

Santo Domingo, Dominican Republic, 2–6 June 2003

DRAFT



FRAMEWORK FOR A
REGIONAL PROGRAM
FOR THE CONTROL OF
SOIL-TRANSMITTED
HELMINTH INFECTIONS
AND SCHISTOSOMIASIS
IN THE AMERICAS



**Pan American
Health
Organization**

Regional Office of the
World Health Organization

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Introduction

Ensuring the effective control of soil-transmitted helminth infections and schistosomiasis in the Americas is a challenge that cannot be put off. This objective was the motive behind a gathering of professionals committed to pooling their efforts and eradicating these parasitic diseases that afflict the most vulnerable populations.

The motives behind the *Meeting of Experts and Coordinators Soil-transmitted Helminth Infections and Schistosomiasis Control Programs in the Americas*, held in Santo Domingo, the Dominican Republic, from 2 to 6 June 2003, were not only to respond to the alarming morbidity figures but to shine a spotlight on the hard socioeconomic realities.

It is estimated that over 2 billion people, or one-third of the world's population are infected with the parasites of one or more schistosomes or soil-transmitted helminths.

Thirty percent of Latin America's population suffers from a soil-transmitted helminth infection of heterogeneous endemicity, while schistosomiasis has a narrower niche. Both, however, impact the work force population in the countries.

The prevalence and severity of soil-transmitted helminth infections and schistosomiasis are high, making programs to combat these parasitic diseases imperative.

Behind these compelling statistics lie the perpetuation of poverty, the stunting of growth and cognitive development of our youngest generations, and the impairment of the productive capacity of adults.

This Meeting of Experts is the result of the sound decision by the 54th World Health Assembly of the World Health Organization (WHO) in Geneva in 2001 to designate these parasitic diseases a public health priority. Determining that the technical conditions were ripe for launching sanitary programs, the Assembly adopted the resolution prioritizing this issue.

This is the time for a coordinated initiative involving greater commitment from the Latin American and Caribbean governments to make the control of these parasitic diseases part of their existing programs and to allocate the necessary resources.

Shared knowledge and experience, together with open information exchange, maximize the effectiveness of interregional ties. It is essential to work within this framework in order to meet the objective of productive, harmonious social development in a healthy environment.

A fundamental expected result of the Soil-transmitted Helminth Infections and Schistosomiasis Control Program is to reduce the morbidity associated with these parasitic diseases in vulnerable populations and decrease the parasite load in infected individuals to the point where it no longer poses a threat to their health, growth, and cognitive capacity.

This document is the conceptual framework for a regional plan that lays the foundations for the practices and policies of the various parasite control programs in the Hemisphere and provides orientation. The exercise offers a platform for responding to the challenges issued by the 54th World Health Assembly of WHO.

One of the Assembly's resolutions calls on the member countries to launch mass treatment efforts aimed at achieving at least 75% coverage of the at-risk school-age population by the year 2010.

It should be noted that the content of this document has not yet been agreed upon, since it is the product of a workshop that brought experts from the Region together to study the Pan American Health Organization (PAHO)/WHO guidelines in Geneva.

It is anticipated that the regional distribution of this document will lead to a series of comprehensive multidisciplinary actions to improve public health and result in a deeper commitment on the part of health authorities.

This document also seeks to elicit a commitment from ministries of health to promote health education, articulation with other health programs, the availability of drugs in the health facilities, regular treatment of high-risk groups, and environmental sanitation.

A ministerial commitment in health and education is indispensable in the Americas and can be achieved through the Meeting of Ministers of PAHO's member governments and its Representatives in the countries of the Region.

The distribution of this document is also expected to lead to the production of social, scientific, and technological resources for mounting operational strategies and promote initiatives that will culminate in national programs.

This document is not intended to be an *ad integrum* solution that is absolute or infallible, but rather the perfectible beginning of a renewed struggle against the parasitic diseases that Latin America and the Caribbean must rid themselves of in the coming years.

1. Background: Geohelminths and Schistosomiasis, an Extensive Problem

1.1 The Global Problem

The prevalence and severity of soil-transmitted helminth and schistosome infections, with their profound impact on human health and development, remain high. Upwards of 2,000 million people, roughly one-third of the world's population, are infected with one or more of these parasites (Table 1). Of this population, some 300 million suffer from serious clinical forms

of these parasitic infections and approximately 155,000 die annually from causes attributable to them (Crompton, 1999). From these figures it has been estimated that soil-transmitted helminth and schistosome infections account for more than 40% of the global burden of disease for all tropical diseases except malaria (WHO, 1999).

Table 1. Estimates of the global prevalence of infection, morbidity, and mortality caused by soil-transmitted helminths and schistosomes

Parasites	Prevalence of the infection (in millions)	Morbidity (millions of cases)	Mortality (thousands of deaths)
<i>Ascaris lumbricoides</i>	1450	350	60
Uncinarias	1300	150	65
<i>Trichuris trichiura</i>	1050	220	10
Schistosomes	200	20	20

Source: Adapted from Crompton, 1999

Soil-transmitted helminth infections are found in virtually all the tropical and subtropical regions of the planet, especially in the least developed areas (for example, in the majority of Sub-Saharan African countries and in indigenous populations and periurban settlements characterized by extreme poverty in the Americas).

While schistosome infections also have their niche in neglected populations, they tend to be concentrated in foci dictated by environmental conditions and the geographic distribution of the parasite and vector species involved in their life cycles.

However, the reasons for addressing the control of soil-transmitted helminths and schistosome infections are not only the morbidity and mortality figures cited above or the widespread geographical distribution of these parasitic infections, but the major role they play in the perpetuation of poverty in endemic areas or countries, impairing the growth and cognitive development of young generation (Nokes et al., 1992) and reducing the work capacity and productivity of adults (Guyatt, 2000).

Considering this and the technical advances towards successful development of programs for soil-transmitted helminth and schistosome control, the 54th World Health Assembly adopted a resolution urging that these parasitic infections be considered a public health priority (WHA, 2001). In compliance with the mandate issued by that Assembly, an informal meeting of experts and coordinators of programs for control of soil-transmitted helminth and schistosome infections in the Americas was convened by PAHO in Santo Domingo, Dominican Republic, from June 2 to June 6 2003. This meeting, whose discussions are elaborated on later in this paper, determined that the time is ripe to launch a coordinated initiative to control these parasite infections in the Region. The present document, which complements the Guide for Managers of Control Programs (WHO, 2003), is intended to offer the health authorities of the Region a framework for the design and implementation of such programs.

1.2 The Problem in the Americas

An estimated 30% of the Latin American population suffers from soil-transmitted helminth infections (PAHO, 1998). However, this endemicity is not uniform. The relatively few studies conducted reveal prevalence rates that differ widely from country to country and even from area to area within a single country. This is due to climatic factors (lower prevalence in countries and areas farther from the tropics) and, more importantly, social and economic factors (higher prevalence in countries and areas with greater poverty).

A 1995 survey among 2,015 children enrolled in public elementary schools in the National District of the Dominican Republic revealed a helminth infection prevalence of 44.7%. Interestingly, almost two years later, after two rounds of treatment with albendazole, the prevalence fell to 19.1%.

In 1996, health authorities in Guatemala, Nicaragua, and El Salvador conducted studies on the prevalence of soil-transmitted helminth infections in their respective countries. In Guatemala a prevalence of over 90% was reported in six departments (provinces). In Nicaragua, where the study was conducted in five SILAI (Integrated Local Health Systems), the rates ranged from 40.7% in Managua's SILAI to 59.4% in Granada's. In El Salvador, a prevalence of 43% was found. One year later, in 1997, evaluations were conducted in six health regions of Honduras, yielding rates ranging from 27.3% to 88.6%.

Studies in Brazil and Mexico, two of Latin America's largest nations geographically, showed the greatest differences in the prevalence rates of soil-transmitted helminth infections between areas of different socioeconomic levels within a country. For example, Tabasco, in Mexico's impoverished southeast, reported a rate of 94.7%, while in Jalisco, in the country's more well-off central zone, the prevalence rate was 2.5%.

Analysis of the studies conducted in the Region reveals differences and deficiencies in the methodologies used to evaluate the prevalence and severity of soil-transmitted helminth infections. Careful rectification of these discrepancies, one of the purposes of the new program now being developed, should lead to the definition of standardized protocols that meet the needs of the regional initiative to control these parasitic infections.

Different strategies for the control of soil-transmitted helminth infections have been applied in several countries in the Hemisphere, and more often than not have been discontinued. These strategies have managed to achieve a slight reduction in the prevalence and severity of these parasitic infections in the Region.

In addition to the methodological differences employed in prevalence and severity studies to establish a baseline and monitor possible interventions, two additional obstacles have impeded local attempts to control soil-transmitted helminth infections in the Americas:

- Poor integration of the strategies utilized. This lack of integration has been seen in at least two areas:
 1. the failure to develop an adequate intersectoral approach, which hinders the proper use of a available infrastructure resources in other ministries and sectors, and
 2. absence of a necessary multidisease approach that achieves rational linkage between these programs and others already under way for the control of other diseases.
- The nature of the majority of the Region's health services, which were designed to cure diseases already present and not to offer comprehensive care to individuals.

In the case of schistosomiasis, one of the main problems in the Region is the lack of reliable information. According to the data available today, eight countries are endemic for schistosomiasis: Brazil, Venezuela, Suriname, and Guyana on the continent; and the Dominican Republic, Puerto Rico, Martinique, and Saint Lucía in the Caribbean. The prevalence and intensity rates for these parasitic infections have apparently fallen to such a degree in most of these countries that current techniques are not sensitive enough to detect all cases. Hence, there is a need to work toward the development of diagnostic tools that are more sensitive than the existing ones.

The previously mentioned Santo Domingo meeting of experts and managers of soil-transmitted helminth and schistosome infections control programs in the Americas, concluded that until there is a change in the socioeconomic conditions that foster the endemicity of these parasitic infections in the Region (something that will not occur in the short term), a control program is an initiative that is not only necessary, but currently feasible. Some of the points in its favor were the following:

- Worldwide, there is greater support for initiatives of this type. The resolution adopted by the 54th World Health Assembly is an example of this (WHA, 2001). Today, more experts (scientists, economists, politicians) believe that even though (they) are associated with relatively low mortality figures, (soil-transmitted helminth and schistosome infections) constitute an impediment to the health and socioeconomic development of large span of populations across the globe.
- There is satisfactory knowledge about the control measures to institute at all links in the chain of transmission and a clear awareness of the successes and failures of other control programs undertaken in the past, some of which are still in progress.
- Today, the drugs available for treatment of soil-transmitted helminth and schistosome infections are highly effective and inexpensive, produce few minor side effects, and some of them can be administered in single-dose regimens.
- In the case of soil-transmitted helminth infections in particular, efficient, inexpensive, accessible, and easily attainable diagnostic techniques are available.
- In the case of schistosomiasis, capacity has been developed in the Region to employ sanitary engineering techniques to eliminate foci of intermediary hosts.

Sustainability will be one of the key challenges facing the Program for Control of Soil-transmitted Helminth and Schistosome Infections in the Region. This issue, whose more relevant aspects will be explored further later in this document, was widely discussed at the meeting in Santo Domingo. From it emerged the conviction that, in addition to the tasks related to each of its components, the design and implementation of this program in each country should include tools for enlisting social participation and mobilizing resources to ensure that its goals are met.

2. Biomedical Aspects of the Problem

2.1 Species Implicated

Among the hundreds of helminth species that infect humans, four soil-transmitted and five schistosome species are the ones most commonly found in body fluids (Table 2). Moreover, because these are linked with significant morbidity and mortality to a lesser extent, they attract greater attention in public health. Although some of these species share some biological characteristics, all of them can be differentiated by their respective biological cycles, the disease that they produce in humans, and their geographic distribution. Among them, only the soil-transmitted helminths and *Schistosoma mansoni* cause health problems in the Americas.

Table 2. - Soil-transmitted helminths and schistosomes that cause public health problems

Species	Geographic distribution
Soil-transmitted helminthes	
<i>Ascaris lumbricoides</i> , <i>Trichuris trichiura</i> , <i>Ancylostoma duodenale</i> , <i>Necator americanus</i>	Tropics and subtropics throughout the globe. In the Americas, these constitute health problems from Mexico to Argentina, with some differences between species
Intestinal schistosomes	
<i>Schistosoma mansoni</i>	Africa/Middle East/ In the Americas, foci are reported in eight countries
<i>Schistosoma intercalatum</i>	Africa
<i>Schistosoma japonicum</i>	Asia
<i>Schistosoma mekongi</i>	Asia
Urinary schistosomes	
<i>Schistosoma haematobium</i>	Africa/Middle East

2.2 Transmission

Soil-transmitted helminth transmission begins when eggs in human feces, resulting from poor hygiene and environmental sanitation, contaminate warm, moist soils. Humans are infected in one of the following ways, depending on the species:

- The ingestion of infective eggs present on the hands, in water, or in contaminated food (*Ascaris lumbricoides* and *Trichuris trichiura*).
- The ingestion of infective larvae present on the hands, in water, or in contaminated food (*Ancylostoma duodenale*).
- Penetration of the skin by infective larvae (*Ancylostoma duodenale* and *Necator americanus*)

Schistosome transmission begins when the eggs in human feces and urine, also the result of poor hygiene and environmental sanitation, contaminate fresh water sources that children and adults have contact with through a variety of activities (personal hygiene, work, recreation). Humans become infected when the cercariae of the parasite penetrate the skin.

2.3 Impact on Human Health

Soil-transmitted helminth and schistosome infections affect three population groups in particular:

A- **School-age children**, for two reasons:

- This is a stage of steady physical growth with great nutritional needs. When these needs are not fully met, a common problem in endemic areas, individuals are more susceptible to the infections.
- They are more exposed because of their daily activities and lack of knowledge of hygiene.

B- **Pregnant women**, due to a combination of two factors:

- Their domestic chores can expose them to parasites that penetrate the skin (uncinarias, schistosomes).
- Uncinarias and schistosomes can cause malnutrition along with anemia, endangering the life of both mother and fetus.

C- **Adults whose work involves close skin contact with contaminated soil and water** (fishermen, agricultural workers, miners).

Soil-transmitted helminth infections cause disease and sometimes death, through the following mechanisms:

- They undermine nutritional status in various ways, depending on the infective species: intestinal bleeding and anemia (*Ancylostoma duodenale* and *Necator americanus*); loss of appetite, poor absorption of nutrients and competition for micronutrients (*Ascaris lumbricoides*); and diarrheal diseases (*Trichuris trichiura*).
- Development of complications requiring surgical intervention: intestinal obstruction (*Ascaris lumbricoides*), rectal prolapse (*Trichuris trichiura*).
- Cognitive impairment: short attention span, memory loss (soil-transmitted helminths in general; *Trichuris trichiura* in particular).

Schistosome infections result in morbidity and, less commonly death, through the following mechanisms:

- Undermining of nutritional status: bleeding from the urinary tract and anemia (*Schistosoma haematobium*).
- Induction of tissue reactions: granulomata (caused by hypersensitivity to the eggs) in the mucous membrane of the urinary tract, intestine, and liver (schistosomes, in general); fibrosis in the channels of the portal system (schistosomes, except for *Schistosoma haematobium*); calcifications and bladder cancer (*Schistosoma haematobium*).

2.4 Drug Therapy

The drugs used in the treatment of soil-transmitted helminth infections and schistosomes are highly effective and inexpensive; generate few minor side effects, and some of the drugs can be administered in regimens of a single dose (Table 3). These qualities make them very useful in control programs for these parasitic infections.

Table 3.- Drugs available for the treatment and control of soil-transmitted helminth and schistosome infections

Infection caused by:	Drugs	Dosage *
Soil-transmitted helminths (1)	Albendazole	400 mg ^a
	Levamisole	80 mg ^b
	Mebendazole	500 mg ^a
	Pyrantel pamoate	10 mg/kg
Schistosomes (2)	Praziquantel	40 mg/kg
	Oxamniquine (only for <i>S. mansoni</i>)	15-30 mg/kg

(1) *Ascaris lumbricoides*, uncinarias (*Necator americanus*, *Ancylostoma duodenale*), *Trichuris trichiura*

(2) *Schistosoma mansoni*

* *Use in children under 2:* Although these drugs are not approved for general use in children; however, side effects have been reported in children aged 9 to 23 months.

Use in pregnancy: Pregnant and nursing women can be administered a single oral dose; these drugs should not be administered during the first trimester of pregnancy.

(a) The formulation of these drugs in a single tablet makes them particularly attractive for use in school-based control programs, because they do not require a scale to weigh the children.

(b) For school-age children, a single dose of two 40 mg tablets.

Source: Adapted from WHO, 2003

3. Epidemiological Foundations for the Control Program Soil-transmitted Helminth and Schistosome Infection

The WHO Guide for Managers of soil-transmitted helminth and schistosome infections control programs (WHO, 2003) points out that a successful approach to the control of these parasite infections requires that some of the general characteristics of helminth infections be

taken into account. The experts in this field who gathered in Santo Domingo last June agreed that the framework document for the design of control programs in the countries of the Region should briefly mention these characteristics. Among them are:

- 1- Morbidity from these infections is directly related to the parasite burden. **The more parasites in the infected person, the greater the morbidity.** For example, in the case of uncinarias, it has been demonstrated that the quantity of blood lost in the feces (morbidity) increases as the number of eggs per gram of feces (parasite burden) increases.
- 2- The communicability of these infections is also directly related to the parasite burden. **The more parasites in the infected person, the greater his or her capacity to transmit the infection.**
- 3- Unlike other infectious agents, the schistosomes and soil-transmitted helminths to be targeted by a control program do not multiply in their human host. That is, external sources are always responsible for infections and reinfections. Thus, **treatment will be successful at the individual and community level even though all the parasites are not eliminated;** the worms that manage to survive without reproducing will not pose a serious threat to the health of the host and, because there are fewer of them, will contribute fewer eggs to the transmission of the infection.
- 4- In populations where soil-transmitted helminth and schistosome infections are endemic, the majority of infected people will have infections of low or moderate intensity, while only a fraction of them will have high-intensity infections. Thus, **intensity, as well as prevalence, should be measured as an indicator of the epidemiological situation.**
- 5- Depending on the parasite in question, counting the number of eggs per gram of feces makes it possible to determine the intensity of infection in each individual (Table 4).
- 6- In addition to drug therapy, reducing prevalence depends on changes in people's behavior and environmental conditions. These changes generally take longer to incur. Thus, **small changes in prevalence rates after repeated drug treatment should not be considered a failure of the control program,** since a reduction in the number of intensely infected people will surely have been achieved.

Table 4. - Classification of the intensity of infection in each individual, according to type of parasite.

	Low-intensity infections	Moderate-intensity infections	High-intensity infections
<i>A. lumbricoides</i>	1-4 999 epg**	5 000-49 999 epg	>50 000 epg
<i>T. trichiura</i>	1-0 999 epg	1 000-09 999 epg	>10 000 epg
Uncinarias *	1-1 999 epg	2 000-03 999 epg	>04 000 epg
<i>S. mansoni</i>	1-0 099 epg	0 100-00 399 epg	>00 400 epg

* For the uncinaria infections, the level of severity varies not only with the number of worms present, but with the species of uncinaria and the age and nutritional iron intake of the individual in question. The 1987 WHO Expert Committee did not establish fixed categories. The categories indicated are based on fecal hemoglobin loss found by Stoltzfus et al. in 1996 in children from Zanzibar infected mainly with *Necator americanus* and are presented as possible thresholds:

- Low-intensity infections: a loss of less than 2 mg of hemoglobin per gram of feces
- High-intensity infections: a loss of over 5 mg of hemoglobin per gram of feces

** epg = eggs per gram of feces

Source: Taken from WHO, 2003

4. Control Programs of Soil-transmitted Helminth and Schistosome Infections in the Americas

4.1 Components of a Control Program

Until effective vaccines are available, three types of activities can reduce the parasite burden in individuals and/or interrupt the helminth transmission cycle.

- A- Drug therapy, primarily aimed at reducing the parasite burden in the host.
- B- Health education, aimed at promoting behaviors that impede transmission.
- C- Environmental sanitation, aimed at reducing soil and water contamination.

In general terms, the components of a helminthiasis control program depend on the objectives and strategy proposed. If the objective is to reduce the parasite burden, and with it morbidity, the measures in options A and B are sufficient (obviously, if the resources are available, better results would be obtained with the addition of the measures in option C). If the objective is to eliminate the parasitic infection, then these three measures must be applied.

4.2 Objective of the Soil-transmitted Helminth and Schistosome Infection Control Program

The basic objective of the Soil-transmitted Helminth and Schistosome Infection Control Program is to reduce the morbidity associated with these parasitic infections. Or, to put it another way, to reduce the parasite burden in infected people to levels that do not pose a threat to their health, growth, and ability to learn.

4.3 Strategy of the Soil-transmitted Helminth and Schistosome Infection Control Program

Soil-transmitted helminth infections and schistosome and their impact on the health of the host result from the interaction of many factors. **The strategy of the control program for these parasitic infections is the integrated application of a series of measures that take into account the multifactorial causation to reduce morbidity in infected people in each country, area, or community.** The package of measures varies with the epidemiological situation and available resources. The selected measures would fall somewhere between two extremes: a basic package that would be used in the most difficult financial conditions, and an optimal package that would be used when resources permit.

Basic Package

- Drugs available in health services
- Regular treatment of high-risk groups
- Health education

Optimal package

- All of the above, and....
- Environmental sanitation: improvements and modifications in environmental conditions

The program involves the integrated use of drug therapy, health education and, wherever possible, environmental sanitation activities in high-risk groups (basically school-age children) over a three-year period. After this phase, the educational and, environmental sanitation components (when possible) will remain in place for two more years.

It should be clear that the problem of soil-transmitted helminth infections will not be completely resolved in five years. The program is an attempt to demonstrate that:

- Over a three-year period, its components, particularly treatment with drugs, can lower the prevalence and particularly the severity of infections to levels that do not pose a public health problem for communities.
- An additional two years of health education and environmental sanitation measures can maintain and even improve the statistics achieved in the initial three-year phase.

Once the program has been in place for five years, only continuous improvement in the living conditions of individuals and their communities—which, obviously, includes improvements in their education and physical environment—will make it possible to maintain, and even heighten, the achievements made without reintroducing mass anti-parasite programs.

4.4 Priority Countries, Areas, Populations, and Age Groups

4.4.1 Countries

Bolivia, Guyana, Haiti, Honduras, and Nicaragua will be given priority in the first phase of the program, as they are the least developed countries of the Region with the highest prevalence of soil-transmitted helminth infections, according to the available epidemiological information. This does not preclude the possibility of including other countries and regions, such as Ecuador, Haiti, and the northeast of Brazil, in this initial phase.

In the case of schistosomiasis, it was decided to target foci selected by the national program managers of the endemic countries.

4.4.2 Areas

In each country, the national program managers should use two criteria for selecting the areas to be targeted:

- data from the records and reports of the Ministries of Health, hospital records, and academic publications.
- risk factors identified by the local program managers.

4.4.3 Population Groups

Taking into account the biological, geographical, and socioeconomic factors that determine the distribution of these parasitic infections, priority will be given to populations in rural and marginal areas (indigenous groups, slum-dwellers, etc.).

4.4.4 Age Groups

For the reasons below, the following age groups will be prioritized:

- 1- **School-age children** (6 to 15 years). Among other benefits, gearing the program towards school-age children would make it possible to:
 - reduce morbidity and improve growth and the ability to learn.
 - take advantage of the school system's infrastructure, facilitating the distribution of control activities. This would also help to increase awareness of the intersectoral aspects of this program.
 - encourage schoolchildren to act as important agents of change in their communities.
- 2- **Women of childbearing age**, because of the risks that these parasitic infections pose to the life of both mother and baby.
- 3- **Adults whose involvement involves close skin contact with contaminated water** (only for schistosomiasis).

4.5 Studies on the Prevalence and Intensity of Infection in the Selected Areas and Groups

Once the intervention's target areas and groups have been selected, studies will be conducted on the prevalence and intensity of the infection in order to:

- select intervention modalities according to the categories defined by WHO (Tables 5 and 6).
- obtain baselines for assessing the impact of the intervention.

Table 5.-- Diagnosis of soil-transmitted helminth infections at the grassroots level and the selection of control measures.

Category	Cumulative prevalence*	Cumulative percentage of individuals with moderate or high-intensity infections**	Recommended interventions ***
High prevalence and /or high intensity	>70%	>10%	1. Treatment of all school-age children (2 or 3 times a year) 2. Health education activities 3. Improvements in sanitation
Moderate prevalence and low intensity	>50 <70%	<10%	1. Treatment of all school-age children (once a year) 2. Health education activities 3. Improvements in sanitation
Low prevalence and intensity	<50%	<10%	1. Health education activities 2. Improvements in sanitation 3. Individual management of each case

* Percentage of individuals in a population infected with at least one parasite.

** Percentage of individuals in a population with moderate or high-intensity infection with at least one parasite.

*** In all cases, there will be guaranteed access to anthelmintic drugs in health services for individual case management.

Source: Prepared with data from WHO, 2003

Table 6.-- Diagnosis of schistosomiasis at the grassroots level and selection of control measures.

Category	Prevalence	Recommended interventions
High prevalence	>50%	Treatment of all school-age children 1 x year
Moderate prevalence	>10 <50%	Treatment of all school-age children 1 x 2 years
Low prevalence	< 10%	Selective treatment of all school-age children*

* Twice during the primary education cycle (at the beginning and the end)

Source: Prepared with data from WHO, 2003

4.6 Treatment Regimens based on Epidemiological Profiles of the Region

One of the first challenges facing the program, will be to determine the prevalence and intensity of these parasitic infections, in order to set up mass treatment regimens in each community.

Soil-transmitted helminth infections are predominately found to have either moderate prevalence/low intensity or low prevalence/low intensity. Following the WHO recommendations (Table 5), an annual cycle of the drug will be administered in the former situation, and infected people will receive individual treatment in respective health services in the latter.

As for schistosomiasis, moderate and especially declining prevalence predominate, as far as the studies have been able to determine, again, following the WHO recommendations (Table 6), the drug will be administered every two years in the first case, and mass treatment of school-age children will be carried out at the beginning and end of the primary education cycle in the second.

4.7 Health Education

The educational component of the program has three objectives:

- 1- Promoting a positive attitude toward the program among all its beneficiaries. For example, regular and prompt attendance at sessions to administer of the drug.
- 2- Mobilizing the cooperation of all relevant members of the community: at-risk individuals (primarily school-age children), family members, teachers, and community leaders.
- 3- Encouraging healthy behaviors in the community. Health education should provide beneficiaries with basic knowledge (information on the life cycle of the parasites and the consequences of being infected), as well as practical knowledge (information on how to prevent infection) that would enable them to adopt behaviors to reduce their exposure to the infection.

In order to meet these objectives, several types of activities are recommended:

- 1- Administration of KAP (knowledge, attitudes, and practices) surveys to members of the community. This would make it possible to obtain information on conditions and behaviors that may be promoting transmission of infection and gear educational programs to changing these conditions and behaviors accordingly. The expectation is that changes will gradually occur in community knowledge, attitudes, and practices as they relate to the parasites.
- 2- Production and distribution of educational materials of all types (books, pamphlets, posters, videos) on practical basic aspects that would enable individuals in a community to adopt behaviors that would reduce their exposure to the infection. In order to ensure implementation and uniformity at the regional level, an initial step would be the preparation of generic educational materials, which would later be adapted to the various cultures and idiosyncrasies of different countries, areas, and communities.

4.8 Impact Monitoring and Assessment

A basic component of the Soil-transmitted Helminth Infections and Schistosome Infection Control Program is the monitoring of effectiveness, a process with the following objectives:

1. To ensure the maximum possible benefit for participants, their families, and their communities.
2. To document the impact of the program, report on practices, and adjust future attempts.
3. To document possible adverse reactions (and/or resistance) administered to the drugs.

Four types of indicators will be used to monitor program execution. The frequency with which they are evaluated and those responsible for their execution can be found in section 7, Operationalization and Integration.

1. **Process indicators:** Indicators that refer to the operational aspects of program implementation. The most important of these, according to the experts at the Santo Domingo meeting, is the calculation of drug coverage—that is, what proportion of school-age children benefit from the program, whether they are enrolled in school or not, and if they received the drugs (calculation of the corresponding index). Other process indicators—for example, the number and type of educational activities—should also be considered.
2. **Parasitological indicators:** Indicators that monitor the program's impact on the presence of soil-transmitted helminth and schistosome infections.
 - For soil-transmitted helminth and schistosome infections: prevalence and intensity of the infection (measured with the Kato-Katz technique). If necessary, technical and professional staff will be trained to perform this procedure.
3. **Morbidity and mortality indicators:** These indicators monitor the program's impact on certain biomedical variables closely linked with soil-transmitted helminth and schistosome infections.
 - For soil-transmitted helminth infections: weight, height, hemoglobin and micronutrient levels (whenever measurements are possible) information that could eventually be obtained in the areas where the program is under way (reports of intestinal occlusion, rectal prolapse, etc.).
 - For schistosome infections: mortality, average age at death, records of hospital admissions for these causes.
4. **Other indicators:** knowledge, attitudes, and practices (KAP) surveys to evaluate the program's health education components. If need be, the professionals involved will be trained in how to prepare and administer these surveys.

5. Sustainability of the Program

As noted earlier, sustainability will be one of the main challenges facing the Soil-transmitted Helminth and Schistosome Infections Control Program in every country in the Region. It will require very different types of factors to come together, notably:

5.1 Social Mobilization

Support from the children's families and the community at large is the most important factor in program sustainability. Active community involvement can ensure that the program benefits all school-age children, whether or not they are enrolled in school. The community can also help to cut costs (obtaining financial donations, facilitating distribution of the drugs, etc.).

Active community involvement, however, is not something that just happens. It will require mass communication strategies and public awareness campaigns to change behaviors. A very interesting experience in this regard is WHO's mass communication model, known as COMBI (Communication for Behavioural Impact). This model, a guide for social mobilization and behavioral change, has been successfully used in two programs: one in Zanzibar, India, and Sri Lanka for the prevention of lymphatic filariasis; and another in the state of Johor Bahru, Malaysia, for dengue control.

When to launch the communication strategies will depend on the situation in which the program is being carried out. However, steps should be taken to ensure that the time between the implementation of communications plan and the community intervention is short.

In terms of information, steps should also be taken to ensure that the community is informed about the results of the intervention.

Working with the community also involves the identification of its various actors and negotiation with them, such as local leaders, neighborhood associations, religious organizations, and other social groups that affect daily life.

5.2 Involvement of the Ministries of Health

The control program in each country should be placed under the Ministry of Health or its subagencies to ensure long-term sustainability; this does not preclude the involvement of other sectors. Lack of a ministerial legal instrument that officially endorses the control programs has been one of the major reasons behind the relatively limited success of these programs to date. The ministerial commitment already exists, since in 2001 the World Health Assembly (WHA, 2001) agreed to launch a Soil-transmitted Helminth and schistosome Infection Control Program. Making the program a reality is essential and may require utilizing the Annual Meeting of Ministers at PAHO and the PAHO/WHO Representatives in the countries of the Region.

5.3 Multidisease Approach

Incorporating the program within the Ministry of Health also facilitates communication with other community programs and makes the program less costly. The absence of a multidisease approach to achieve sensible linkage among the programs has been one of the causes of failed attempts to control soil-transmitted helminth infections in recent years.

5.4 Intersectoral Approach

Starting with the assumption that most school-age children attend school, satisfactory implementation of this program depends to a large extent on effective collaboration between the ministries of health and education in every country in the Region. This collaboration, in which other sectors of society could participate, would foster sensible, practical use of the available resources and infrastructure. For example, as noted earlier, use of the school system infrastructure facilitates aspects of the distribution of control activities. Conversely, collaboration between the two ministries in implementing the program would not only increase children's ability to grow and learn but create incentives for bringing children outside the school system into the classroom.

5.5 Mobilization of Resources

Country programs should not depend entirely on external financial resources. National involvement is essential to guarantee their sustainability. "Seed funds" will be necessary in some countries to guarantee program start-up. Once this has been accomplished, the countries must work toward self-sufficiency (with national resources, or through a combination of these and other sources).

The government, private sector, nongovernmental organizations, bilateral cooperation agencies, international agencies, etc. should help to achieve the financial sustainability of the program in each country.

The ministries of health of the Region should promote partnerships (with agencies of the United Nations system, including WHO-PAHO, bilateral agencies, nongovernmental organizations, the private sector, etc.), and should establish mechanisms for coordination among them at the national level throughout 2004. As the Ministries determine, they can ask the PAHO Representative Office in their countries to coordinate the national partnerships. At the request of the member countries, PAHO can assume responsibility for coordinating regional partnerships.

6. Goals

By the end of 2004:

- The priority countries will have been identified.
- A regional plan will have been drawn up.
- At least seven countries will have put together a pilot intervention proposal.

By the end of 2005:

- At least three priority countries will have launched a program to give no less than 75% of the at-risk school-age population access to the necessary drugs.
- A plan will have been drawn up for schistosomiasis elimination in the Dominican Republic.

By the end of 2010:

- An initiative will be under way for the control of soil-transmitted helminth and schistosome infections that guarantees access to drugs for no less than 75% of the at-risk school-age population in all priority countries of the Region.

7. Development and Integration

7.1 Actions

Actions	Mode of Implementation	Time/Period	Responsible Party
Carry out situation analysis: <ul style="list-style-type: none"> • Identify the problem • Evaluate opportunities for coordination with other programs that can be taken advantage of immediately 	<ul style="list-style-type: none"> • Identification of a focal point in the Ministries of Health • Formation of working groups 	2004	Ministry of Health, technical cooperation, as requested, from PAHO
Seek resources for anti-parasite plan	Focal point in the Ministry of Health of each country will begin negotiations with potential sources of resources for the anti-parasite plan	2004	Focal point in the Ministry of Health, with technical cooperation, as requested, from PAHO

7.2 Communication, Social Mobilization, and Health Education

Actions	Mode of Implementation	Time/Period	Responsible Party
Communication, social mobilization, and health education.	<ul style="list-style-type: none"> • Technical training of staff involved in the program. • Regional meetings to negotiate the necessary budget and other matters related to the plan. • - Designation of working groups for developing and implementing the COMBI component at the regional and national levels (e.g., to achieve changes in behavior related to defecating in the fields and handwashing). 	2004	<ul style="list-style-type: none"> • Focal point in the Ministry of Health • Regional Technical Committee of PAHO.

7.3 Community Participation

Actions	Mode of Implementation	Time/Period	Actors
<ul style="list-style-type: none"> • Continue negotiations to promote community participation in the program, initiating the process at the base of the social pyramid • - Include the community in planning and execution of the program 	Through meetings, encounter groups, training workshops, activities to raise awareness	2004-2010	Responsible Party
			Focal point in the Ministry of Health
			Implementers
			<ul style="list-style-type: none"> • Social leaders • Communications experts • Joint National Committees • Collaborating institutions
			Advisors
			PAHO Committees, others

7.4 Drug Therapy

Actions	Mode of Implementation	Time/Period	Actors
Undertake mass treatment until at least, 75% coverage of the school-age population is achieved	<ul style="list-style-type: none"> • Application of the drug therapy component of the program (e.g., alternative activities and drugs that would make it possible to maintain, strengthen, or modify strategies should be considered). • Consideration of a contingency fund for procuring the necessary anti-parasitics and supplies. • - Use of generic anti-parasitics with necessary quality control and acceptability. 	2004-2010	Responsible Party
			Focal point in the Ministry of Health
			Implementers
			<ul style="list-style-type: none"> - Institutions involved - Community networks
			Advisors
			PAHO Committees, others.

7.5 Monitoring and Impact Assessment

Actions	Frequency	Actors
Process indicators	In each round of drug therapy	Responsible Party
		Focal point in the Ministry of Health
		Implementers
		Professional and technical staff trained for this type of task in the respective ministries
		Advisors
	PAHO Committees, others	
Parasitological indicators	In sentinel populations, at the beginning of the program and immediately before every round of treatment (three years). Afterwards, annually until five full years after the start of the program.	Responsible Party
		Focal point in the Ministry of Health
		Implementers
		Professional and technical staff trained for this type of procedure in the Ministry of Health
		Advisors
	PAHO Committees, others	
Morbidity and mortality indicators	In sentinel populations, at the beginning of the program and with every round of treatment (three years). Afterwards, annually until five full years after the start of the program.	Responsible Party
		Focal point in the Ministry of Health
		Implementers
		Professional and technical staff trained for this type of procedure in the Ministry of Health
		Advisors
	PAHO Committees, others	
Other indicators (KAP surveys)	In sentinel populations, at the start of the program and with every round of treatment (three years). Afterwards, annually until five full years after the start of the program.	Responsible Party
		Focal point in the Ministry of Health
		Implementers
		Professional and technical staff trained for this type of task in the respective ministries
		Advisors
	PAHO Committees, others	

7.6 Design of a Manual for Working with the Community that Facilitates Program Implementation

Actions	Mode of Implementation	Time/Period	Actors
Design of a manual for working with the community that facilitates program implementation	Through workshops with national or international experts, with the participation of operational personnel and community representatives	Beginning of 2004	Responsible Party
			Ministry of Health
			Implementers
			Focal point in the Ministry of Health, NGOs, community
			Advisors
	PAHO Committees, others		

7.7 Information Systems

Actions	Frequency	Actors
<p>In countries that already have information systems for evaluating health programs, these systems will be used for obtaining the necessary information.</p> <p>In the absence of such information systems, as is the case with the five priority nations in this program, basic information systems will be created to compile the necessary data. Here, it will be necessary to mobilize the resources needed for the creation of those systems (networks, computers, staff training, etc.)</p> <p>In both cases, whether or not information systems are in place, staff training should be taken into account when necessary. The conditions will be created to ensure that copies of all the information are available, so that there is no risk of losing it.</p> <p>A list of core data for the national information systems will be prepared and delivered to each national program manager.</p>	<p>Determined by the frequency with which the aforementioned data is acquired.</p>	Responsible Party
		Ministry of Health
		Implementers
		Focal point in the Ministry of Health
		Advisors
PAHO Committees, others		

7.8 Communications

Actions	Mode of Implementation	Time/Period	Actors
<p>Communications</p> <p>Create opportunities for formal personal, written, electronic, or virtual communication for sharing information about the progress of the program—opportunities that should be constantly encouraged.</p> <ul style="list-style-type: none"> • Education and training, where requested, to achieve effective communication. • Facilitate the involvement of regional advisers in these activities. 		Permanent	Responsible Party
			Ministry of Health
			Implementers
			Ministry of Health
			Advisors
PAHO Committees, others			

7.9 Financing and Mobilization of Resources

Actions	Frequency	Responsible Party and Implementers
<p>For the acquisition of resources from:</p> <p>1- National governments: Using different motivation mechanisms, among them the COMBI strategy, the national coordinators in each country will promote the collaboration of the corresponding government agencies, with technical cooperation from PAHO.</p> <p>2- International Agencies: <i>Nongovernmental Organizations, others:</i> Meetings of the national technical boards will be organized and possible donors invited with the intention of obtaining their financial cooperation.</p> <p>In each country, the people in charge of resource acquisition for the implementation of the program (inside or outside the government) will be identified.</p>	<p>The meetings of the national technical boards will be held prior to program start-up and, once the program is off the ground, as many times as necessary.</p>	<p>Program managers and staff of the agencies involved.</p>

7.10 Partnerships and Expansion of Networks

Actions	Mode of Implementation	Time/Period	Responsible Party
Partnerships and expansion of networks	<ul style="list-style-type: none"> • Contacts and follow-up meetings with international organizations at their headquarters or regional offices to obtain agreements • Nonpresential, and even virtual and other types of communication among countries, agencies, cooperating organizations, and donors at the regional level. <p><i>Note:</i> This requires specific communications plan developed through PAHO.</p>	Ongoing	<ul style="list-style-type: none"> • Joint National Committees • PAHO Regional Coordinating Committee

7.11 Annual Meetings

Actions	Frequency	Responsible Parties and Implementers
Annual meetings will be held at the national and regional level, attended by professionals from the program and academia. These meetings will evaluate program implementation and, if necessary, modifications will be made.	Annual	Program coordinators, PAHO regional level and staff from the donor agencies involved.

7.12 Development of Instruments

Actions	Frequency	Responsible parties and Implementers
<p>1. Preparation of the framework for the soil-transmitted helminth and schistosome infection regional control plan. The conceptual framework will be prepared for a regional plan that, together with the Guide for WHO program managers, will serve as a methodological and chronological reference for programming national activities.</p>	Before program start-up	Regional program managers
<p>2. Development of national pilot plans. National pilot plans will be drawn up for the control of soil-transmitted helminth infections, using the framework for the regional plan and the WHO Guide for Program Managers; these plans will link with other programs already under way in areas with a high prevalence and intensity of these parasitic infections.</p>	Before program start-up	National program managers, with the collaboration of regional advisors
<p>3. Laboratory procedures Diagnostic procedures need to be developed to identify schistosomiasis cases in areas with low prevalence and intensity.</p>	Before and during program	Institutions and researchers from the Region
<p>4. Data collection forms - local The forms for collecting the data indicated in the guidelines (WHO Guide) should be adequate for ensuring that the information is collected and entered in system.</p>	Before and during the program	National program managers, with the collaboration of regional advisors

7.13 Research Priorities

Actions	Frequency	Responsible Parties and Implementers
1. Conduct benzimidazole-resistance studies; these should include the development of procedures to study the potential appearance of resistance	Before and during the program	Regional technical committee institutions and researchers from the Region
2. Development and evaluation of diagnostic procedures that permit identification of schistosomiasis cases in areas with low prevalence and intensity.		
3. Characterization of individual susceptibility to developing heavy parasite burdens or reinfection.		

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