

HEALTH EQUITY IN RELATION TO SAFE DRINKING WATER SUPPLY

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INTRODUCTION

The United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, in June 1992, issued a Declaration of Principles, asserting that “human beings are at the center of concern for sustainable development. They are entitled to a healthy and productive life in harmony with nature.” The Conference’s plan of action—Agenda 21—approaches environmental concerns and actions within a sustainable development process that focuses on the well-being of present and future generations. Section I of the Agenda, “Social and Economic Dimensions,” emphasizes that the elimination of poverty and the protection and promotion of health are important elements of sustainable development (United Nations, 1992). Latin American and Caribbean countries took the position that, “There will not be sustainable development as long as almost half of the population continues to be in abject poverty.” They further stated that, “Human development must

be the keystone of our strategy if it is to be ecologically viable. This, together with the rational use of natural resources, must be the central focus of our strategy. Every other concern must be subordinated to it.” The Agenda also stresses that the achievement and maintenance of health for the Latin American and Caribbean population “. . . demands the integration of health concerns with those of the environment as part of the new model of sustainable development” (Latin American and Caribbean Commission on Development and Environment, 1990).

About 200 million poor live in Latin America and the Caribbean—in 1994, 38% of the total population was poor and 16% was indigent. Poor people in urban and rural areas by and large do not have safe drinking water supplies. Some carry water to their homes from stand pipes and consequently waste valuable work or study time and risk their health by carrying heavy loads and consuming unsafe water. Others purchase water from vendors at prices up to twenty times higher than that paid by people with piped water.

The implementation of Agenda 21 underscores the close and complex links between the environment and human health, as well

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as the need for decision-makers to have a broad understanding of the relationship between environmental risk and health outcome in order to control exposures and protect health, and concomitantly to contribute to the reduction of inequities. Unfortunately, even though the matter is of critical importance, it has been given limited attention so far, and there are few studies available on socioeconomic inequalities in access to safe water supply.

In addition to its marked interest in the issue of equity and health outcomes, the Pan American Health Organization (PAHO) also is concerned with equity in the various determinants of health, including the broad physical, social, and economic determinants of health. In many cases, the determinants of health are key to attaining equity in health.

Many determinants of health, as are determinants in other sectors, are linked directly or indirectly to poverty. Because the relationship between poverty and health, which has been known for centuries, is clearly evident today, PAHO is striving to identify and define inequalities and inequities in health status within and among countries. Through its various activities and programs, the Organization is trying to improve the knowledge about and understanding of this issue as a basis for diminishing health harms and risks, particularly for the more disadvantaged populations.

The relationship between health and the environment touches on an extremely broad range of issues. The ability to link health to environmental data, and to better understand how the physical, social, and economic environments affect health, continues to challenge health professionals. Nevertheless, this step is fundamental for controlling the adverse environmental effects on human health in general, and on the more disadvantaged groups, especially the poor, in particular. In order to establish these links, health and environment data must be analyzed as a way to estimate the health impact of environmental factors and set priorities for action according to the

population's basic physical, social, and economic requirements (Associação Brasileira de Engenharia Sanitária e Ambiental, 1999; Associação Brasileira de pós-graduação em Saúde Pública, 1998; World Health Organization, 1996; World Health Organization, 1997).

The World Health Organization (WHO) has developed a six level cause-and-effect framework as a basis for analyzing how environmental risks generate health outcomes (World Health Organization, 1996). This framework, although still being tested, has provided valuable results that may help decision-makers and policy-makers understand these complex relationships and focus their actions on the health aspects of sustainable human development. This process should provide data to identify and better define where inequalities and inequities are concentrated and to determine which interventions are required to improve the situation.

In discussing the relationship among health, the environment, and sustainable development this chapter establishes a context for describing the basic situation that countries face in the new development processes. It also emphasizes the importance of water resources and the related inequalities that may affect the provision of safe drinking water supplies. This is a critical element among environmental determinants of health and an important expression of inequity, especially in relation to the health of the urban and rural poor. Further, this discussion demonstrates how water supply and sanitation measures affect populations, and how inequities in safe drinking water supplies can be demonstrated, specifically in relation to cost, coverage, and water quality. Finally, the chapter discusses the Environmental Health Framework for Decision-making, including the six lines of action designed to reduce inequities in relation to the provision of drinking water. It is expected that this methodology will be a useful mechanism for the identification, definition, prioritization, and implementation of actions to attain equity in health through environmental interventions.

HEALTH AND ENVIRONMENT IN HUMAN DEVELOPMENT

Inequalities and inequities in the provision of safe water have been expressed in many different ways and are considered explicitly in the broader global agenda on sustainable development. The Declaration of Principles issued in Rio de Janeiro, as expressed in Agenda 21, implies that development should meet the needs of people, their health, and their well-being, as well as provide a healthy environment in which people can attain their development, including health.

The basic human needs for a healthy environment are safe water, adequate food, and shelter, as well as the social and economic conditions whereby different people can live together with equity and peace—a desire of human beings over the ages. More recently, this aspiration has evolved into the concept of “human development” in the broadest sense, and is becoming a fundamental objective of more general development. Consequently, increasing awareness of the complex links between economic growth and environmental protection has become a major challenge in governments’ efforts to achieve human-oriented sustainable development (Carey, 1999; United Nations, 1992; World Bank, 1999).

In the Region of the Americas, the subject of health and the environment in development has been discussed in several meetings of heads of state and, in particular, at the 1996 Pan American Conference on Health and Environment in Sustainable Human Development. Presently, governments and peoples are cognizant that they must reconfigure their development policies and programs to equitably meet growing human needs and to correct existing inequities, while at the same time maintaining an ecological balance and facing the pressing demand for constructing healthy social systems. It is important to keep in mind that insufficient development, which is generally a consequence of poverty—and poverty affects a very large portion of the population in developing countries in the Americas—can

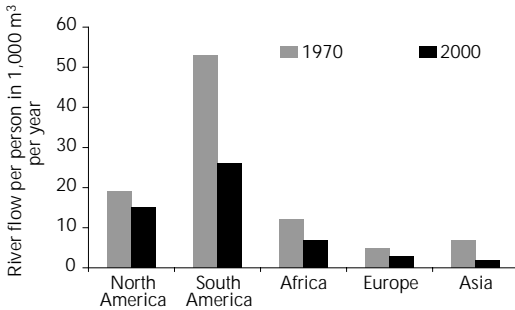
be a major contributor to environmental deterioration; this, in turn, can result in poor health (Pan American Health Organization, 1998; Pfaff, 1999).

Currently in this Region there is an understanding of the fact that people’s health cannot be promoted and protected by the health sector alone, or even primarily. As was shown during the Pan American Conference on Health and Environment in Sustainable Human Development in 1996, good health is the result of a series of actions by the whole of society, led by governments. Therefore, the establishment of partnerships that mobilize public and private sectors to act synergistically to address health goals is essential if significant progress is to be made. To fit within the framework of sustainable development, approaches to support health must shift from the traditional sectoral approach to a new, broader intersectoral effort. Intersectoral action is especially important when dealing with health and environment, because of the intrinsic links between the human and the natural environments (Pan American Health Organization, 1998; World Bank, 1999; Alleyne, 1998).

WATER RESOURCES AND QUALITY OF LIFE

Clean water is essential for life and for maintaining good health; it also is necessary for human activities, including those that enhance the quality of life. Except for some Caribbean islands, the Americas are endowed with a plentiful supply of surface water resources. About 13% of the world’s continental waters are found in Latin America and the Caribbean. On a per capita basis, this Region is very rich in terms of water, compared with other continents, as shown in Figure 1, particularly since estimates of the amount of water needed for development indicate that countries with 1,000 m³ to 1,600 m³ per person per year may experience shortages in drought years, and that those with less than 1,000 m³ per person

FIGURE 1. Availability of water resources for human use, by region, 1970 and projections for 2000.



Source: Adapted from Reiff, 1989.

per year may see development curtailed (World Resources Institute, 1998).

Groundwater is a valuable source of drinking water supply, and most countries of the Region take care of the water supply needs of large populations using this resource. Although freshwater supplies in Latin America and the Caribbean vary significantly from country to country, few countries currently face problems nationwide. Nevertheless, several must deal with localized shortages of adequate drinking water sources, particularly in large metropolitan areas and in some smaller cities, where the poorer strata of the population are usually affected.

The need for water resources goes beyond quantity and must also consider quality. The capacity of these resources to provide water for human well-being is shrinking as a result of population growth, degradation from pollution and other environmental abuses, inefficiency, and waste. The poor can be further disadvantaged, as the areas they live in often receive effluents discharged by residents living upstream. Projections indicate that in the year 2000, the demand for water due to the increase of population alone will have doubled since 1980. The rate of increase is likely to grow further in future decades if appropriate policies are not implemented and appropriate actions are not taken.

The production of goods and services is necessary to meet the needs of ever-growing

urban populations and improve the quality of life of the urban and rural poor. However, most of the uses of water contribute to degrade water quality, and this, in turn, affects human beings and other species that depend on this water for survival. In general, water quality must satisfy the requirements of society's many uses, but it is essential that drinking water meet public health requirements. Further, as pressure for different uses of water increases, the potential for conflicts also increases, with the risk that water quality for human consumption may fall by the wayside, thereby exacerbating existing inequalities. To avert severe conflicts relating to quantity and quality of drinking water, strong advocacy for new policies that give proper attention to water for human consumption is required. Presently, 2 billion people drink water that others would not even use to wash their cars, while another 1.2 billion people would dearly love to have such water (Otterstetter, 1996).

The quantity of water required by different users varies widely. On a global scale, needs for irrigation account for about two-thirds of all human water use: for example, it takes about 1,000 tons of water to grow 1 ton of grain, and some 2,000 tons to produce 1 ton of rice. However, these processes have associated water losses that may range from 50% to 80% (World Resources Institute, 1987), which means that there is room for improvement here. Reuse of municipal wastewater is another potential area of recovery for irrigation. In many cases, policies do not favor or give attention to the equitable distribution of scarce natural resources, such as the adequate assignment of water for drinking and other purposes. Frequently, the needs of the poor are ignored and, because of this, poor people often miss opportunities such as developing cottage industries or other activities that require water that could improve their economic status (World Bank, 1999).

In the Region of the Americas, it was estimated that 12% of the water consumed in 1995 was used for domestic purposes, while 26% was used for industrial purposes, with agri-

culture as the largest consumer (World Resources Institute, 1998).

DRINKING WATER SUPPLY AND HUMAN HEALTH

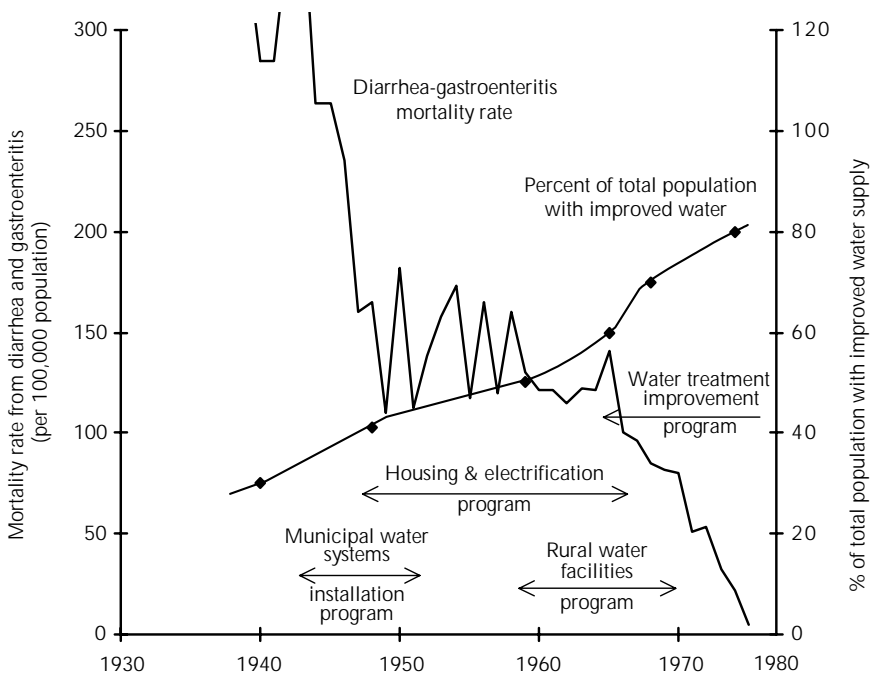
Water is an essential element in every aspect of human life: drinking, hygiene, cooking, and leisure. People are in contact with water all their lives and are exposed to whatever it contains. Water is also essential for other living organisms, including disease vectors.

Among all the uses of water and the needs of human beings, a safe drinking water supply is the most essential, although not sufficient in itself to attain and maintain good health. The association between safe drinking

water and other sanitary measures to attain good health has been recognized for a long time. One example is the drop in diarrhea-gastroenteritis mortality rates in Costa Rica with the implementation of such measures (Figure 2). However, this knowledge is not always readily incorporated into water supply projects or other health and development projects. Figure 2 demonstrates the importance of water and sanitation to improve community health. Further, although the benefits are in many cases reaped by the better-off, the extension of coverage also usually benefits marginal areas to some extent (Alleyne, 1998).

An estimate of the impact of the exposure to poor water supply and poor sanitation on the risk of disease can be estimated on the basis of Disability Adjusted Life Years (DALYs). DALYs are the expression of the number of

FIGURE 2. Mortality rates from diarrhea and gastroenteritis versus time and percent of total population with improved water supply, Costa Rica.



Source: Adapted from Reiff, 1981.

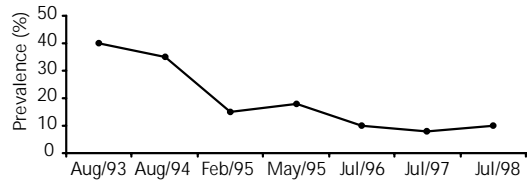
years of life lost (YLLs) added to a comparative adjusted measure of years living with disability (YLD). The YLD measurement adjustments are based on the severity and duration of the disease and age and sex of the individual (Murray, 1996).

For Latin America and the Caribbean, the DALYs of water- and sanitation-related risk factors is estimated at 5,183. This value means that water and sanitation are the most important environmental determinants of health—compared to determinants such as occupation and air pollution—and are more significant for this Region than malnutrition, which is the highest risk factor globally according to DALY calculation. Table 1 illustrates this data and reveals other related details. Unfortunately, there are no data available that specifically address low-income or poor populations (Murray, 1996).

Further illustrations of the association between the availability of water supply/sewerage/drainage and health indicators are shown in Figures 3 and 4. These figures are based on the results of a sanitary intervention in Baixa do Camarajipe, Salvador, Brazil, where a poor community received better sanitation from 1992–1998. As a result of these interventions, the level of diseases was reduced significantly (Borja, 1999).

The installation of water supply systems not only makes water available but also decreases the unit cost of water. This is particularly beneficial for the poor, who are subjected to paying high prices for limited quantities of water that is usually of questionable quality. Those

FIGURE 3. Decrease in the prevalence of diarrhea in children 0–5 years old due to improvements in sanitation in Baixa do Camarajipe, Salvador, Bahia, Brazil, 1993–1998.



Source: Adapted from Borja, PC, Moraes, LRS, 1999.

who have no water or lack sufficient water are mostly poor, and for them the cost of water is higher than for the better-off, as shown in Figure 5. Consequently they use less water, and have lower levels of hygiene and a higher incidence and prevalence of several water-related diseases. There is no other way to break this vicious cycle than by improving access to adequate quantities of safe water through disinfected piped supply systems (Pan American

FIGURE 4. Decrease in the prevalence of helminthes infestation in children 7–14 years old due to improvements in sanitation in Baixa do Camarajipe, Salvador, Bahia, Brazil, 1994–1997.

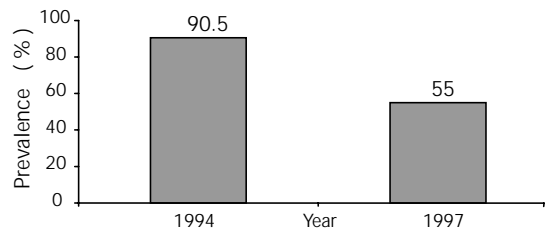


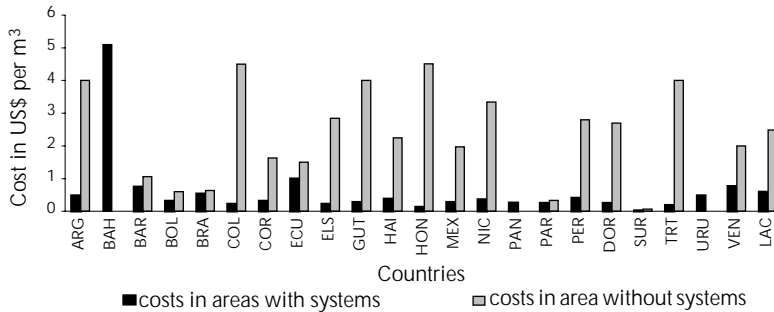
TABLE 1. Burden of diseases attributable to selected risk factors, Latin America and Caribbean, 1990.

Risk factor	Deaths (1,000)	% total deaths	YLLs ^a (1,000)	% total YLLs ^a	YLDs ^b (1,000)	% total YLDs ^b	DALY ^c (1,000)	% total DALY ^c
Poor water supply, sanitation, and personal and domestic hygiene	135.3	4.5	4,254	7.6	929	2.2	5,183	5.3
Malnutrition	135.0	4.5	4,540	8.1	520	1.2	5,059	5.1
Occupation	97.7	3.2	1,973	3.5	1,708	4.1	3,681	3.7
Air pollution	33.6	1.1	377	0.7	98	0.2	476	0.5

Source: Adapted from Murray, 1996, p. 312–315.

^aYLLs: Years of Life Lost; ^bYLDs: Years Lived with Disabilities; ^cDALYs: Disability-Adjusted Life Years.

FIGURE 5. Comparison of the cost of water between areas with and without water supply systems in selected countries of the Region.



Health Organization, 1997). Evidence such as that shown in Figure 5 provides a strong argument that less than full coverage produces an unfair distribution of benefits and burdens; that is, inequities.

Even with the evidence available, governments often give a lower priority to investment projects for water supply and sanitation due to the cost. This may be due to a misconception of the role of water supply systems and sanitation, which, in addition to providing water for human consumption, are also an essential element of urban and industrial development. In the Region of the Americas only about 5% of the water supply produced is consumed directly for health-related purposes. Therefore, only about 5% of the cost of such investment should be considered a health-related cost. Furthermore, water systems are built with a projected life of 50 or 60 years; amortization of the investment should, therefore, be spread over this same period. By taking into account these two issues, investment in water supply becomes extremely cost beneficial in terms of improvements in health (Briscoe, 1996).

MEASURING INEQUITIES IN SAFE WATER SUPPLY

The main health inequities related to water supply deal with population coverage,

quality, cost, and accessibility. Other factors, such as the geographic location of freshwater sources and the distance individuals must travel to gain access, accentuate existing inequalities.

To facilitate the analysis of the relationship between countries' economic level and the availability of water, information on countries in the Americas can be grouped on the basis of per capita GNP, according to the division adopted by PAHO. *Group I* includes the countries with the highest per capita GNP and *Group V*, the countries with the lowest per capita GNP (Table 2) (Pan American Health Organization, 1996; Pan American Health Organization, 1997; Pan American Health Organization, 1998).

In the Region of the Americas, 18% of the population has no access to water systems. In *Group V*, 43.8% of the population has no access and in *Group I*, 4.6% has no access. The ratio between the lowest and the highest GNP group of countries is 9.6, which means that the countries in *Group V* have 10 times more people without access to water than the countries in *Group I* (Figure 6) (Pan American Health Organization, 1997; Organización Panamericana de la Salud, 1998).

Inequalities also occur between rural and urban populations. In urban areas, 13.28% does not have access to water, while in rural areas, 40.58% has no access, indicating that the proportion of population without access to

TABLE 2. Country groups according to per capita GNP in 1996, population and population without access to water in 1998, and rate of population without water, Region of the Americas.

Groups	Per capita GNP, 1996	Population, 1998	Population without water, 1998	Rate of population without water (100 population)
GNP Group V	530.20	27,400,000	12,001,741	43.80
GNP Group IV	1,784.82	119,501,000	33,115,917	27.71
GNP Group III	3,497.49	307,332,000	73,073,052	23.78
GNP Group II	7,713.30	43,762,000	14,162,043	32.36*
GNP Group I	26,205.78	304,431,000	13,860,385	4.55
Region	11,986.29	802,426,000	146,213,138	18.22

Source: Pan American Health Organization, Special Program for Health Analysis.

* Group II included Argentina (Population, 36,123,000) and some small countries (Population, 7,639,000), as of PAHO basic data 1998. In Argentina, 65% of the population has access to water. Because the table uses average values for countries, the numbers for Argentina influence the rates of persons without access to water.

drinking water in rural areas is three times higher than in urban areas (Pan American Health Organization, 1997).

In rural areas, technical, educational, and socioeconomic limitations present additional challenges for securing high water quality. For example, supply systems in poorer, rural areas are less well maintained than are those in urban areas. In addition, the rural population has limited knowledge about the benefits of safe water, such as the need for adequate storage and disinfection.

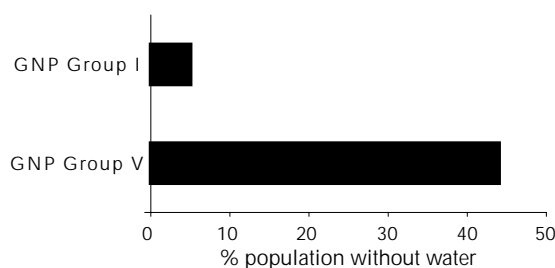
Figure 7 presents the concentration curve and the concentration index for access to water in the Region of the Americas. To estimate these values, the groups of countries were

ranked by GNP per capita, from the lowest to the highest. The concentration curve in Figure 7 suggests that in the Region of the Americas, 20% of the population that lives in countries with the highest GNP per capita have only 5% of their population without access to water. Conversely, 20% of the population of the region living in countries with the lowest GNP per capita have 30% of the population without access to water. A concentration index of -0.30 was estimated for this distribution (Kunst, 1994; Mackenbach, 1997; Pan American Health Organization, 1999).

Lack of access to basic sanitation services is directly associated with the incidence and prevalence of waterborne diseases and other health effects in the population. For example, there is a strong association between infant mortality and lack of access to drinking water, as shown in Figure 8. In areas where about 40% of the population has access to drinking water, infant mortality is about 50 per 1,000 live births, while in areas where 100% of the population has access to drinking water infant mortality is around 10 per 1,000 live births (Pan American Health Organization, 1999).

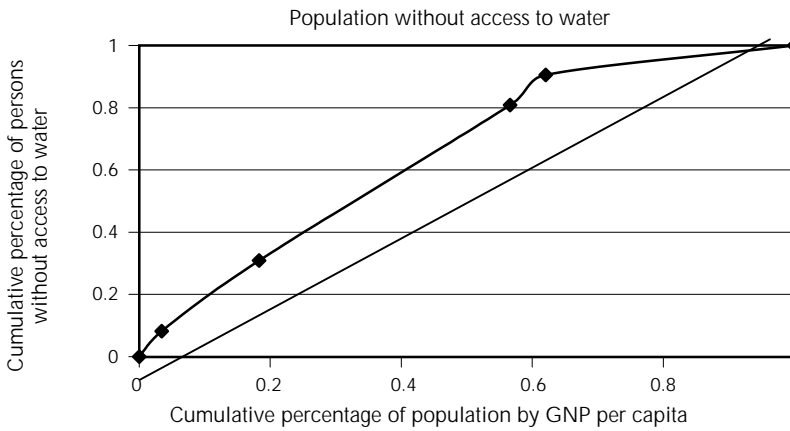
The above examples clearly indicate the need for strong policies for the provision of basic needs, especially drinking water supply, of marginalized populations in order to im-

FIGURE 6. Percent of population without access to drinking water in countries of Group V (lowest per capita GNP) and Group I (highest per capita GNP), Region of the Americas, 1995.



Source: Special Program on Health Analysis, Pan American Health Organization.

FIGURE 7. Distribution of the population without access to water in the Region of the Americas, 1997.



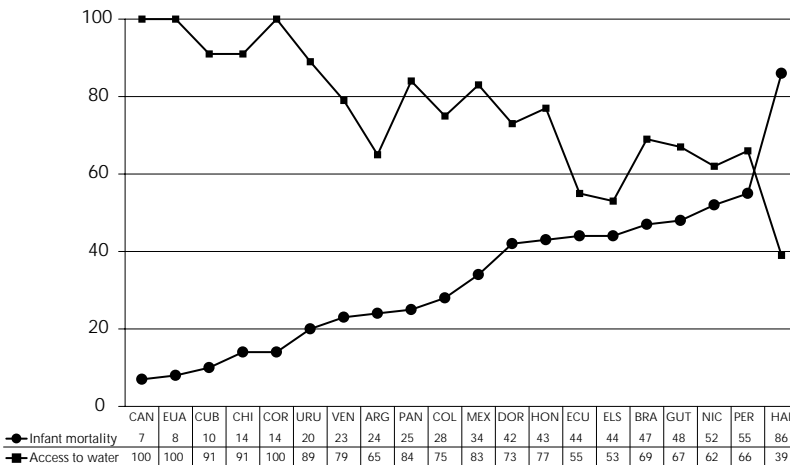
Source: Special Program on Health Analysis and Division of Environmental Protection and Development, Pan American Health Organization.

prove health and achieve equitable and sustainable human development, in accord with the spirit of the Rio Declaration and Agenda 21.

Under present economic conditions and trends, a country's ability to invest in water supply systems, improve coverage, and provide access to safe water depends largely on

the population's ability to pay back the investments. Clean water is required for good health, but it also is a basic ingredient for urban development and for many industrial processes necessary to promote and sustain economic development. The development of water supply systems also must consider the benefit to other uses (externalities). Unfortunately, these

FIGURE 8. Trends in infant mortality rate (per 1,000 live births) and water access, Region of the Americas.



considerations are rarely given the weight they deserve, nor is cost-sharing generally incorporated into discussions (Rogers, 1997; World Health Organization, 1997).

ENVIRONMENTAL HEALTH FRAMEWORK FOR DECISION MAKING

The relationship between human health and the environment is complex, particularly since health/environment aspects are linked to several economic and social development issues. By and large, environmental data may be available in most countries, as may be data on the health situation. However, the ability to link health and environmental data to clarify the relationship between levels of exposure and health outcome is vital in attempting to control exposure and protect health. Decision-makers need this information in order to assess the implications of their decisions, compare the potential effect of different decisions, and prevent costly health and environmental damage (World Health Organization, 1996; World Health Organization, 1997; Brasil, 1999).

In order to tackle the problem, the World Health Organization, taking as a guide the model developed by the United Nations Development Program (UNDP) to monitor the progress of countries towards sustainable development, elaborated a framework for the analysis of various aspects of health/environment situations (World Health Organization, 1995).

WHO proposed a six-level, cause-effect framework as a way to facilitate the analysis of the environmental-health situation. The framework was designed to assist decision-makers and policy-makers in setting priorities and taking action, as well as to increase the focus on the health aspects of sustainable human development. It can facilitate the identification of inequalities and inequities as well as the development of actions to improve the situation (World Health Organization, 1995).

This cost-effect framework is known as DPSEEA, an acronym derived from its six action levels—driving force, pressure, state, exposure, effect, and action; it is a response to Chapter 40 of Agenda 21 (Information for Decision-making).

Driving force is the first and broadest of the framework's levels and refers to the general factors that motivate and drive environmental processes, such as population growth and economic development.

Driving forces generate human occupation or exploitation of the environment, resulting in *pressure* on the environment, which is the second level of the framework.

Continuing pressures alter the environment's original condition, leading to the third level of the framework—the *state* of the environment. An example of this level is the degree of balance between the natural components and the level of pollutants.

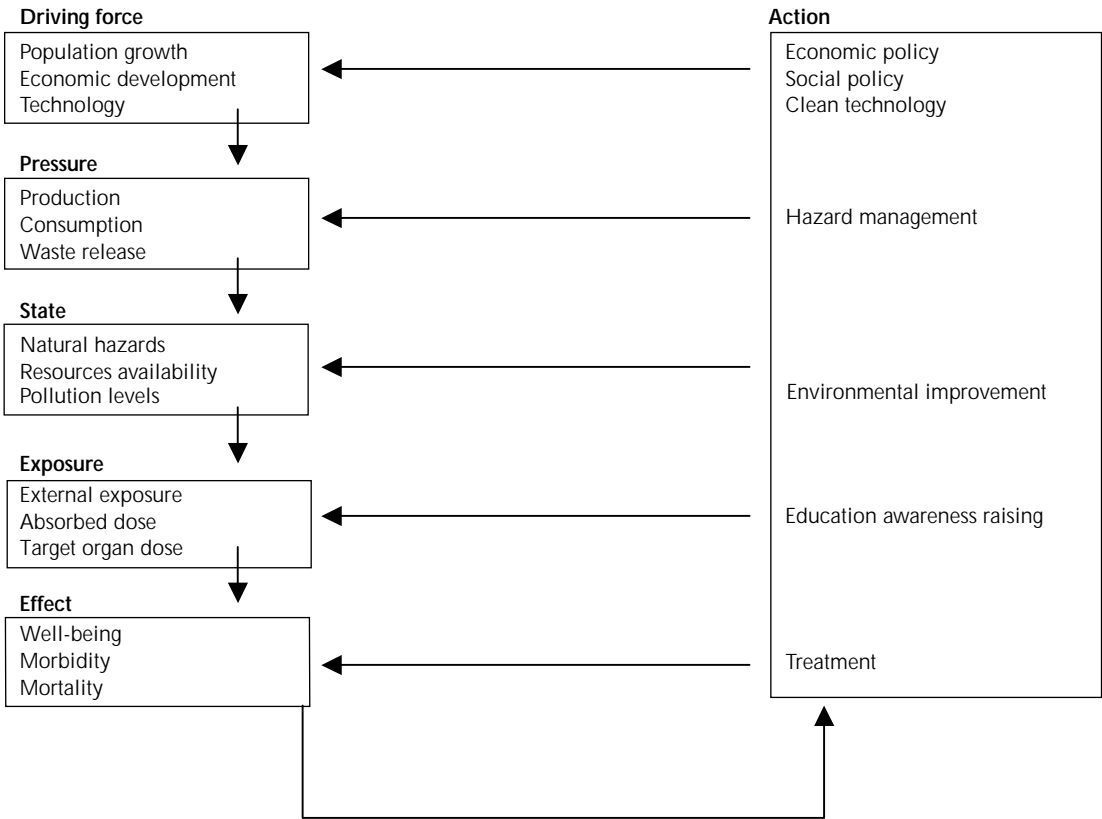
Environmental conditions and the presence of contaminants can result in environmental hazards for humans if they generate an *exposure*; this is the fourth level.

If an exposure exists, a health *effect* is expected to develop; this is the fifth causal-chain level. Health effects call for *action*, but the solution of the problem may require actions at all levels, or at certain levels of the causal-chain to attain the defined objective. Using the DPSEEA framework to orient these actions is critical if the health sector and other sectors are to achieve sustainable development. Figure 9 shows the dynamics of DPSEEA and the internal relations.

IDENTIFICATION OF PRIORITIES AND ACTIONS TO REDUCE INEQUALITIES

There are several actions that may be taken to reduce inequity in drinking water supply. Table 3 presents examples of lines of action that the health sector and other sectors may take at the different levels of the framework, emphasizing the practical application and use of the DPSEEA framework.

FIGURE 9. Framework for decision making to mitigate inequities in water supply for human consumption and hygiene.



Source: Adapted from World Health Organization.

The examples included in the table take into account the importance of common lines of action to be explained later in the document. In applying DPSEEA to the health and environment area, it is important to consider at least five lines of action to change the situation:

- advocacy,
- regulations,
- monitoring,
- dissemination of technologies, and
- mobilization of resources.

LINES OF ACTION TO REDUCE INEQUITY

DPSEEA can generally use available information at the sector, institutional, and community levels to focus efforts and resources on priority interventions. The final actions to reduce the distributive gaps in drinking water supply that emerge from the application of DPSEEA should result in general lines of action that can be grouped into the five categories below.

TABLE 3. Actions to reduce inequity in safe water using the DPSEEA approach.

Cause/effect chain	Issues/examples	Health sector actions	Other sector actions
<i>Driving force</i>	<ul style="list-style-type: none"> • Urban and industrial development; • Housing and sanitation policies; • Poverty and social exclusion. 	<ul style="list-style-type: none"> • Studies on implication of development policies in health; • Proactive role of the health sector in promoting sustainable development; • Advocacy before other sectors on adequate policies and regulation on water; • Promotion of the environmental primary attention strategy. 	<ul style="list-style-type: none"> • Adopt health impact analysis in development projects and policies; • Include the health sector as a major contributor to national development plans; • Establish sound urban public health development policies.
<i>Pressure on the environment</i>	<ul style="list-style-type: none"> • Water supply for human and industrial consumption demand; • Housing and internal plumbing demand; • Sewerage and drainage systems demand. 	<ul style="list-style-type: none"> • Promote use of appropriate and low cost technology for water supply; • Promoting healthy housing for the poor; • Promoting community participation; • Establishment of regulation for the control of pollution of the water bodies. 	<ul style="list-style-type: none"> • Implement programs and projects for extension of coverage; • Implement system for the improvement of quality of water supply; • Implement regulation on population settlements and housing.
<i>State of the environment</i>	<ul style="list-style-type: none"> • Presence of pollutants in water bodies; • Pollution of drinking water; • Storage of water for human consumption in inadequate manner. 	<ul style="list-style-type: none"> • Maintain environmental surveillance (monitoring and control) system; • Carry-out health education activities for hygiene and safe storage of water; • Advocate for projects on pollution control (wastewater treatment); • Monitoring water quality of the water supply systems. 	<ul style="list-style-type: none"> • Maintain environmental surveillance system of water resources; • Implement pollution control projects (wastewater treatment).
<i>Human exposure</i>	<ul style="list-style-type: none"> • Consumption of contaminated drinking water; • Consumption of contaminated food. 	<ul style="list-style-type: none"> • Implement community based demonstration projects; • Carry-out public education campaigns. 	<ul style="list-style-type: none"> • Carry-out public education campaigns; • Implement community based demonstration projects.
<i>Health effects</i>	<ul style="list-style-type: none"> • Diseases and other effects that can be reduced by basic sanitation (diarrhea, hepatitis, parasitism, cholera, and low body weight and height development). 	<ul style="list-style-type: none"> • Maintain epidemiological surveillance system of water-related diseases; • Improvement of health services. 	<ul style="list-style-type: none"> • Cooperate with the health surveillance system; • Improve support of health services.

Monitoring Trends in Inequities in Water Supply

Existing inequities in safe water supply quantity and quality are relevant in explaining several health effects that are responsible for morbidity and mortality in the countries of the Region of the Americas. Existing mechanisms could be used to monitor inequities in water supply and could become powerful tools to identify deficiencies and to measure the health impact of improvements to the water supply. Therefore, it is important for countries to develop environmental and epidemiological surveillance systems.

The timely and updated data to maintain current the “Global Assessment of Drinking Water Supply and Sanitation Services 2000” database is expected to be a very important contribution to measure inequities and monitor changes in the Region.

Table 4 is an example of how DPSEEA can be used to establish indicators to measure inequities in water supply. A careful definition of the indicators to be used can assist decision-makers to focus their actions and scarce resources in areas where they can make a difference in the population’s health.

Even though DPSEEA needs further evaluation and testing by international agencies

and countries before being widely used, some pilot studies have already revealed that it can be a useful tool for supporting advocacy and dialogue among the sectors responsible for water supply and public health (Borja, 1999).

To further support the adoption of DPSEEA, PAHO has funded case studies, which have led to the establishment of a set of indicators to be used to analyze trends and generate critical information for actions.

At the international level, the database of the “Global Assessment of Drinking Water Supply and Sanitation Services 2000” is a major source of information. This initiative brings together critical information for analyzing water supply trends in the Region of the Americas, and most of it can be reassembled within the framework in order to make use of the data for both the environmental and the public health sectors. Efforts to obtain information on the situation of lower income population groups should take into account their concerns in the decision-making process.

National institutions also have their own databases and the same information that has been available for years for traditional analysis of trends can be integrated into the DPSEEA framework scheme, thus improving the planning and decision-making processes for the water supply sector.

TABLE 4. Use of the DPSEEA framework to establish indicators to measure inequities related to safe water.

Cause-effect chain level	Indicators
<i>Driving forces</i>	<ul style="list-style-type: none"> • Population Growth Index; • Percent of satisfied goals of national sanitation plan.
<i>Pressure</i>	<ul style="list-style-type: none"> • Percent of the population connected to a water supply system; • Median value of the consumed water in liters per inhabitant; • Median price of water expressed in percent of the median income.
<i>State</i>	<ul style="list-style-type: none"> • Percent of water samples with concentration higher than the national standard for <i>E. coli</i>; • Percent of samples without physical and chemical national standards.
<i>Exposure Effects</i>	<ul style="list-style-type: none"> • Percent of population living in areas without any access to water supply. • Incidence of acute diarrhea, intestinal parasitism, cholera, and low body weight and height development;
<i>Actions</i>	<ul style="list-style-type: none"> • Number of health professionals trained for treatment of water-borne diseases. • Percent of municipalities with environmental surveillance system; • Percent of municipalities with health education program.

Source: Adapted from Borja, 1999.

Strategies for Advocacy

The health sector alone cannot carry out all the functions required to secure a healthy human environment, but it can use advocacy to promote actions in other sectors that will help to reduce inequities in access to safe water supply. There are several examples where advocacy has influenced decisions in other sectors and has resulted in public health benefits. International agencies should play a strong role in providing evidence and international guidance to help country health authorities to effectively advocate for a healthy human environment. Other activities should include promoting intersectoral dialogue and actions; supporting country studies to generate data for advocacy; promoting the "Environmental Primary Attention Strategy;" and disseminating information.

Promotion to Strengthen Regulations

The health sector should fulfill its responsibility to develop and help implement regulations at the national level that contribute to reducing health inequities. The establishment of water quality standards and the maintenance of surveillance systems are some of the most important contributions that the health sector can make to the sustainable development of nations. The use of international guidelines for waste water and solid waste management and for drinking water quality, and the use of health impact assessments on plans, programs, and projects should assist countries in the implementation of national regulations.

Dissemination of Technologies

The lack of appropriate and economic technologies is frequently identified as a barrier for the development of a safe water supply. Experiences in several of the Region's countries have proven that investments in this area have clearly benefited health. The identifica-

tion, selection, and dissemination of information on technology can contribute at the same time both to reducing costs and to insuring selection of the most suitable technology.

Mobilization of Resources

The lack of financial resources is an important obstacle to the development of water supply in countries. The health sector can provide strong arguments to advocate for investment projects in this area, and also can develop studies to orient projects to maximize social and health benefits.

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