murray CJ, Ezzati M. Comparative risk assessment collaborating group (cancers). Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors. Lancet. 2005 Nov 19;366(9499):1784–93.
114. United States, California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. Health effects of exposure to environmental tobacco smoke: final report. Sacramento: OEHHA; 2005. Available at: http://www.oehha.ca.gov/air/environmental_tobacco/2005etsfinal.html. Accessed 31 October 2006.
115. United States, Department of Health and Human Services, Centers for Disease Control and Prevention. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. Atlanta: HHS; CDC; 2006.
116. United States, Department of Health and Human Services, Centers for Disease Control and Prevention; World Health Organization. Global Youth Tobacco Survey (GYTS). Available at: http://www.cdc.gov/tobacco/global/surveys.htm #gyts.
117. Navas-Acien A, Peruga A, Breysse P, Zavaleta A, Blanco-Marquizo A, Pitarque R, et al. Secondhand tobacco smoke in public places in Latin America, 2002–2003. JAMA. 2004; June 9;291(22):2741–45.
118. Barnum H. The economic burden of the global trade in tobacco. Tob Control. 1994;3:358–61.
119. United States, Department of Health and Human Services, Centers for Disease Control and Prevention. Annual smoking-attributable mortality, years of potential life lost, and economic costs, United States, 1995–1999. Morb Mortal Wkly Rep. 2002 Apr 12;51(14):300–3.
120. Behan D, Eriksen M, Lin Y. Economic effects of environmental tobacco smoke [report]. Schaumburg, Illinois: Society of Actuaries 2005. Available at: http://www.soa.org/ccm/cms-service/stream/asset/?asset_id=13389116&g11n.
121. Adams EK, Melvon C, Merritt R, Worrall B. The costs of environmental tobacco smoke (ETS): an international review. Background Paper for the International Consultation on Environmental Tobacco Smoke (ETS) and Child Health, 11–14 January 1999. Geneva: WHO; 1999.
122. Gonzáles-Rozada M. Economía del control del tabaco en los países del Mercosur y Estados Asociados: Argentina: 1996–2004. Washington, DC: OPS; 2006.
123. Alcaraz VO. Economía del control del tabaco en los países del Mercosur y Estados Asociados: Bolivia. Washington, DC: OPS; 2006.
124. Iglesias R. Economía del control del tabaco en los países del Mercosur y Estados Asociados: Brasil. Washington, DC: OPS; 2006.
125. Debrott Sánchez D. Economía del control del tabaco en los países del Mercosur y Estados Asociados: Chile. Washington, DC: OPS; 2006.
126. Ramos A. Economía del control del tabaco en los países del Mercosur y Estados Asociados: Uruguay. Washington, DC: OPS; 2006.
127. Pan American Health Organization. Profits over people. Tobacco industry activities to market cigarettes and undermine public health in Latin America and the Caribbean. Washington, DC: PAHO; 2002.
128. World Health Organization. WHO Framework Convention on Tobacco Control. Geneva: WHO; 2003.
129. World Health Organization. Policy recommendations on protection from exposure to second-hand tobacco smoke. Geneva: WHO; 2007.
130. Canada, Physicians for a Smoke-free Canada. Fact-sheet. Background on protection from second-hand smoke in Canada [Web page]. Ottawa: Physicians for a Smoke-free Canada; 2006. Available at: http://www.smoke-free.ca/fact-sheets/pdf/Q&A-smokefreecommunities.pdf.
131. United States, American Nonsmokers' Rights Foundation. Smokefree air on the increase—More than 50% of U.S. population to be protected by smokefree air laws [Press release]. Berkeley: Americans for Nonsmokers' Rights; 2006. Available at: http://www.no-smoke.org/pdf/smokefreeair-increase.pdf.
132. Pan American Health Organization. Exposure to Second-hand Tobacco Smoke in the Americas: A Human Rights Perspective. Washington, DC: PAHO; 2006.
133. World Bank. Curbing the Epidemic: Governments and the Economics of Tobacco Control. Washington, DC: World Bank; 1999.
134. Blecher EH, van Walbeek CP. An international analysis of cigarette affordability. Tob Control. 2004; 13:339–46.
135. Brazil, Instituto Datafolha. Encuesta de opinión pública realizada el abril de 2002 [data from the Instituto Nacional del Cáncer and the Ministerio de Salud of Brazil].
136. Hammond D, Fong GT, McDonald PW, Cameron R, Brown KS. Impact of the graphic Canadian warning labels on adult smoking behaviour. Tob Control. 2003;12: 391–95.
137. Hammond R. Tobacco advertising and promotion: The need for a coordinated global response. Background paper for the WHO international conference on global tobacco control law: towards a WHO Framework Convention on Tobacco Control. World Health Organization; 2000.
138. Saffer H. Tobacco advertising and promotion. In: Jha P, Chaloupka F, eds. Tobacco control in developing countries. Washington, DC: World Bank; WHO; 2000.
139. Dalton M, Sargent J, Beach M, Titus-Ernstoff L, Gibson J, Ahrens M, et al. Effect of viewing smoking in movies on adolescent smoking initiation: a cohort study. Lancet. 2003; 362(9380):281–5.
140. United States, Smoke Free Movies. [Web page]. Available at: http://www.smokefreemovies.ucsf.edu/index.html. Accessed in December 2006.

141. Mexico, British American Tobacco. Acomodando a ambos, "fumadores" y "no fumadores" [Web page]. Monterrey: British American Tobacco Mexico; 2006. Available at: http://www.batmexico.com.mx/oneweb/sites/BAT_5NNARK.nsf/vwPagesWebLive/DO5PKSKK?opendocument&SID=&DTC=&TMP=1. Accessed December 2006.
142. British American Tobacco. Social Report 2005 [Web page]. British American Tobacco; 2005. Available at: http://www.bat.com/OneWeb/sites/uk__3mnfen.nsf/vwPagesWebLive/C1256E3C003D3339C12571690056085D?opendocument&DTC=&SID. Accessed in December 2006.
143. Argentina, Nobleza Piccardo. Leyendas de advertencia [Web page]. Available at: http://www.noblezapiccardo.com/OneWeb/sites/NOB_58LMXM.nsf/vwPagesWebLive/DO6HGQHP?opendocument&SID=&DTC=&TMP=1. Accessed in December 2006.
144. United States, Department of Justice. National Campaign for Tobacco-Free Kids. Special report: Justice Department Civil Lawsuit. Available at: http://www.tobaccofreekids.org/reports/doj/. Accessed 6 December 2006.
145. British American Tobacco. Annual Review and Summary Financial Statement 2005. Available at: http://www.bat.com/OneWeb/sites/uk__3mnfen.nsf/vwPagesWebLive/DO52AK34?opendocument&SID=&DTC=&TMP=1. Accessed 6 December 2006.
146. Wiehe SE, Garrison MM, Christakis DA, Ebel BE, Rivara FP. A systematic review of school-based smoking prevention trials with long-term follow-up. J Adol Health. 2005;36:162–69.
147. World Health Organization. The World Health Report 2002. Reducing Risks, Promoting Healthy Life. Geneva: WHO; 2002.
148. Rehm J, Monteiro M. Alcohol consumption and burden of disease in the Americas: implications for alcohol policy. Rev Panam Salud Pública. 2005;18(4/5):241–48.
149. Rehm J, Room R, Monteiro M, Gmel G, Graham K, Rehn N, et al. Alcohol use. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds. Comparative quantification of health risks: global and regional burden of disease due to selected risk factors (Vol. 1). Geneva: WHO; 2004. pp. 959–1108.
150. Harwood H. Updating estimates of the economic costs of alcohol abuse in the United States: estimates, update methods, and data report. Prepared by the Lewin Group for the National Institute on Alcohol Abuse and Alcoholism, 2000.
151. Single E, Robson L, Xie X, Rehm J. The economic costs of alcohol, tobacco and illicit drugs in Canada. Addiction. 1992;93(7):99–100.
152. World Health Organization, Department of Mental Health and Substance Abuse. Global Status Report on Alcohol 2004. Geneva: WHO; 2004.
153. Rehm J, Room R, Graham K, Monteiro M, Gmel G, Tempos C. The relationship of average volume of alcohol consumption and patterns of drinking to burden of disease: an overview. Addiction. 2003;98:1209–15.
154. Kohn R, Levav I, Caldas de Almeida JM, Vicente B, Andrade L, Caraveo-Anduaga JJ, Saxena S, Saraceno B. Los trastornos mentales en América Latina y el Caribe: asunto prioritario para la salud pública. Rev Panam Salud Pública. 2005;18(4/5):229–40.
155. World Health Organization. Global Status Report: Alcohol and Young People. Geneva: WHO; 2001.
156. Mandelbaum D. Alcohol and culture. In: Marshall M (ed.). Beliefs, behaviors and alcoholic beverages. Ann Arbor: University of Michigan Press; 1979. pp. 14–30.
157. Pan L. Alcohol in colonial Africa. Vol. 22. Helsinki: Finnish Foundation for Alcohol Studies; 1975.
158. Seale P, Shellenberger S, Rodríguez C, Seale JD, Alvarado M. Alcohol use and cultural change in an indigenous population: a case study from Venezuela. Alcohol and Alcoholism. 2002;37(6):603–8.
159. Organización Panamericana de la Salud. Alcohol y salud de los pueblos indígenas El Alto, Capital Aymara. La Paz: OPS; 2006.
160. Room R, Jernigan D, Carlini-Marlatt B, Gureje O, Makela K, Marshall M, et al. Alcohol in developing societies: a public health approach. Vol. 46. Finnish Foundation for Alcohol Studies/WHO; 2002.
161. Babor T, Caetano P, Casswell S, Edwards G, et al. Alcohol: no ordinary commodity. Research and Public Policy. Oxford: Oxford University Press; 2003.
162. Duailibi S, Ponicki W, Grube J, Pinsky I, Laranjeira R, Raw M. Does restricting opening hours reduce alcohol related violence? Am J Public Health. 2006. (In press).
163. Chisholm D, Rehm J, Van Ommeren M, Monteiro M. Reducing the global burden of hazardous alcohol use: a comparative cost effectiveness analysis. J Stud Alcohol. 2004;65:782–93.
164. Pan American Health Organization. World Report on Violence and Health. Washington, DC: PAHO; 2003. (Scientific and technical publication No. 588).
165. Pan American Health Organization. Health Situation in the Americas. Basic Indicators. Washington, D.C.: PAHO; 1996–2005.
166. Ellsberg M, Peña R, Herrera A, Liljestrand J, Winkvist A. Candies in hell: women's experiences of violence in Nicaragua. Soc Sci Med. 2000;51(11):1595–1610.
167. El Salvador, Equipo de Reflexión Investigación y Comunicación; Instituto de Encuestas y Sondeos de Opinión; Instituto de Investigaciones Económicas y Sociales; Instituto Universitario de Opinión Publica. Maras y pandillas en Centroamérica. Pandillas y capital social. Vol. II. San Salvador: UCA Editores; 2004.
168. Santacruz M, Concha-Eastman A, Cruz JM. Barrio adentro. La solidaridad violenta de las pandillas. San Salvador:

OPS/OMS; Universidad Centro América J.S. Cañas; Instituto Universitario de Opinión Pública; 2001.
169. Peres MFT. Violência por armas do fogo no Brasil—Relatorio Nacional, São Paulo, Brasil. Universidade de São Paulo, Núcleo de Estudos da Violência; 2004.
170. Colombia, Instituto Nacional de Medicina Legal y Ciencias Forenses. Forensis, Datos para la vida. Bogota; 2001–2005. Available at: http://www.medicinalegal.gov.co/.
171. Londoño, JL, Gaviria A, Guerrero R (eds.). Asalto al desarrollo. Violencia en América Latina. Washington, DC: Banco Interamericano de Desarrollo, Red de Centros de Investigación; 2000.
172. Programa de las Naciones Unidas para el Desarrollo. Cuánto le cuesta la violencia a El Salvador. San Salvador: PNUD; 2005.
173. Pan American Health Organization; World Health Organization. International Classification of Diseases and Related Health Problems (ICD-10). Vol. I. Washington, DC: PAHO/WHO; 2003.
174. Garfield R, Llanten Morales CP. The public health context of violence in Colombia. Rev Panam Salud Pública. 2004;16(4): 266–71.
175. Concha-Eastman A. Ten years of a successful violence reduction program in Bogota, Colombia. In: McVeigh C, Hughes K, Lushey C, Bellis MA (eds.). Preventing violence: from global perspective to national action. Liverpool: Center for Public Health, John Moores University; 2005. pp. 13–18.
176. Guerrero R, Concha-Eastman A. An epidemiological approach for the prevention of urban violence: the case of Cali, Colombia. Journal of Health and Population in Developing Countries. 2001;4(1). Available at: www.jhpdc.unc.edu.
177. Colombia, Sistema Unificado de Información sobre Violencia y Delincuencia de Bogotá. Available at: http://www.suivd.gov.co.
178. United States, Department of Health and Human Services, Centers for Disease Control and Prevention. Homicide trends and characteristics, Brazil, 1980–2002. Morb Mortal Wkly Rep. 2004 Mar 5;53(8):169–71.
179. United States, Department of Health and Human Services, Centers for Disease Control and Prevention. Homicides among children and young adults, Puerto Rico, 1999–2003. Morb Mortal Wkly Rep. 2006 Apr 7;55(13):361–64.
180. Guatemala, Instituto Nacional de Estadísticas. 2000–2005.
181. El Salvador, Mesa Técnica, Policía Nacional, Fiscalía General de la República, Instituto de Medicina Forense. [Data from 2005]. Fiscalía General de la República. [Data from 1999–2004].
182. Costa Rica, Instituto Nacional de Estadística y Censos. 1996–2005. Available at: http://www.inec.go.cr/.
183. Belize, Ministry of Health. Homicide rates. 2001–2005.
184. Organización Panamericana de la Salud/Organización Mundial de la Salud. Informe de la jornada de trabajo sobre indicadores de seguridad humana. Panama, August 2006.
185. Ward E. Application of an injury surveillance system for targeting interventions or violence prevention. In: McVeigh C, Hughes K, Lushey C, Bellis MA (eds.). Preventing violence: from global perspective to national action. Liverpool: Center for Public Health, John Moores Univesity; 2005. pp. 53–58.
186. Lemard G, Hemenway D. Violence in Jamaica: an analysis of homicides 1998–2002. Inj Prev. 2006 Feb;12(1):15–18.
187. Briceño-León R. Violencia interpersonal y percepción ciudadana de la situación de seguridad en Venezuela. Unpublished; 2006.
188. Cruz JM (ed.). Maras y pandillas en Centroamérica. Vol. IV. Las respuestas de la sociedad civil organizada. San Salvador: UCA Editores; 2006.
189. Honduras, Asociación Cristiana de Jóvenes; Save the Children. Las maras en Honduras. Investigación sobre pandillas y violencia juvenil, consulta nacional. Plan Nacional de Atención. Ley especial. Tegucigalpa: Frinsa Impresos; 2002.
190. Castro M, Carranza M. Las maras en Honduras. In: Maras y pandillas en Centroamérica. Vol. I. Managua: UCA Publicaciones; 2001.
191. Smutt M, Miranda JL. El fenómeno de la violencia en El Salvador. San Salvador: PNUD; 1998.
192. Cruz JM, Portillo PN. Solidaridad y violencia en las pandillas del gran San Salvador. Más allá de la vida loca. San Salvador: UCA Editores; 1998.
193. United States, United States Agency for International Development, Bureau for Latin American and Caribbean Affairs, Office of Regional Sustainable Development. Central America and Mexico Gang Assessment. April 2006.
194. Organización Panamericana de la Salud. Fomento del Desarrollo Juvenil y Prevención de la Violencia. OPS/GTZ; 2006. Available at: http://www.paho.org/CDMEDIA/FCHGTZ/principal.htm.
195. Colombia, Organización Panamericana de la Salud. Salud y desplazamiento. ¿Quiénes son los desplazados por la violencia?
196. Colombia, Sistema Único de Registro. Registro único de población desplazada. 2005. Available at: http://www.accionsocial.gov.co/SUR/Registro_SUR_Acumulado.xls.
197. Organización Panamericana de la Salud. Available at: http://www.disaster-info.net/desplazados/. Accessed 27 February 2007.
198. World Health Organization. Holder Y, Peden M, Krug E, Lund J, Gururaj G, Kobusingye O (eds.) Injury Surveillance Guidelines. Geneva: WHO; 2001. Available at: http://www.who.int/violence_injury_prevention/en/.
199. World Health Organization. International Classification of External Causes of Injury. Available at: http://www.iceci.org.

200. Colombia, Universidad del Valle, Instituto de Promoción de Coexistencia y Prevención de Violencia. Available at: http://www.cisalva.univalle.edu.co/.
201. Pan American Health Organization. World Report on Road Traffic Injury Prevention. Washington, DC: PAHO; 2004.
202. Acero-Velásquez H, Concha-Eastman A. Road safety: a public policy problem in the Americas. Washington, DC: PAHO; 2004.
203. World Health Organization. Injury severe enough to need medical attention. Available at: http://www.who.int/healthinfo/statistics/gbdwhoregionincidence2002.xls.
204. Hijar M, Vásquez-Vela E, Arreola-Risa C. Pedestrian traffic injuries in Mexico: a country update. Injury Control and Safety Promotion. 2003;10:37–43.
205. Argentina, Ministerio de Salud de la Nación, Dirección de Estadísticas e Información de Salud. 2002.
206. García González M. Muertes en accidentes de tránsito. Forensis 2002: datos para la vida. Bogotá: Centro de Referencia Nacional sobre Violencia; 2003.
207. Venezuela, Comisión Interministerial para la Atención, Prevención y Educación Vial. Coordinación programa prevención de accidentes y otros hechos violentos. (Presented at the Seminario Internacional sobre Seguridad Vial, Pan American Health Organization, Brasilia, 28–30 June 2004.)
208. Cuba, Ministerio de Transporte, Comisión Nacional de Vialidad y Tránsito; Ministerio de Salud Pública; Policía Nacional Revolucionaria; Instituto Medicina Legal. Perfil nacional sobre seguridad vial, 2004. (Presented at the Seminario Internacional sobre Seguridad Vial, Pan American Health Organization, Brasilia, 28–30 June 2004.)
209. Trinidad and Tobago, Ministry of Planning and Development, Central Statistical Office. Available at: http://www.cso.gov.tt/statistics/psvs/default.asp. Accessed 11 June 2004.
210. Costa Rica, Ministerio de Salud. Perfil nacional sobre seguridad vial, 2004.
211. World Health Organization. Global Burden of Disease Project, 2002. Version 1.
212. Vasconcelos EA. Strategies to improve traffic safety in Latin America. (Presented at the World Bank Taller de Consulta en América Latina: Revisión de la Estrategias para Transporte Urbano, Santiago, Chile, 6–9 November 2000.)
213. Mexico, Consejo Nacional para la Prevención de Accidentes. Modelo de Atención Prehospitalaria.
214. Peru, Policía Nacional; Ministerio del Interior; Instituto de Medicina Legal; Ministerio de Salud. Perfil nacional sobre seguridad vial, 2004.
215. Pan American Health Organization. 47th Directing Council. Health Promotion: Achievements and Lessons Learned from Ottawa to Bangkok. CD47/16. Washington, DC: PAHO; 2006.
216. World Health Organization. Ottawa Charter for Health Promotion. First International Conference on Health Promotion, Ottawa, Canada, 17–21 November 1986.
217. World Health Organization. Adelaide Recommendations on Healthy Public Policy. Second International Conference on Health Promotion, Adelaide, Australia, 5–9 April 1988.
218. Pan American Health Organization, World Health Organization; Colombia, Ministerio de Salud. Declaration of the International Conference on Health Promotion. Bogota: PAHO/WHO; 1992.
219. Pan American Health Organization. Health Promotion: An Anthology. Washington DC: OPS; 1996. (Scientific publication No. 557).
220. Mexico Ministerial Statement for the Promotion of Health. Fifth Global Conference on Health Promotion. Mexico City, Mexico, 5 June 2000.
221. Sundsvall Statement on Supportive Environments for Health. Third International Conference on Health Promotion, Sundsvall, Sweden, 9–15 June 1991.
222. Organización Panamericana de la Salud/Organización Mundial de la Salud. Guía de evaluación participativa para municipios y comunidades saludables. OPS/OMS; 2003. Available at: http://www.bvsde.ops-oms.org/bvsdemu/fulltext/guiaeval/guiaeval.html.
223. Pan American Health Organization. Health Promoting Schools: Strengthening of the Regional Initiative. Washington, DC: PAHO; 2003.
224. Chile, Ministerio de Salud. Presentación de la experiencia de Chile. Santiago de Chile; January 2006.
225. United States, Department of Health and Human Services. Healthy People 2010. Washington, DC: Department of Health and Human Services; 2000. Available at: http://www.health.gov/healthypeople.
226. Jakarta Declaration on Leading Health Promotion into the 21st Century. 4th International Conference on Health Promotion, Jakarta, Indonesia; 21–25 July 1997.
227. Cerqueira MT, Conti C, De La Torre A. La promoción de la salud y el enfoque de espacios saludables en las Américas. In: FAO. Food, Nutrition and Agriculture. 2003;33:36–44.
228. Economic Commission for Latin America and the Caribbean. The Millennium Development Goals: a Latin American and Caribbean Perspective, 2005. Santiago de Chile: ECLAC; 2005.
229. Argentina, Red Argentina de Municipios y Comunidades Saludable. 2006. Available at: http://municipios.msal.gov.ar/.
230. Akerman M, Mendes R (eds.). Participating evaluation of healthy cities, communities and environments: the Brazilian trajectory—memory, thoughts and experiences. São Paulo; Midia alternativa; 2006.
231. Canada, Ontario Healthy Communities Coalition. 2006. Available at: http://www.healthycommunities.on.ca/.
232. Canada, Réseau québécois de villes et villages en santé. 2006. Available at: http://www.rqvvs.qc.ca/anglais/ reseau/intro.htm.
233. United States, Center for Civic Partnerships. 2006. Available at: http://www.civicpartnerships.org.

234. United States, Indiana University, WHO Collaborating Center for Healthy Cities. 2006. Available at: http://www.iupui.edu/~citynet/citynet.htm.
235. Peru, Red de Municipios y Ciudades Saludables. 2006. Available at: www.miraflores.gob.pe/redmunicipiosaludables.
236. Organización Panamericana de la Salud. Vivienda saludable: reto del milenio en los asentamientos precarios de América Latina y el Caribe. Guía para las autoridades nacionales y locales; 2005.
237. Zuluaga J. Neurodesarrollo y estimulación. Bogotá: Editorial Médica Panamericana SA; 2001.
238. Ippolito-Shepherd J, Cerqueira MT, Ortega D. Iniciativa Regional Escuelas Promotoras de la Salud en las Américas. IUHPE Promotion and Education 2005;XII(3–4):220–29.
239. Ippolito-Shepherd J. Las escuelas promotoras de la salud en América Latina. Resultados de la Primera Encuesta Regional. Serie Promoción de la Salud Nº 3. Washington, DC: OPS; 2005.
240. Organización Panamericana de la Salud/Organización Mundial de la Salud. Memoria de la Cuarta Reunión de la Red Latinoamericana de Escuelas Promotoras de la Salud y Asamblea Constitutiva de la Red Puertorriqueña de Escuelas Promotoras de la Salud, San Juan, Puerto Rico, 11–16 de julio de 2004. Serie Promoción de la Salud Nº 11. Washington, DC: OPS/OMS; 2006.