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STATUS OF MALARIA PROGRAMS IN THE AMERICAS

XXXV REPORT

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INTRODUCTION

The general purposes of the Communicable Diseases Program during 1986 were to provide technical cooperation with Member Countries in preventing mortality, reducing morbidity, reducing levels of transmission in endemic areas, and preventing and controlling epidemics of communicable diseases by strengthening and augmenting the technical and operating capacity of the health services responsible for their control.

The program for the control and eradication of malaria in particular, in addition to pursuing the aforementioned general purposes, stressed technical cooperation for the reorientation of national programs on the basis of an epidemiological approach that took account of local variability in the distribution, intensity and evolution of malaria and of the need to improve the administration of the programs so that they would be carried out as constituents of primary health care measures.

To accomplish the stated purposes, the technical cooperation provided was directed at supporting the effort of the Governments at critical analysis of the development of the malaria problem and of the specialized programs for its control in order to facilitate the planning of the program and the selection of appropriate strategies; continuing and refining the process of epidemiologic stratification of the malaria problem for operational purposes; encouraging and collaborating in the training of manpower and in its orientation toward the epidemiologic approach to control; supporting country initiatives for reorienting the reporting subsystems toward improvement of the epidemiologic surveillance of malaria, and harmonizing the information with that of the general health services; fostering and supporting efforts to increase inter- and intrasectoral cooperation; encouraging field studies to gather more information on how knowledge of the sociocultural and economic factors that influence malaria transmission can be used to enlist the active participation of communities in control of the disease and, finally, favoring and supporting research to identify gaps in our knowledge and to contribute appropriate technology and methods for solving the problems.

Malaria, as a general health problem in the Region, became worse in 1986 than it had been in earlier years, with an increase in the annual parasite incidence and a contraction of the coverage of control programs expressed in a smaller number of housing units protected by insecticide applications.

Several countries noted with concern a rise in mortality from malaria, particularly in regions where Plasmodium falciparum was prevalent.

Malaria persisted or intensified in areas where it already existed and its transmission resumed in previously disease-free areas. Moreover, the disease continued predominant in the countryside, where housing and living conditions were primitive, and impaired the population in their crop-growing, animal production, fishery, mining and other production activities.

A total of 950,471 cases of malaria were reported by all countries in the Region in 1986, including cases discovered in countries and territories with no evidence of transmission and in areas of certified malaria eradication.

House spraying with residual insecticides remained the chief control measure. While an effort was being made to maintain the coverage of earlier years, the level attained was insufficient to accomplish the stated purposes. Where domiciliary spraying of insecticides had diminished, the incidence of malaria rose, and no other control measures were attempted to compensate apart from the use of antimalarial drugs. While in some countries the rising cost of insecticides adversely affected spraying programs, in others the failing was inappropriate operations for their application.

The continued increase of malaria cases compelled the countries to step up the use of antimalarial drugs, and programs were awakening to the need to expedite and decentralize diagnosis for greater efficiency in control of the endemic through prompt treatment of patients locally.

Migrations of refugees, displaced persons and workers of new production enterprises in national socioeconomic development projects continued to increase the incidence and spread of the disease.

A general shortage of resources, and of finance and personnel in particular, persists in many countries and helps aggravate the situation. However, with the support of the Organization the countries have stepped up their efforts for the basic and advanced training of their existing manpower.

I. CURRENT STATUS OF MALARIA CONTROL PROGRAMS

A. General Situation

The public health problem of malaria in the countries of the Region is conditioned at present by a combination of sociocultural factors associated with development and economic problems common to most of them. In addition, factors deriving from common borders and ease of communication between countries allows greater interaction among the geographic and bioecological factors involved in the epidemiology of malaria. These factors help intensify the transmission and spread of the disease at a pace that exceeds the operating capacity to contain it of the health services responsible for its control. Moreover, the countries are passing through a phase of transition

between the doctrine and strategy of the eradication and those of the control of malaria, and are aware of the need to reshape their programs and adjust their administrative structures for the surveillance, prevention and control of malaria on the basis of an epidemiological approach that takes account of the socioeconomic situation and resources of the local population. To this end, the countries have been endeavoring to incorporate malaria control into their local health systems so as to ensure the continuity and permanence of measures for that purpose in keeping with the primary health care strategy.

The population of the Region of the Americas grew from 400.5 million inhabitants in 1960 to 662.9 million in 1986. The population at risk from contracting malaria is estimated to have increased from 143.6 million (30%) inhabitants in 1960 to 263.4 million (39%) in 1986 (Tables 1 and 2). The area of the malarious territory is given in Km^2 in Table 3.

Since 1965 about 9 million thick-smear blood tests a year have been done for the detection of parasites in the Region. In the last 20 years the proportion of blood samples in which plasmodia have been found rose from 2.7% in 1965 to 9.5% in 1986. Morbidity per 100,000 inhabitants in the malarious area doubled from 164.95 in 1965 to 340.5 in 1986 (see Table 4).

On the basis of the number of cases with parasitologic confirmation, over the last four years the epidemiological situation has stabilized with 830,460 cases registered in 1983, 931,097 in 1984, 893,012 in 1985 and 950,471 in 1986.

In the wake of the energy crisis of 1973, it was difficult to identify precisely the attack and consolidation phases in some areas where the rural population was scattered without any order, and ongoing and emergency surveillance and control measures were carried out at random as the availability of local resources allowed or in response to severe epidemics. Nonetheless, the population doubled in the areas considered to be in the maintenance phase.

The general results of case-finding in 1986 is presented in Table 5, and Table 6 shows the epidemiological information for the 21 countries that had active control programs in that year. This group of countries accounted for 89.1% of the samples examined and 99.8% of the positives detected in the Hemisphere.

The countries in the Region have been classified in four groups on the basis of the status of the malaria problem and the advancement of the program and its results (Table 7):

Group I. Comprises the 12 countries and territories in which there is no present evidence of transmission: Chile, Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Martinique, Saint Lucia, Trinidad and Tobago, and the United States of America, including Puerto Rico and the Virgin Islands. 1,664 cases were reported in 1986. (Map 1).

Group II. Includes three countries -- Argentina, Costa Rica and Panama -- where malaria transmission was reduced considerably down to 1984. In 1986, however, 3,850 cases were reported, twice the figure for 1985. (Map 2). Also includes five countries in which there was never any transmission (Bahamas, Barbados, Bermuda, Canada and the Cayman Islands).

Group III. Consists of five countries in which malaria increased in endemic areas: Brazil, French Guiana, Guyana, Paraguay and Suriname. In 1986 this group registered 466,639 cases, or 49% of all cases found in the Region. (Map 3).

Group IV. Consists of 13 countries divided into three geographic subregions as follows: Subregion A: Haiti and the Dominican Republic, Subregion B: Belize, El Salvador, Guatemala, Honduras, Mexico and Nicaragua, and Subregion C: Bolivia, Colombia, Ecuador, Peru and Venezuela. This group reported 476,138 cases of malaria in 1986 (50.0% of the total in the Americas). (Map 4).

However, in view of the present socioepidemiological implications of the malaria problem, it appears advisable to envisage the grouping of countries by subregions. Moreover, Brazil and Mexico, with their larger area and population in malarious territory, skew with their statistics the epidemiological analysis of the other countries in their respective groups and by subregions.

Tables 8 to 13 illustrate the basic malaria indices of the last five years in the individual countries and classify them on the basis of the groups they belong to.

The 950,471 malaria cases reported in the Region in 1986 represent an increase of 57,459 cases over the total reported in 1985, and is the largest number reported since 1958 (see Table 4). The increase took place in 12 of the 21 countries in which control activities are conducted (Argentina, Bolivia, Brazil, Colombia, Costa Rica, the Dominican Republic, French Guiana, Guyana, Mexico, Nicaragua, Panama and Peru). The increase was sizable in Argentina, the Dominican Republic, Guyana and Panama. In that year the number of reported cases decreased in seven countries from the figures for 1985 (Belize, Ecuador, El Salvador, Guatemala, Honduras, Paraguay and Suriname). In Venezuela the number of cases registered in 1986 was the same as that of 1985. In Haiti the case-detection system was substantially changed in late 1985, so that the lower figures for 1986 are not comparable to those of earlier years.

There is no important geographic connection among the countries and territories with no evidence of transmission. Malaria cases discovered within their borders have been imported from malarious areas, and changes from year to year may be interpreted as reflecting developments in the other countries of the Region. The yearly increase in the number of cases seen in the countries of Group I from 1,206 in 1984 to 1,664 in 1986 kept pace with the

steady rise in the Region as a whole. Of the 1986 total, 918 cases (55%) were in the United States of America, 401 (24%) in Cuba, 302 (18%) in Canada, and the rest were distributed as follows: Trinidad and Tobago 18, Barbados and Cayman Islands 3 cases each, Bahamas, Chile and Puerto Rico 2 cases each, and Bermuda, Dominica and Grenada 1 case each.

In the North American Region, malaria is endemic only in Mexico. In this country the number of cases continued to rise, going from 85,501 in 1984 to 130,915 in 1986, or 13.9% of all cases in the Hemisphere. The ABER remain under 1.29%, the API rose from .1% in 1983 to .162% in 1986. The HRS doubled from .354% to .763% between 1985 and 1986 (Table 8).

In the Caribbean Subregion (Table 9) the problem centered on Haiti and the Dominican Republic, which share the island of Hispaniola between them. In Haiti, although the ABER dropped from 7.14% (1984) to 3.89% (1986), the number of cases registered reduced the API from 12.94 to 2.13 in the same years, and the SPI also fell, from 18.13% to 5.47%. In the Dominican Republic, fresh outbreaks in 1986 raised the number of cases to 1,360, almost double the 816 cases registered in 1985. In Belize, the API dropped from 2.872% in 1983 to 1.664% in 1986. Guyana, Suriname and French Guiana as a group reported 18,683 cases in 1986. The rise was steady over the three-year period, and the 1986 figure doubled that of 1984.

The Subregion of Central America and Panama as a whole improved steadily from 184,734 cases in 1984 to 149,249 in 1985 and 117,850 in 1986, the latter figure representing 12% of the regional total. During the period 1984-1986 the number of cases declined steadily in El Salvador and Guatemala, but increased in Costa Rica, Honduras, Nicaragua and Panama (Table 10).

In the Andean Subregion as a whole, the number of cases dropped from 193,953 cases in 1984 to 188,465 in 1985, and then rose to 212,901 (22.4% of the regional total) in 1986. During the three-year period, the API rose in Bolivia, Colombia, Peru and Venezuela, but in Ecuador declined from 8.21% to 5.3%. In these countries, the HRS has remained low and very irregular in the last five years (Table 11).

In Brazil the number of cases has been on the rise since 1982. The 443,627 cases registered in 1986 represent 46.7% of the regional total in that year. The API rose from .175% in 1982 to .32% in 1986 (see Table 12).

Malaria also increased in the Southern Cone. Argentina reported 2,000 cases in 1986, almost three times as many as in 1985 and more than four times as many as in 1984. Paraguay reported 4,329 cases in 1986, slightly fewer than in 1985, but seven times more than in 1984 (see Table 13).

Tables 14, 15, 16, and 17 group the blood samples examined and the positives by species, program phase and countries. Table 18 compares the results of active and passive case-finding in the several countries. These figures show that 61.5% of all samples examined were seen in passive case finding, in which the largest number of cases was detected: 774,425 or 81.5%.

This year French Guiana, Guyana and Haiti did not report the number of blood samples by type of case-finding arrangement.

B. Operations in the Field

As the principal means to vector control, the use of insecticides held in 1986 at the level of 1985. DDT use was practically unchanged from the previous year except for liquid DDT, the use of which was reduced from 60,384 litres in 1984 to 42,246 in 1986. The use of propoxur and fenitrothion declined. DDT continued to lead the insecticides used even though it had not been used for several years in El Salvador and Haiti, or since 1984 in Guatemala (Tables 19, 20 and 21).

The following table shows the numbers of persons protected by intradomiciliary sprayings of the various insecticides.

INSECTICIDE	INHABITANTS PROTECTED (1986)
DDT	22,729,542
MALATHION	20,609
FENITROTHION	1,305,550
PROPOXUR	499,129
BENDIOCARB	238,484
DELTAMETHRIN	150,172
CLORFOXIM	29,941
Others (unspecified)	464,437*
	25,446,864

* Guatemala.

In Mexico, larvicides were used in 1,078 localities over an area of 11,175 square kilometers, protecting a population of 12,780,858 inhabitants. In El Salvador, sanitary engineering works continued to be used to eliminate breeding places, with 156,191 persons protected in an area of 867 Km^2.

Another prevention and control measure was mass distribution of antimalarial drugs to 1,125,817 inhabitants at risk, and in some countries these drugs were distributed selectively to 4,560,178 persons. The latter figure is half the close to nine million persons to which these drugs were so distributed in 1985. In Mexico, radical treatment of P. vivax infections was administered to 577,580 persons (confirmed cases and household contacts). Combined measures (insecticide plus medications) protected 14.7 million persons in different areas of the Region.

Some countries reported leaving populations at risk without control measures for the following reasons:

Reason	Unprotected Populations
Lack of funds	11,433,563
Sociopolitical problems	2,929,442
Difficulty of access	874,441
Migratory population	571,406
Others (unspecified)	3,870,018
	19,678,870

In all countries having control programs, drugs were used to treat acute cases. Table 22 provides the total quantities of drugs used from 1982 to 1986, and Table 23 specifies the consumption of antimalarials in 1986 and the consumption estimated for 1987 in the different countries.

Moreover, it can be seen in Figure 1 that the number of house sprayings per 1,000 inhabitants falls off considerably from the beginning of the seventies. On the other hand, the trend of the index of reported parasitemias remained stable from 1960 to 1973, and has been steadily rising since 1974. There was a slight decline in the annual indexes of blood examinations (per 100 inhabitants) starting in the late sixties and then a levelling-off down to 1986.

Table 24 provides data on the personnel employed in antimalaria programs in 1985 and 1986.

C. Budget

Table 25 summarizes the data on the funds spent under malaria programs in the Americas, breaking them down into those provided by governments, those put up by PAHO/WHO and those obtained in international loans and grants. The figures are stated in absolute values for each year converted to United States dollars at the official exchange rates established in the several countries. It should be noted that in some of these countries the dollar rate on the black currency market is far above the official rate.

D. Information on the Countries

ARGENTINA

The number of cases rose from 774 in 1985 to 2,000 in 1986, of which 751 were classed as imported. There may be a larger number of cases among illegal immigrants not registered in the health system.

The Regular Health Services of Salta, the province where the endemic is most severe, is adopting activities in support of the malaria program. No anopheline resistance to insecticides or of P. falciparum to chloroquine has been reported.

BELIZE

The number of registered cases continued its decline from 4,595 in 1983 to only 2,779 in 1986 (an API of 16.64%), of which fewer than 5% had been produced by P. falciparum. The latter were clustered chiefly in a pocket in the Stann Creek area, and responded to prompt house sprayings and radical treatment of the cases discovered.

The program is receiving material, equipment and technical support both from the bilateral USAID and the subregional USAID/PAHO projects. Efforts are being made to a) improve the statistics unit, including the computer system, b) set up an entomology unit, and c) give the regular health services a larger part to play in control activities (surveillance and case treatment).

BOLIVIA

The number of cases rose from 14,354 in 1985 to 18,813 in 1986 (17.4%) despite an increase in the number of house sprayings from 56,205 in 1985 to 85,479 in the latter year.

Seven-thousand five-hundred mosquito nets were experimentally impregnated with deltamethrin at a concentration of 0.025 gm^2 in selected localities of Zone I (Beni) and V (Pando). The results are being analyzed in 1987.

Funds have been available since May 1987, and work is proceeding regularly, labor stoppages having become less frequent.

A campaign was waged to mobilize the public against malaria and its vectors, and succeeded in increasing the numbers of reporting posts and voluntary collaborators.

BRAZIL

The number of cases rose from 401,904 in 1985 to 443,627 in 1986. The problem continues to be associated with the areas of recent settlement in Amazonia, where 96.3% of all cases in the country are registered, more than 70% of these in the states of Pará and Rondonia. In 1986 the country had a program covering 59 million inhabitants; control activities were directed at the problem areas. In areas where transmission was interrupted, surveillance arrangements were in place to prevent a reintroduction of transmission. In addition to routine operations, the epidemiologic situation prompted the

Health Ministry to adopt, through SUCAM, an emergency plan for selective chemotherapy to reduce the numbers of parasitemias in 11 municipalities of Pará and five of Rondonia.

Of the 2,500,000 sprayings scheduled, 77% were carried out owing to delays in the delivery and distribution of insecticide and shortages of field workers.

COLOMBIA

In 1986, 89,247 blood samples were found positive compared with 55,791 in 1985 (a 60% increase). This development is viewed as a consequence of a lack of funds and of breaches of public order, which hindered access to areas of high transmission. Of the 998,815 sprayings that should have been carried out, only 57% could be scheduled. In addition, 55,966 day wages were lost during the year owing to delays in making payments, which permitted a coverage of only 36%.

The Ministry of Health and the SEM have given maximum importance to the need to use the general health services for the control of malaria through implementation of the Primary Health Care strategy. There is interest in integrating the resources of the sector so that more and better services can be provided. The Antioquia and Quindío Health Services are conducting their own malaria programs in coordination with the SEM.

As health services take over the functions of epidemiological surveillance, the SEM will be able to concentrate its resources in problem areas, where two-thirds of all cases originate.

COSTA RICA

The largest number of cases seen over the last five years was 790 in 1986, with an annual parasite incidence of 1 per 1,000 inhabitants.

Owing to migrations from other Central American countries, epidemics broke out along the Caribbean littoral. Of the 318 cases imported in 1986, 312 originated in Nicaragua. The malaria program continued to enjoy adequate financial support as in earlier years, which permitted 17,360 sprayings to be carried out in houses in 117 localities for the direct protection of 52,703 persons.

CUBA

The total number of malaria cases dropped considerably in the country from 1,037 in 1985 to 401 in 1986. Of the latter, 364 were imported, most of them from nine African countries (Angola 317, Ethiopia 20, Guinea 3, Congo 3, Mozambique 1, Sudan 1, Ghana 1, Sierra Leone 1, and Burkina Faso 1) and 16 from Nicaragua. The remaining cases (37%) were classed as introduced.

DOMINICAN REPUBLIC

In 1986 the epidemiological section stressed personnel training. Several workshops were held with sector supervisors, epidemiological assistants, and area chiefs in order to review the principal indicators of the disease and those of personnel performance in each sector, and as refresher training and to set short-term goals.

In the first quarter of the year, a course in the diagnosis of hematozoons was conducted for ten staff members of the SNEM (most of them evaluators) and two medical technologists of CESPAS.

In January and February 1986, antimalarial drugs continued to be distributed to all febrile cases, and this activity was complemented by fortnightly visits in an active search for febrile cases. This procedure was discontinued for lack of funds.

The number of registered cases rose in 1986 to 1,350, one of which was diagnosed as P. malaria. Of 62 cases studied in vitro by microtechniques, 61 showed total inhibition of schizont maturation with 5.7 picomoles of chloroquine. Only one case, originating in the state of Bolivar, Venezuela, suggested in vitro resistance. Unfortunately, the in vivo parasite response was not documented.

ECUADOR

Despite a reduction in the number of registered cases from 68,989 in 1985 to 51,430 in 1986, there was no substantial change in the epidemiological situation of malaria. The factors interfering with the program included nonperformance of spraying operations with fenitrothion, labor and logistical problems, and shortages of DDT.

Important studies were being done by the Under Secretariat for Health Region II with advice from USAID, to implement a computerized information subsystem for the application of control strategies.

To set in motion the participation of the General Health Services of the Ministry of Public Health in antimalaria measures, the National Malaria Eradication Service, with the cooperation of the Under Secretariat for Health Region II, conducted training courses for personnel of this sector, after which responsibility for the treatment of victims of the disease was transferred to that personnel. This measure, ordained at the highest level, is based on the premise that every case of malaria should be properly treated in the health units of the MPH.

EL SALVADOR

The strategy for the control of malaria in El Salvador is based on the conduct of integrated attack measures such as mass drug administration, the application of larvicides and house and atmospheric sprayings in selected areas, and the construction of small physical works with community and interinstitutional participation.

While malaria is regarded as a priority health area of the Ministry of Health, integrated attack measures are carried out in only 23.9% of the population of the first-priority (hyperendemic) area.

It had been decided to use the voluntary collaborators, personnel of the Program and of the official medical services for the mass drug administrations, and this arrangement was extended to the entire country in 1983. The emergence from 1983 to 1986 of a positive response to this measure, combined with other attack measures, helped reduce the number of cases registered in 1985/1986. The acute sociopolitical and economic crisis that the country has been suffering since 1979 was the main impediment to the comprehensive implementation of the strategies and attainment of the goals of the Program.

Taking 1977 as a base year and an API of 7.59/1,000, the curve of the resurgence index is found to turn downward in 1980 and becomes negative in 1986.

Moreover, the country is interested in stepping up the construction, with the participation of the community and of local and foreign agencies and institutions, of physical works for the elimination and reduction of mosquito breeding places.

During 1986 the malaria program remained one of seven priority areas identified by the Ministry of Health. Thus, unbroken coordination was maintained between the Direction of the Program and external cooperation agencies, chiefly AID, which contributed to the purchase of the basic inputs that made it possible to carry out malaria control operations. Contact was also maintained with the IDB in order to strengthen the Program yet further.

FRENCH GUIANA

While the information is still incomplete, the number of reported cases went up from 691 in 1985 to 979 in 1986, bringing the figure back to the levels of 1983 and 1984. Three quarters of the malaria infections (731) registered in 1986 were of P. falciparum, which heightened the risk to the population. The API of 1.165% was one of the highest in the Hemisphere in 1986, ranking with those of Belize, Guatemala, and Guyana.

GUATEMALA

A general picture of the malaria situation was obtained, as every year, by taking blood samples from suspected victims of the the disease: 453,401 samples were taken, representing 13.6% of the population in the malarious area.

From 54,958 in 1985, the number of cases fell to 42,609 in 1986 (for an API of 1.278%), of which 97% were P. vivax and the remaining 3% P. falciparum.

The cases caused by the first species were 22% and those of P. falciparum 54% fewer than in 1985.

In regard to the distribution of malaria cases among ecological regions, 54.8% of the positive samples were clustered in the northern region.

In the three regions, the incidence of malaria was reduced 22.05% in the northern, 4.82% in the east-central and 38.13% in the southern region.

House sprayings were applied in the localities with the largest numbers of cases in the seven top-priority municipalities.

Mass chemotherapy was administered in localities where the disease was particularly prevalent, on a schedule of a single dose repeated every 15 days for three months.

Resistance to DDT, fenitrothion, propoxur and chlorfoxim was verified in the southern ecological region, and studies of cyflutrin are in progress at Puerto San José, Escuintla.

GUYANA

The situation in the country is alarming because the API (with the population in the malarious area as the denominator) was 2.059% in 1986, the highest in the Region, with 56.61% of the infections caused by P. falciparum. Of a total of 16,388 registered cases, 7,052 are of this species. In 1985 the API had been .827%. The program has received donations of antimalarial drugs from the governments of Brazil and Venezuela and from the local miners' associations. In addition, the parasite detection network has been strengthened, which has increased the number of blood samples taken and treatments administered. Up to 1984 malaria had been confined to the Rupununi area on the Brazilian border in the southwestern part of the country, but today is widespread. Although the ratio of sprayings to cases rose from 6.31 in 1985 to 9.02 in 1986, coverage remains at very low levels, and, moreover, the frequency of transmission has increased in the areas of A. darlingi, where there are many transient laborers exploring natural resources, and provisional housing is without walls. Efforts are being made to stratify the country so that the measures may be selected that are best suited to each area. The progress of the program is impeded by the lack of a geographic and demographic reconnaissance and the absence of an epidemiological assessment. There have

been defects in the treatment of P. falciparum with chloroquine and with the combination pyrimethamine-sulfadoxine. Malaria transmission seems to be reestablishing itself in the littoral, where Anopheles aquasalis has been identified.

HAITI

The annual blood examination rate dropped to 7.14, 4.35 and 3.89/100 inhabitants in the years 1984, 1985 and 1986, and was accompanied by a proportional decline in the number of registered cases in terms of the annual parasite incidence from 12.94 (1984) to 2.13/1,000 inhabitants (1986), and of the slide positivity index from 18.3% (1984) to 10.57% (1985) and 5.59% (1986).

The epidemiological surveillance system consists of the health institutions, surveys, and voluntary collaborators in the indicator areas. The latter contribute 90% of the blood samples from rural populations.

Prompted by an epidemic on the border with the Dominican Republic (Pedernales/Anse-à-Pitres), the two countries drew up a joint plan.

The most important activity of the year was the distribution of drugs to febrile cases by voluntary collaborators to prevent mortality and reduce morbidity. Moreover, 194,512 house sprayings were done with fenitrothion in two passes. A training period was expanded to accomodate several categories of SNEM personnel and the technical staff of the MSPP. Monitoring of P. falciparum in vivo sensitivity to chloroquine in Bellevue and a study of the prevalence of G6PD deficiency are continuing.

HONDURAS

The incidence of malaria in the country has been in steady downtrend since 1982 (the API has declined from 1.585% to .533%). This improvement is credited to the strategy adopted -- when the inputs are available -- of employing a combination of measures: spraying, drug administration and antilarval operations, chiefly during the season of greatest transmission.

Malaria is concentrated in six departments, and those of Olancho, Colón, Yoro and Choluteca accounted for more than two-thirds of all cases in the country. The severe forms of P. falciparum are located in Region 6 on the Atlantic littoral, although no precise mortality data are available.

Climatic conditions are favorable for the development of malaria on the Aguán River, in Colón department, where there are also large unmonitored populations moving in from the southern part of the country, and the area is regarded as one of high risk.

Another area of high endemicity is that of the El Cajón hydroelectric project, in the middle of the country. This area has been made highly vulnerable by the ecological changes in the area of the reservoir.

The first data on A. albimanus resistance to DDT were reported in 1962 in the southern area and to malathion in 1965. Later, resistance emerged to propoxur and other insecticides in the same areas in coincidence with the growing of cotton and vegetable crops, which were subjected to constant insecticide spraying.

In face of the suspicion that resistance to these insecticides was spreading, fenitrothion was introduced in 1982. The problem of vector resistance to insecticides remains localized in some areas of the southern region, and less heavily in some municipalities of Francisco Morazán department and the Comayagua Valley.

Although spraying with DDT and fenitrothion has been highly sporadic, and not all passes have been carried out, with the complement of drug administration and other measures it has managed to reduce the incidence of the disease.

In vivo and *in vitro* susceptibility tests done in Honduras by local and international personnel since 1980 have always shown susceptibility of P. falciparum to chloroquine. Owing to a reduction of the incidence of falciparum malaria, however, these tests could not be performed regularly in 1986 owing to the difficulty of contacting patients at the right stage in the development of the plasmodium and without the interference of the already ingested drug.

MEXICO

Malaria control is a priority program of the Government of the Republic for improving the sanitary conditions of rural communities in the affected area and to favor the country's social and economic development, and the program's budgetary funding was increased considerably in 1985 and 1986. More field operations were completed than in 1985, and efforts were in hand to improve the supply of inputs. For the first time, bendiocarb was sprayed inside houses and areas where the vector is resistant to DDT.

The stratification process begun in 1987 continues to improve, and is being used to establish priorities for the servicing of the states, municipalities and localities, in which infection is heaviest.

In 1986 a total of 130,915 cases were diagnosed, similar to the figure of 1985. Positive localities numbered 16,028, 14% more than in 1985. Blood samples examined numbered 1,217,848, 5.3% more than in 1985 and 11.3% more than in 1984. The number of cases of P. falciparum decreased 30% from the 1985 figure.

The process of administrative absorption of the Program into the general health services of the states began in October 1984. Most of the difficulties in the way of this restructuring have been surmounted, and the Program is now in the phase of real integration into the health jurisdictions

so that the person in charge of each may assume his assigned function in the planning, operation, supervision, information and evaluation of measures in the given area.

The labor problems that arose prior to decentralization of the Program have significantly decreased.

If the financial support provided by the federal government in 1986 continues in 1987, antimalarial operations can be satisfactorily conducted. Moreover, the heads of the state health services are particularly interested in the Malaria Control Program, greater participation by state and municipal authorities is being promoted, and more effective participation by local health services in antimalarial measures has begun.

NICARAGUA

During 1986 the Nicaraguan Malaria Control Program accomplished a significant sampling of blood specimens with 510,289 slides (an ABER of 15.2), among which 20,308 positives were detected (34.2% more than in 1985). The annual parasite incidence rose from 4.6 to 6.0/1,000 inhabitants, and the risk of disease to the population increased 1.3 times from the 1985 level, mainly in places of vector resistance to insecticides and in war zones. The necessary inference is that in 1986 the malaria situation deteriorated significantly, falling to the levels of 1981. Of all victims detected, 50% were in Health Region No. 2-Chinandega and León; 34% of the cases were in war zones, and the remainder in regions III and IV.

Activities concentrated on passive case detection, and on radical, preventive and mass drug administration, house sprayings (24.4 houses sprayed per 1,000 inhabitants) and larva control by physical methods and larvicides.

Despite the world crisis, from which Nicaragua is not exempt, and the economic situation, the Government assigns priority to the malaria program. The main achievement of 1986 was the conduct of regional stratification seminars (five altogether) and the drawing up of the 1987 Program on the basis of the data of the operational stratification. The main problems detected are a lack of critical inputs (insecticides and larvicides), desertion of personnel owing to low pay, a deterioration of labor discipline, insufficient supervision owing to lack of transport, and difficulty of penetrating into the war zones.

PANAMA

Until 1985, this was the only country that had managed to avoid the deterioration seen in the rest of the region. Of the 126 cases registered in 1985, 99 were from border areas and more than half were classed as imported. In 1986, of a total of 388,485 blood samples, 1,060 tested positive, 58 of them as P. falciparum, 1,001 as P. vivax, and one mixed. Of the 985 cases

investigated, 940 were locally transmitted. Of the imported cases, 42 had come in from Colombia, two from India and one from Belize. The areas of persistent transmission are characterized by nomadism and migration of the population and by wall-less houses in which the principal vector is A. albimanus. The most extensive problem area on the Pacific side is Jaqué-Darien with 1,183 Km^2, followed by Puerto Piña, Darien with 313 Km^2. In the areas of Wala and Mosti in the eastern part of the country, together with Payón Chico, Playa Grande, Puerto Obaldía and Irgando in the district of San Blas, Palenque in Colón, Puerto Limón, Aguas Claras in the Bayano area, and Cañazas, Torti Abajo in the area of the Pan American Highway, were highly vulnerable and susceptible places where it was endeavored to concentrate efforts under the program.

PARAGUAY

The epidemiological situation remains unfavorable. The number of positive localities from 444 in 1985 to 467 in 1986. The number of registered cases remained at the same high level: 4,568 in 1985 and 4,329 in 1986.

The control measures practiced are still house spraying with DDT and patient treatment.

As mentioned last year, physical-biological factors that contribute to the increase of vector densities and socioeconomic factors associated with the opening up of extensive agricultural areas are important determinants of the dynamics of transmission.

In addition to rising prices, other difficulties are also encountered in obtaining the insecticide used by the service when it is needed. Despite the dispersal of cases, more than 90% are clustered in areas along the Brazilian border. Those in charge of the program are convinced that, if attack operations were properly stepped up and conducted regularly in the problem areas with the requisite trained personnel, logistical support and supervision, transmission could be controlled.

PERU

The national Malaria Control Program has been modest in its scope chiefly owing to the limited funding for its execution. The availability of DDT at 75% P.M. made it necessary to assign relative priorities to the areas to be treated, the Northwestern region being most important as harboring 65% of the country's malaria cases and as a development pole. Spraying was programmed for 160,663 (24.7%) of the 650,000 houses in the country's malarious area, but only 118,314 (19.2%) could actually be sprayed.

In keeping with the national health policy, decentralization of case diagnosis and treatment was begun, and the health posts were strengthened by reassignment to them of the evaluation assistants, and they were also

entrusted with operations under other priority programs. Of 5,500,000 inhabitants at risk from the disease in the country as a whole, it was programmed that blood samples would be taken from 222,710 (4%), of which 184,636 (3.4%) were actually taken, and 36,866 cases of malaria were reported and treated.

The most important of the problems encountered are perhaps a) increasingly inadequate budgetary appropriations, which are insufficient to acquire the basic inputs needed for vector control operations, b) the extension of crop-growing into new jungle regions, and c) that health services neither program nor budget for malaria control operations.

Among the possible solutions, the following proposals were made:

a) To increase and reactivate participation by the organized community in control operations: case finding, diagnosis, drug administration, attacks on the vector, reporting, and promotion.

b) To strengthen decentralization of the program and make the health organization congruent with the political jurisdictions. That activities be planned to accord with local development programs.

c) To stimulate and promote coordinated action with other sectors, particularly with education (schools and universities), agriculture, housing and local government.

d) Promotion of the design of new strategies and technologies through institutes, universities and other scientific establishments.

e) Integration with other health programs, and promotion of the training of personnel for work in different areas.

f) The use of integrated control measures and focal strategic planning.

SURINAME

Until July 1986 the malaria situation was satisfactory everywhere in the country. Guerrilla operations began in August in the eastern part of the country, and today the entire attack area is a theater of military operations. Owing to this situation, most antimalarial activities have been interrupted and epidemics have probably occurred in some areas. A total of 1,316 cases of malaria were registered in 1986, of which 1,002 (76.14%) were by P. falciparum.

VENEZUELA

A total of 14,361 cases of malaria were reported in 1986 compared with 14,305 in 1985. Despite a slight decline of transmission in areas in the attack and consolidation phases, there was an increase in maintenance areas, where transmission resumed in some municipalities. Locally transmitted falciparum infections persisted in the southern area in the attack phase, and imported cases were reported in different parts of the country. The presence of P. falciparum resistant in vivo to chloroquine was confirmed in Bolivar state on the border with Brazil and Guyana.

Despite the program's operational and financial difficulties in 1986, those in charge of it assert that its future strategy must be directed at preventing the reestablishment of malaria transmission in new maintenance phase areas, as well as to continue measures to eliminate existing pockets, to continue epidemiological surveillance activities in the area in the consolidation phase until the requirements for eradication have been achieved, and to successfully stabilize malaria transmission in the area in the attack phase at a level that does not pose a public health problem, which situation is consistent with the degree of economic development of those regions.

II. SPECIAL PROBLEMS OF MALARIA CONTROL PROGRAMS

A. Parasite Resistance

The problem of parasite resistance to drugs is confined to the countries of South America, and its greatest prevalence has been found in Brazil, Colombia, Ecuador and Venezuela. In pockets of resistant P. falciparum, the phenomenon frequently occurs at low levels (R-1), which permits the effective use of the 4-aminoquinolines for treatment of the acute malaria attack, particularly at the primary care level.

The resistance of falciparum infections to the pyrimethamine-sulfadoxine combination (PYR-SO) is on the increase. Resistance to quinine does not appear to be high when the drug is associated with PYR-SO or antibiotics. These are alternative treatments coming increasingly into use at secondary care levels for infections resistant to the 4-aminoquinolines and the PYR-SO combination.

B. Anofeline Resistance

The problem of vector resistance to insecticides must be addressed in relation to the use of pesticides in agriculture and other actions upon the environment in order to understand the relationship better, study the genetics and mechanisms of the generation of resistance, make appropriate predictions and evaluate the possible repercussions of resistance on the dynamics of transmission.

There is general consensus that specialized teams should be maintained that can detect and monitor responses of malaria infections to drugs and the resistance of Anopheline vectors to insecticides and larvicides, and to characterize the mechanisms of resistance and the impact of resistance on transmission.

While resistance to insecticides could seriously undermine the malaria control strategy in some situations, particularly in areas of the intensive cultivation of certain crops (cotton, sugarcane and rice), much appears to depend on the ecoepidemiological and socioeconomic conditions prevailing in the area.

C. Critical Analysis of Deficiencies in the Current Approach to Malaria Control

On the one hand, it is admitted that malaria has disappeared from the most developed areas and countries as a result of social and economic progress. On the other hand, however, control activities have rarely been based on a serious consideration of the different patterns of social and economic development. As mentioned in the XVIII Report of the ECM/WHO, the process involved in achieving and maintaining control has depended not only on the previous intensity of transmission, but also on new trends in agriculture and mining and on the current distribution of rural populations. The traditional malarious locality is rapidly giving way to a mobile rural population in quest of employment. Workers are temporarily concentrated in primitive camps and wall-less sheds in conditions favorable to the transmission of malaria. In some areas a population density is developing that far exceeds all the resources of the general and specialized health services. In others, services are not used when they should be. The slowness of the conversion from an eradication to a control strategy often allows epidemics to occur. In some areas of the Pacific littoral of Central America, instead of mesoendemic conditions there are epidemics owing to the difficulty of maintaining effective control. The same has happened in Ecuador and Paraguay in South America.

In most rural malarious areas in the Region of the Americas, antimalaria services antedated the emergence of the infrastructure of general health services. In many areas malaria units are still the only health services permanently available in outlying areas. Though efforts have been made to integrate these antimalaria units into slowly-growing basic health services, they have not only not contributed to the growth of the services, but have had the effect of seriously weakening malaria control. In many situations, the recrudescence of malaria has prompted decisions not to integrate because the general health services were not given the resources needed to perform their functions.

House spraying with insecticides and mass drug administration are generally effective measures. Their use can drastically reduce both the transmission and the prevalence of malaria and, if sustained long enough,

could even eliminate the reservoir. However, when the effectiveness of these measures falls off or they are discontinued, the old levels of endemicity return unless the gains are maintained by other means. In contrast, more lasting effects are obtained by eliminating anopheline breeding places and improving housing and living conditions.

D. Incorporation of Malaria Control into General Health Services

In some countries of the Region vertical activities or health campaigns have been combined under a common administration that is extended from the center to the periphery. This has improved the efficiency of control activities in Brazil, Colombia, Guatemala, and Venezuela. Campaigns remained centralized in all aspects of problem characterization and control. However, medical care of health problems unrelated to direct campaigns continued under the responsibility of the basic health services.

In some countries plans are being made to transfer the responsibility for diagnosis and treatment of cases, as well as the collection and analysis of epidemiological information, to the general health systems. This means the incorporation of the network of voluntary malaria collaborators and their logistical support to the system within the strategy of Primary Health Care (PHC).

Decentralization of the organization carrying out control can permit a more timely and appropriate response to health problems. Most of the countries have difficulties in modifying existing specialized services. The greatest difficulty is the lack of an infrastructure that not only provides entry to the national health system, but also effectively leads all the population to preserve and recover its health.

E. Selection of appropriate measures for malaria control and their implementation as part of primary health care

Antimalaria activities are currently based on the diagnosis and timely treatment of cases. Treatment at the most peripheral level by health workers and voluntary collaborators is carried out by means of clinical judgment. This treatment, based on the diagnosis of symptoms should be made with safe and effective drugs administered orally or by suppository. Serious cases and therapeutic deficiencies should be referred to a second level of the health system and treatments with dihydrofolin-reductase inhibitors or by parenteral application of quinine. The use of second-line drugs should be based on diagnostic confirmation carried out by microscopy. In areas where the frequency of R-III resistance suggests that treatment with first-line drugs, such as chloroquine or amodiaquine, may pose a high risk to the patient at the peripheral level, it is essential to take the microscopic diagnosis facility to the periphery.

Chemoprophylaxis as a public health measure in the region of the Americas is not justified since the protection of the population that inhabits the endemic areas is based on access to timely diagnosis and proper treatment. Chemoprophylaxis should be limited to controlled groups of visitors coming from nonendemic areas during their stay in transmission areas.

It is becoming necessary to disseminate knowledge of the management of serious and complicated cases of malaria.*

In view of the flexible approaches currently needed for implementation of the strategies of Primary Health Care, more studies on the epidemiology of malaria in general and the ecology of the vectors in particular will be needed in order to design and use successful integrated control methods.

Before the countries carry out complex and expensive activities they should identify priority areas for control, consider the local epidemiological situation, and select measures in accordance with the available appropriate scientific technology to resolve the problem and that it is feasible to apply at the level of the general health services. The cost should be within the capacity and the resources of the health system, since it will usually be necessary to sustain and maintain the activities over long periods of time.

In many areas particular problems exist derived from residual foci of malaria to which migrants move seeking employment, especially in agricultural projects. As a result, the peripheral infrastructure should be improved in terms of facilities, personnel, and of community access.

The mechanisms of epidemiological information should be adapted in order to collect, present, and analyze data relative to the activities in question, community participation, surveys, and mobilization of resources for the prevention and the control of malaria so that the information may be used at the decision-making level in order to develop effective programs. Practically, in the region of the Americas, only the basic indicators of eradication campaigns are used: index of blood samples examined per 100 inhabitants (IAES), annual parasite incidence per 1,000 inhabitants (API), and household spraying among 1,000 inhabitants (IRC) in the malaria program.

Recently renewed interest has been shown in reviewing the program's information subsystem and incorporating data derived from indicators such as mortality, morbidity, incidence, and prevalence. The active search of cases is a very expensive operation with little yield, whereas the so-called passive search with community participation by means of popular health representatives, voluntary collaborators, private enterprises, and general health services is much more productive with regard to timely detection and treatment of cases of malaria. The organization of the referral system

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* See: Transactions of the Royal Society of Tropical Medicine and Hygiene. 80: 1-50, 1986.

presents a special set of problems with regard to monitoring to avoid errors and duplication in the registration, management, and treatment of malaria patients.

In vivo response to treatment requires a sub-system organized for collection and analysis of parasitoscopic diagnoses and of follow-up of the results obtained in the treatment of serious cases.

It is becoming necessary to develop methodologies for forecasting, registering, and following up of epidemics and of the evolution of the phenomenon of resistance of plasmodia to drugs and of vectors to insecticides. These systems should include field ecological and meteorological information supplemented by information obtained through satellites and other means.

III. RESEARCH

Despite the economic crisis in the countries of the Region and the fact that in crises research has historically been the greatest loser, in some areas of malaria research support is continuing from health ministries and research councils and from bilateral and multilateral agencies (see table on next page). An important event in the Region was the International Symposium on Malaria held at Rio de Janeiro, Brazil, in 1986. Meetings of this type are expected to strengthen and consolidate the interest of researchers and the personnel of control programs in pursuing research in this area.

A. Socioeconomic Research

One of the least regarded areas of malaria research is socioeconomic research. This happens despite recognition of the potential importance of research in this area for contributions to the solution of malaria control problems. The existing gap on the subject in the literature of the social sciences and in epidemiological analysis is attributed to the fact that the disease has become less of a social burden and to excessive reliance on technical solutions to a problem that is eminently social (1). Moreover, there are not enough people in the Region inclined to carry out research protocols on the social aspects of malaria. As a contribution to rectifying this situation, a group of experts has met in Panama* to frame standards for protocols that can be used in studies of this kind.

On the occasion of a seminar held in Salvador, Bahía, Brazil, in August 1986, on the use of social research for the improvement of education in the control of tropical diseases, a meeting was held on the social sciences and malaria. One purpose of this meeting was to review the methodological strategies employed in social science research applied to malaria. In addition, it discussed the establishment of a network of researchers, epidemiologists and administrators of control programs, and other personnel interested in exchanges of information on and experience in the transmission and control of malaria (2).

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* This meeting was arranged by PAHO in Panama in 1986.

FUNDS OF COUNTRY AND INTERNATIONAL AGENCIES FOR MALARIA RESEARCH IN THE REGION OF THE AMERICAS, 1986

AGENCY	AMOUNT US$
Group on Research and Technology for International Development. Institute of Medicine/National Academy of Sciences, USA.[x a]	
National Institute of Allergy and Infectious Diseases, National Institutes of Health, USA.[* b]	
Agency for International Development, USA.[* c]	
United States Army.[d]	
United States Navy.[e]	
Pan American Health Organization/World Health Organization (PAHO/WHO).[x]	
Special Program for Research and Training in Tropical Diseases, UNDP/World Bank/WHO.[x]	

x Calendar year 1986. * Fiscal year 1986: October 1985-October 1986.

a Field research on mosquitos done in Brazil, Colombia, Guatemala, Mexico and Peru.

b Funds for institutions in the USA.

c Most of the funds for institutions in the USA. Funds are also allocated to projects in other countries, including Peru.

d Most of the funds for institutions in the USA. Funds are also allocated to projects in other countries, including Brazil.

e Most of the funds are for institutions in the USA. Funds are also allocated to projects in other countries, including Mexico.

The meeting discussed methodological matters in relation to several current projects financed by the Socioeconomic Research Component of the UNDP/World Bank/WHO Special Program for Research and Training in Tropical Diseases (TDR). The main methodological conclusion was that, for purposes of malaria control, there is no single formula for the conduct of social sciences research in relation to malaria. The wide range of variation of malaria patterns in the different ecological and sociodemographic settings, combined with the diversity of appropriate control measures and of specific contributions by the various areas of the social sciences, rules out any uniform approach to the problem. The methods chosen must be suited and specific to each study, existing conditions at the research site, the resources of the research team, and the limitations encountered. Standardized protocols are not recommended unless carefully evaluated and found appropriate (3).

Other conclusions were that:

1. There is a general need for social science research on malaria to be multidisciplinary. This applies among researchers both in the social sciences and biomedicine, and among researchers in the various branches of the social sciences.

2. The social sciences have their own analytical concepts and methods. Despite the similarity of their concerns, social sciences research on malaria or any other disease should not be confused with epidemiology.

3. It is important for researchers to work in close contact with the personnel of control programs at all stages of their research, from the statement of the problems and design of the research to performance of the analysis and the final circulation of results.

4. The area or areas in which the field research is to be done must be carefully chosen in light of epidemiological criteria and the specific purposes of the research.

5. When the area has been chosen, the researchers must thoroughly familiarize themselves with the local living conditions and culture before undertaking the design and using to questionnaires and other formal instruments.

6. It is desirable that qualitative data be gathered and analyzed.

7. Attention must be given to how to articulate the analyses at the level of the individual, the family and home, the community, and nationally and internationally.

8. To be able to encompass all the multiplicity of biological, economic, social, cultural, political, environmental and other factors that determine the transmission and control of malaria, proper theoretical and technical frameworks must be devised. One possible technique is multivariate analysis.

9. It is not yet clear, in connection with malaria, what measurements are appropriate for different research purposes and conditions. A critical analysis must be made of current causes of mortality and morbidity and of their incidence and prevalence. In addition, new measuring instruments could be needed. Evaluations must be made of the procedures for parasitologic, serologic and clinical diagnosis and of the information on malaria provided by the patients themselves. Special attention must be given to possible errors and prejudices and to their effects on research findings.

10. It is desirable that, to the extent that the specific character of the area and the research methodology permit, that research findings be comparable.

11. Research findings are not always properly documented and circulated. There must be better communication with other scientists, personnel of the control program and health services, the general public and the community in which the research is being done.

Another result of the meeting was the establishment of a network of institutions working on the subject in order to promote the generation and exchanges of knowledge that is not only scientifically appropriate, but also of use for control purposes. Moreover, the network will provide a forum for exchanges and the critical discussion of research findings, methodological approaches, and possible applications in control (2).

As previously mentioned, migration is recognized in the Region as one of the factors that influence the malaria situation. This has been the case in such countries as Costa Rica, where malaria is under control, or in Brazil, where 40% of the parasitologically confirmed cases in the Region have been detected. In the former case, many small epidemics are associated with the presence of migrants from Nicaragua. In the latter case, greater migration from the south-central, southern and southeastern regions into the Amazon region and movements of population within the Amazon region itself have led to a considerable increase in malaria transmission. During the seventies the population grew about 5.04% a year. Proliferation of agricultural settlements gave the Rondonia area the largest number of migrants. More than 30,000 new farms have been established in this area over the last ten years, and the population rose from 570,000 to 1,040,000 between 1981 and 1985. Moreover, the discovery of gold in Pará state has generated a fresh influx of immigrants that has more than doubled the population of the mining areas in recent years. So it is not to be wondered that the number of malaria cases has kept pace with the growth of the general population in the area. Besides, immigrants who return to their states of origin take malaria with them. It came as no surprise, therefore, that in 1985 most of the malaria patients detected in states outside the Amazon region were not of local origin (3).

The concentration of malaria cases (70% of the total) in two states of Brazil stems from the fact that it is in them that most of the new land for agricultural purposes is taking place and where the new gold mining operations are in progress. In these activities, the migrant population interacts

intimately with the environment, causing ecological disturbances that are difficult to guard against. Moreover, the continual moving about of the settlers prevents the implementation of measures to reduce contacts between them and vectors. The lack or primitiveness of the available health services, the living conditions, lack of hygiene, poor transportation and communication services, and a lack of other rudimentary health services do nothing to improve a situation already made difficult by migration (4). Malaria appears to have an adverse effect on rural production, interfering with the clearing of woodland, and with planting and harvesting. In extreme cases, the disease is said to prompt emigration by workers out of hyperendemic areas. On the other hand, malaria does not appear to be impairing production in the gold mines (3).

A longitudinal study has been done in Brazil in which the fortunes of hundreds of settler families were followed for at least three years. It was endeavored to relate the prevalence of malaria in persons and families to the settlement process, social and economic differentiation, and environmental changes. As a first step, a household survey was carried out covering 887 families in Tucumã and Ourilândia, in Pará state. Data were also gathered on agriculture, gold mining, urbanization, health care and other aspects of life in the region. The data from the different sources are being analyzed together to arrive at an understanding of the individual attributes in their economic, social and political context. The research was later extended to Rondônia. The first step was a survey of the perception of malaria among selected families of the Machadinho Settlement Project. While the cross sectional study done in southern Pará yielded a considerable and varied body of information, the Machadinho study will afford analysis in greater depth and the observation of changes over time (1).

The results of the multivariate analysis done so far show that socioeconomic and environmental differences markedly influence the prevalence of malaria. In southern Pará, the goldminers and rural workers have unadjusted prevalence rates more than double the highest of urban workers and employees. In turn, the rates of the latter are twice as high as those of children and those not occupationally at risk. Although these differences have diminished, they survive adjustment for factors and covariables. These observations suggest that external transmission may be much more important than was thought when the house spraying strategy was designed (1).

The prevalence rates used in the study represent the numbers of malaria cases reported per year adjusted for time of exposure. In view of possible variations and of flaws inherent in the information generated by blood microscopy and serologic examinations, and of the current relatively low number of malaria cases, the malaria histories of individuals were obtained through information provided by the patients themselves (1).

Although requiring a very heavy investment in personnel and funds, this multidisciplinary field study of large samples is expected to generate, for the first time in Brazil, reliable quantitative and representative data on the social and economic aspects of malaria transmission and control. It will also yield a corpus of basic qualitative data grounded in systematic observation rather than speculation (1).

B. Chemotherapy

Resistance of human malaria to drugs is of particular importance in some areas of the Region. Plasmodium falciparum populations resistant to chloroquine, dihydrofolate reductase inhibitors, and their combinations with sulfonamides and sulfones have been recorded in several countries. While falciparum infections appear to be highly susceptible to the new available drugs, such as mefloquine and halofantrine, their use should be confined to specific circumstances. Only so can their utility for the treatment of infections resistant to several drugs be preserved.

The problem of multiresistance in falciparum infections has been regarded as one of the factors contributing to the increase of malaria. Several in vivo and in vitro studies have been done to analyze the present situation of the chemotherapy of falciparum malaria in Brazil. Strains isolated from 40 malaria patients in the Brazilian Amazon region were tested for sensitivity to chloroquine, quinine and mefloquine (5). In vitro resistance to chloroquine was established in 100% of the samples. In 82.5% of them, the parasite grew in drug concentrations of 16 and 32 pmol. The plasmodium also grew in 2.5% of the samples treated with 64 pmol of quinine and in 27.5% of those with 4 pmol of mefloquine (5).

The monitoring of 54 patients with falciparum infections in the Amazon region treated with a combination of sulfadoxine (1,500 mg) and pyrimethamine (75 mg) found some resistance to these drugs in almost all the patients. Twenty-one patients showed an R-I response, 24 R-II, 8 R-III and 1 an S or R-I response. In another 75 patients a different combination was used (quinine 1,500 mg/day for 4 days plus tetracycline 1,000-2,000 mg/day for 7 days). Seventy-one patients proved sensitive to these drugs while four gave an R-I response. Seven patients received single-drug therapy with quinine sulfate (1,500 mg/day for 7 days). Three of them gave an R-I response, and when a threefold combination of mefloquine (500 or 750 mg) plus sulfadoxine (1,000 or 1,500 mg) and pyrimethamine (50 or 75 mg) was administered to 46 falciparum patients, three of them gave an R-I response and in the others the drug was effective (5, 6).

In another retrospective study done in Brazil on patients who had acquired the infection in the Amazon region, it was shown that ten of every 44 patients did not respond well to treatment with quinine (7).

Despite these alarming data, another study revealed that chloroquine, to which local falciparum strains are apparently resistant in vitro (artificial selection?), remains an important means for the prevention of mortality and morbidity from malaria. An active search was conducted for individuals infected with malaria in 12,400 housing units of 232 localities in Ariquemes (Rondônia). Individuals in whom malaria parasites were found in the blood were treated with chloroquine (3 days) either alone or in association with primaquine. The number of cases per 1,000 individuals dropped from 385.4 (1984) to 268 (1985). The monthly incidence of positive smears from May to July 1985 yielded the lowest figures obtained in three years. Surveys

conducted in June-July 1984 and July-August 1985, covering 2,457 individuals in 516 housing units selected at random, revealed a reduction of the spleen index in children 2 to 9 years old from 14.9% to 9.4%, and in the adult population from 20.4% to 9%. A reduction was also established in the proportion of detected falciparum cases from 83.3% in 1984 to 41.1% in 1985. This improvement was transient, however. By the end of 1985 the epidemiological indicators had risen to their earlier levels. This study not only suggests the usefulness of chloroquine for the treatment of falciparum malaria, but also that a sustained active case-finding program can be a potent weapon for control of the infection (8).

Studies done in Colombia* to test drug combinations such as sulfadiazine plus pyrimethamine have found 33.9% of patients resistant to treatment. Of these, 48% showed R-I resistance, 41% R-II, and 10.3 R-III. A combination of clindamycin, a derivative of lincomycin, with quinine and amodiaquine was also tested. This combination was found effective for the treatment of falciparum patients. Specimens isolated from these patients were resistant in vitro 87%, 19% and 97% to quinine, amodiaquine and mefloquine, respectively. Multiple resistance was found in 44% of the specimens. Moreover, tested in Brazil, clindamycin proved ineffective to cure five of 139 falciparum patients (9). However, further tolerance-effect studies are needed regarding the deleterious action of antibiotics and of their combination with quinine, 4- and 8-aminoquinolines and sulfonamides.

C. Epidemiology

The possibility that malaria may be acquired by blood transfusion is once again drawing attention. Seven cases of malaria associated with blood transfusion/donation occured in Rio de Janeiro, Brazil, in 1985. Thirty-six cases more were reported in 1985. These figures contrast with the four transfusional cases reported from 1980 to 1983 and the average of 120 cases of malaria reported yearly throughout the state (10).

To evaluate the potential risks of post transfusional infection with malaria, a serologic study was done by the indirect immunofluorescence technique (IFI) and parasite detection in blood by thick smear and thin smear in 829 donors at blood banks in an endemic area of northern Brazil (Pará state). Though every blood donor tested negative in the thick smear and thin smear, 32% of them tested positive by indirect immunofluorescence. Excluding seropositive donors to prevent posttransfusional infection would significantly decrease the reserves of transfusion blood, already scarce in those areas (11).

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* Restrepo, M., Personal Communication

D. Characterization of Strains

In Brazil work to characterize strains and clones of P. falciparum continued. Isolates were tested for isoenzymes in cellulose acetate, sensitivity to drugs, and antigenic characteristics using monoclonal antibodies and the indirect immunofluorescence technique. Considerable intraspecies variation was observed among 12 clones obtained from 3 strains isolated in Pará state, Brazil (12). Further studies of 41 isolates from Rondonia state pointed to the circulation in that state of falciparum strains of several zymodemes (13).

E. Diagnosis

Microscopic detection of malaria parasites in a thick smear is a rapid, accurate technique when the parasitemia level rises above one parasite per 10,000 red cells (10 parasites/ul). At lower levels, however, problems may emerge. Moreover, this technique takes time and must be performed by well-trained personnel. The diagnostic use of DNA probes can afford rapid examination of blood samples in extensive population surveys. Field trials of this procedure were begun in 1985. To the same end, a highly repetitive DNA sequence of Plasmodium falciparum was cloned and used as a molecular hybridization probe for the detection of malaria. The results show that the test is specific for and sensitive to P. falciparum, as little as 20 pg of parasite DNA being detected (14). A radio-labeled synthetic oligonucleotide was also evaluated as a test for the detection of P. falciparum using blood samples directly dissolved in nitrocellulose filters. The technique diagnosed malaria in chimpanzees experimentally infected with 0.001% parasitemia (50 parasites/ul) as demonstrated by blood smears, and in a chimpanzee whose blood smears were negative, but whose blood tested positive for P. falciparum in culture. In a double-blind study of 50 patients, the results of the test correlated well with those of blood smears (15). Unfortunately, nonradioisotopic tests are not yet available, which impedes the widespread use of DNA tests as a diagnostic tool in the field.

F. Entomology and Vector Control

Cyflutrin, an insecticide little used for malaria control, was tested in Guatemala at a dosage of 0.05gr/m^2 for house spraying in a Pacific coast municipality comprising 22 localities with 5,172 houses and 18,814 inhabitants. An adjacent municipality of 30 localities with 4,767 houses and 17,977 inhabitants, in which deltamethrine was used, was selected as a control area. The epidemiological and entomological evaluations made in this area for almost two years demonstrated the effectiveness of cyflutrin for the control of malaria (16).

An enzyme immunoassay was standardized and tested in the field as a substitute for the radioimmunometric assay (RIM) for the detection of sporozoites in mosquito salivary glands. Four monoclonal antibodies --

anti-P. vivax, anti-P. falciparum, anti-P. malariae and anti-P. brasilianum -- were purified, labeled with peroxidase and used in a solid phase. The method was sensitive enough to detect, in all species studied, between five and ten sporozoites in 30 ul of mosquito extract. The technique proved species-specific, no cross-reactions having been observed among the various plasmodium species. Reagents remained active for two years at 4°C without significant deterioration, and the method may be used with dry and fresh mosquitos (17). The technique was tested in Pará state, Brazil, for the identification of vectors of human malaria and to determine the sporozoite rate. A total of 9,040 Anopheles were captured in six areas. Classified on the basis of their morphology, they were found to belong to 14 species. The antigen of the P. falciparum sporozoite was detected at rates ranging between 2.7% and 4.2% in A. darlingi mosquitos and in small numbers of A. oswaldoi collected in one district. Conversely, the antigen of P. vivax sporozoites was found at rates ranging between 0.9% and 12.0% in A. darlingi, A. triannulatus, A. nuneztovari and A. albitarsis. These results were comparable with those obtained by RIM. On dissection, sporozoites were found in the salivary glands of these four species at rates ranging between 0.8% and 2.2%. The three latter species had not previously been cited as significant vectors of malaria in northern Brazil (18).

Similar studies using the RIM were done on 3,700 mosquitos collected with human bait in different regions endemic for malaria in Colombia (the eastern Llanos, the Pacific coast and the northern region). Of the 19 species collected, three of them -- A. albimanus, A. darlingi and A. allopha -- accounted for 90% of that number. The first two-named species had been previously implicated as malaria vectors on the Pacific coast and in the western Llanos, respectively, but not A. allopha. Surprisingly, all three species showed very low sporozoite rates: 0.53% in A. albimanus, 0.14% in A. darlingi, and 0.40% in A. allopha. These results apparently do not explain the high transmission of malaria in these areas (19).

Another method was also devised for the rapid detection of malaria infection in anofeline mosquitos. This consisted in the maseration and filtration of up to 100 mosquitos followed by fixing with glutaraldehyde and concentration of the filtrate by centrifugation. The presence of sporozoite was determined by the examination of a sample of the final filtrate under a phase microscope. The method is simple and suitable for use in the field, both attributes being essential for the applicability of any technique in large-scale field operations. In Mexico, this technique established an infection rate for Anopheles albimanus of 0.9% in mosquitos collected in houses with human bait, and of 0.1% in mosquitos collected with human bait in the peridomiciliary area (20).

G. Final Considerations

The foregoing is a brief summary of the research done in the Region, which is in large part a response to some of the questions that have emerged from the malaria situation in the countries themselves. Biomedical research

in other aspects of the antigenic characterization of the different stages of human plasmodia (21-26), detection of the humoral immune response with synthetic peptides (27), metabolic and biochemical studies in infected erythrocytes (28, 29), and the adaptation of a P. falciparum strain to saimiri monkeys (30) was carried out in the United States of America.

Research was also done on the immune response of infected individuals in Latin America. In Venezuela, a determination was made of the possible role of lymphocytotoxic autoantibodies in the etiology of the reduction of T lymphocytes in human malaria (31). In Colombia, the reactivity of human and animal antibodies to a repetitive sequence of aminoacids of a P. falciparum antigen was established (32). In Brazil, a study was made of the effect of human plasma on the cytoadherence of red cells infected by P. falciparum (33); the dynamics of the protective immune response in infected indivuduals (34), and polyclonal activation of B lymphocytes observed in human malaria (35).

With the support of the BOSTID program, U.S.A., the Special Program for Research and Training in Tropical Diseases (TDR) and PAHO/WHO, a number of studies are being conducted on the entomological aspects of malaria. However, insufficient attention is still being given to the performance of epidemiological studies. This hinders progress in the stratification required to implement programs for the prevention and control of malaria.

IV. PERSONNEL TRAINING

A. Manpower Training Strategies

The Program directed its efforts at securing the provision of training both to specialized personnel and to employees of the general health system. It is essential that physicians be informed on practical methods for the diagnosis and treatment of malaria and, in particular, that they know how to identify severe and complicated cases of the disease and be versed in the management of these patients. They must also know the basic principles of the epidemiology, surveillance and control of malaria.

The training of instructors is regarded as one of the most important ways of improving control work and research. Through research, instructors will be encouraged to learn more about the causes and dynamics of transmission and about advances in the design and evaluation of effective control methods.

If personnel already trained in malaria are assigned to other work in the health field, this knowledge remains useful, and efforts should be made to encourage them and retain them in the service. Local teaching resources must be identified, used and reinforced before training abroad is resorted to. Nevertheless, when specialized courses are organized in other countries, the practical field work continues to be done in endemic areas. Courses for small groups in which the participant can learn to apply the techniques and methods of laboratory and field are more productive. It is preferable to choose students from the existing staff of the health services, as this ensures that

there will be a post available for the person after his training. In the Americas, graduate entomology personnel are trained in general, economic and agricultural entomology, with basic courses in epidemiology and the control of metoxenous diseases, and given a basic understanding of the ecology and biology of arthropods of importance in public health. Graduate courses are being conducted to provide training for epidemiologists in metoxenous diseases and specialists in the environmental management and control of vectors and rodents. Short courses are already available for the control of vectors and rodents as also courses in the management and maintenance of equipment for the application of insecticides and larvicides. In addition, modular short courses in the epidemiology, surveillance and control of malaria for the professional and technical staff of general health services underwent great development during 1986.

Training for implementation of the PHC strategies and for malaria control must draw on experience acquired in the control of other diseases. Some countries have already started to decentralize the malaria program into their provinces and health regions. In these the needs and resources for the conduct of the local malaria control program as an integral component of the local health services are being identified.

Training is an important element in PAHO's technical cooperation. To arrange training courses and workshops and promote the participation of aspirants in the countries, the Organization has used regular and extrabudgetary funds, particularly those assigned under Agreement 597-0007 between PAHO and the Agency for International Development (USAID) for support to the subregional malaria control program in Central America and Panama.

In manpower development the orientation has been to the participation of personnel in activities for the planning, programming and evaluation of and research in the prevention and control of malaria and other communicable diseases.

In several countries of the Region, resources of the community have also been mobilized for participation in a variety of activities for the control of malaria and other vector-borne diseases. The purpose of community participation is to complement and reinforce the operations of specialized health services and give them the continuity that control measures require to ensure the desired lasting result.

Training in the prevention and control of malaria has had the basic purposes of:

i) providing orientation in the epidemiology of malaria to the various categories and levels of health service personnel in order to encourage and improve the effectiveness of their participation in malaria control activities within the primary health care system. To do this, workshops have been held in several countries of the Region using the training modules on "Principles of Malaria Epidemiology," prepared under the Program.

ii) providing training in "Technical and Administrative Management for Intermediate-Level Personnel" through an interinstitutional course held at Quiriguá, Guatemala, attended by 14 students and conducted by several international professors contracted for the purpose.

iii) providing specialized training in "Techniques for the Application of Insecticides and the Handling and Maintenance of Spraying Equipment" in short courses held in Panama.

iv) training personnel from the countries in "Emergency Control of Aedes aegypti" in a short course conducted in Panama.

v) providing refresher training in medical entomology in short courses conducted by the Universities of del Valle in Guatemala and Panama in Panama with the cooperation of PAHO's member countries.

vi) providing technical cooperation and support to academic courses conducted through the University of Panama and the School of Malariology and Environmental Sanitation in the Ministry of Health and Social Welfare of Venezuela. The Panama course leads to a master's degree in medical entomology; it began in September 1985 and will have a duration of 20 months. The International Course in Malaria and Environmental Sanitation is being converted, with the special participation of the Program, for the training of a professional epidemiologist with knowledge and skills as a researcher, teacher and administrator to meet the current needs of the countries for the prevention and control of malaria and other vector-borne diseases. The XLIII Course, begun in January 1987, uses the new revised, expanded and updated curriculum.

vii) awarding fellowships for attendance by local officers at the aforementioned courses and the Course on Integrated Vector Control, conducted at The Wedge, South Carolina, U.S.A.

The strengthening of teaching institutions ties in with personnel education and training, and the Program has carried it out by providing technical and financial cooperation to the University of Panama, the School of Malariology at Maracay, and the National Health Personnel Training Institute (INDAPS) of the Ministry of Health of Guatemala.

The set of five training modules in malaria epidemiology and control, initially prepared in 1983 and updated in 1984-85, has been widely distributed and used. The English and Portuguese versions have also been distributed and a French version is in preparation. This material is intended for the personnel of general health, malaria control and epidemiological surveillance services. In addition to being a teaching tool, workshops will foster articulation among and possibly the integration of the services concerned. Although the material is directed at professional personnel with university degrees in one or another of the health sciences, they have been easily adapted in the countries for the training of the intermediate and auxiliary-level members of the health team.

In addition to the aforementioned activities, PAHO has awarded fellowships in the fields of malaria, parasitology, vector control and related fields, and has supported training activities in the countries.

B. Academic Courses

1. XLIII Course in Malariology and Environmental Sanitation

Duration: 13 January to 14 November 1986
Place: Maracay, Aragua, Venezuela
Institution: School of Malariology/SAS

Enrollment and maintenance costs are defrayed by the Government of Venezuela. PAHO and USAID provided fellowships to the countries.

2. Course Leading to Master's Degree in Medical Entomology

Duration: 20 months (September 1985-June 1987)
Place: Panama City, Republic of Panama
Institution: University of Panama

Conducted with support from PAHO/AID, the Government of Panama, the SNEN, and several PAHO advisors.

C. Short Courses

The training activities in the countries of the Region are presented in Tables Nos. 27 and 28, in which it can be seen that:

- the Program has cooperated in the conduct of three graduate courses, one on the epidemiology of malaria and environmental sanitation, held in Venezuela, and two in medical entomology, in progress in the University of Panama and Nuevo León Autonomous University.

- the subregion of Central America, Belize and Panama was specially favored in 1986, with the holding of 37 activities and the training of 800 persons. This is associated with the priority established by the governments of the subregion (Plan of Priority Health Needs in Central America and Panama) and the special funds obtained under the PAHO/AID Agreement.

- in most of the countries, training was most active in aspects of the epidemiology, parasitology and microscopic diagnosis of malaria, as also in aspects of equipment handling, the application of insecticides, and vector control operations.

- training in aspects of management for the administration of malaria control programs in the countries, and for voluntary collaborators and the community, has begun in some countries, but should be introduced in others.

- training for medical personnel and the staffs of health services in the clinical management and documentation of serious malaria cases should be routine in all the countries.

D. Dissemination of Information

The program carried on a variety of activities for the preparation of technical documents and visual teaching materials in the biology, prevention and control of malaria and other vector-borne diseases. It also promoted the publication of scientific articles written by PAHO staff members and health personnel of the countries (Annex I).

ANNEX I

Communicable Diseases Program
List of Publications, 1986

I.	Technical documents	Language	Status
	1. Principios de epidemiología para el control de la malaria	Spanish	C
		English	C
		Portuguese	C
	2. Situación de los programas de malaria en las Américas (XXXIV Informe, 1986)	Spanish	C
		English	C
	3. Malaria en las Américas: análisis crítico (Serie de Cuadernos Técnicos No. 1)	Spanish	C
	4. Malaria en las Américas: Informe de la IV Reunión de Directores de los Servicios Nacionales de Erradicación de la Malaria en las Américas. (Serie de Cuadernos Técnicos No. 5)	Spanish	C
	5. Atención médica de casos graves y complicados de malaria: reunión técnica informal de un grupo internacional de especialistas, patrocinada por la OMS. (Serie de Cuadernos Técnicos No. 8)	Spanish	C
	6. Consulta técnica regional de expertos en control de la malaria (reunión en Brasilia, julio 1986)	Spanish	C
	7. Informe de un grupo de consulta de la OPS/OMS sobre la participación comunitaria en el control de la malaria (reunión en Honduras, julio 1986)	Spanish	C
	8. *Aedes albopictus*: ecología, biología y control. Bases para la preparación del Plan de Acción.	Spanish	C
		English	C
	9. *Aedes aegypti*: biología y ecología, M. Nelson/HPT/OPS. (Documento PAHODOC Ref. PNSP/86-63 y 64)	Spanish	I
		English	I

* C= In circulation
  I= In press

Technical documents	Language	Status
10. La biología y ecología de los mosquitos de importancia en salud pública, M. Nelson y R.J. Tonn, HPT/OPS y VBC/OMS (Documento PAHODOC Ref. PNSP/86-70)	Spanish English	I I
11. Biología y ecología de los vectores de la malaria en las Américas, G. Fleming, HPT/OPS (Documento PAHODOC Ref. PNSP/86-72)	Spanish English	I I
12. Triatomíneos: biología, ecología y control R.E. Ryckman, et al, Loma Linda University, Calif., y HPT/OPS y VBC/OMS (Documento PAHODOC)	English Spanish	I I
13. Simúlidos de importancia en salud pública, Shelley, British Museum, Inglaterra (Documento PAHODOC)	English Spanish	I I
14. The Current Status of Schistosomiasis in the Caribbean Region: Endemic Areas and Areas at Risk, D. Bundy, Imperial College/ Inglaterra (Documento PAHODOC)	English	I
15. Folletos sobre parásitos intestinales y parásitos de la sangre y tisulares (3), traducidos al español de folletos del CDC	Spanish	I
16. Epidemiología y control de la leishmaniasis en Centroamérica, Panamá, Belice y México. Informe de un seminario (Documento PAHODOC)	Spanish	I
17. Informe de un grupo de estudio para analizar estrategias de control de la enfermedad de Chagas (Documento PAHODOC)	Spanish	I
18. Control de la enfermedad de chagas a través del mejoramiento de la vivienda rural. Informe técnico del proyecto realizado en Venezuela de 1976 a 1986. (Documento PAHODOC)	Spanish English	I

II. Publications in Journals

1. Control de la malaria en las Américas: análisis crítico. Review. Bull Panam Sanit Bureau, 101(5):522-541, 1986

2. Field Trials in Chiapas, Mexico, of a Rapid Detection Method for Malaria in Anopheline Vectors with Low Infection Rates. Ramsey, J.M., Bown, D.N., Aron, J.H., Beaudoin, R.L., Méndez, J.F., Am J Trop Med Hyg, 35 (2):234-238, 1986

3. Use of an Exterior Curtain-net to Evaluate Insecticide/Mosquito Behavior in Houses. Bown, D.M., Ríos, R., Frederickson, C., Cabañas, G., Méndez, J.F., J. Am Mosq. Control Assoc., 2 (1), 1986

4. Vacuna antipalúdica. Alternativa de control? Méndez, J.F., Salud pública de México (in press), 1986

5. An Estimate of the Malaria Vectorial Capacity for Anopheles albimanus in Rural Southern Chiapas, Mexico. Frederickson, C., Castro, I., Bown, D.N., Méndez, J.F. & Trpis, M. (submitted for publication)

6. Anopheles albimanus: Estudios ecológicos en un área endémica a paludismo por Plasmodium vivax en la costa del sur de México, Bown, D. (submitted for publication in the Bull Panam Sanit Bureau)

7. The Evaluation of Bendiocarb and Deltametrin in the Same Village and their Impact on Populations of Anopheles albimanus. Bown, D.N., Ríos, R., Frederickson, C., Cabañas, G., Méndez, J.F. (in press)

8. El xenodiagnóstico artificial en el diagnóstico de la enfermedad de chagas. Cedillos, R.A., Mosca, W., Hubsch, R.D., Tonn, R.J. (submitted for publication in the Bull Panam Sanit Bureau)

III	Visual teaching materials	Language	Status
	1. La historia natural, la epidemiología y el control de la enfermedad de chagas (Serie Visual No. 92)	Spanish	C
	2. El pulverizador manual de compresión (Serie Visual No. 93)	Spanish	C
	3. Control de la esquistosomiasis (OMS)	Spanish English Portuguese	C

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4. Paula, J.A. Passadore presente de uma doenca antiga. Mimeo CEDEPLAR, UFMG. Belo Horizonte, M.G. Brasil.

5. Boulos, M., DiSanti, S.M., Barradas Barota, et al. Some aspects of treatment, prophylaxis and chemoresistence of Plasmodium falciparum malaria. Mem. Inst. O. Cruz. 81 Suppl. II:255-257, 1986.

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8. Moura, R.C.S., Tosta, E.C., Pereira, M.G., et al. Con a short term program of active search for malaria infected individuals in an endemic area, interfere with transmission. Int. Symp. Malaria. Rio de Janeiro. Abstract No. 20, 1986.

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Table 1
POPULATION of MALARIOUS AREAS
1958 - 1986

Year	Originally Malarious Areas					Total Regional Population (in thousands)
	Maintenance	Consolidation	Attack	Prep. phase or Program not started	Total	
1958	52,866	1,996	46,196	34,351	135,409	387,276
1959	52,856	9,349	56,292	27,423	145,920	394,606
1960	54,363	10,101	53,400	25,722	143,586	400,500
1961	56,979	17,879	39,021	33,413	147,292	416,008
1962	59,299	30,424	49,276	14,743	153,742	427,919
1963	56,546	33,901	31,910	29,664	152,021	434,950
1964	57,414	32,277	34,426	34,525	158,642	447,666
1965	60,975	34,731	38,575	12,108	146,389	455,527
1966	69,760	36,128	43,369	17,212	166,469	463,649
1967	70,720	41,581	44,766	12,834	169,901	474,868
1968	72,441	45,812	56,234	217	174,704	484,664
1969	72,757	46,987	56,375	206	176,325	491,483
1970	80,770	40,518	59,807	162	181,257	505,819
1971	81,306	43,644	60,396	146	185,492	513,544
1972	86,634	42,016	61,645	153	190,448	524,774
1973	87,969	45,535	61,915	109	195,528	535,109
1974	91,527	46,042	63,130	56	200,755	544,865
1975	99,405	44,633	61,834	-	205,872	555,676
1976	101,068	48,813	61,205	-	211,086	565,249
1977	104,567	50,610	60,373	-	215,550	576,942
1978	105,611	59,734	54,808	-	220,153	587,704
1979	113,092	57,280	55,989	-	226,361	600,263
1980	114,620	58,087	58,659	-	231,366	610,021
1981	117,042	59,962	62,256	-	239,260	627,375
1982	118,338	62,028	64,941	-	245,307	635,954
1983	119,175	66,970	63,182	-	249,327	639,212
1984	124,408	68,372	64,496	-	257,276	659,535
1985	124,086	67,092	68,659	-	259,837	665,777
1986	116,143	43,717	103,500	-	263,371	662,983

TABLE 2
STATUS OF MALARIA PROGRAM IN THE AMERICAS, BY POPULATION, 1986

Country or other political or administrative unit	Total Population a)	Population of originally malarious areas							
		Total Mal. area		Maintenance		Consolidation		Attack	
		Total	%	Total	%	Total	%	Total	%
Antigua	81 b)	-	-	-	-	-	-	-	-
Netherlands Antilles	267 b)	-	-	-	-	-	-	-	-
Argentina	31,435	3,915	12.45	3,821	97.60	-	-	94	2.40
Bahamas	234 b)	-	-	-	-	-	-	-	-
Barbados	254 b)	-	-	-	-	-	-	-	-
Belize	171	171	100.00	-	-	28	16.37	132	77.19
Bermuda	81 b)	-	-	-	-	-	-	-	-
Bolivia	6,611	2,588	39.15	-	-	-	-	2,588	100.00
Brazil	138,466	59,367	42.87	15,618	26.31	22,796	38.40	20,953	35.29
Canada	25,694 b)	-	-	-	-	-	-	-	-
Colombia	30,092	19,639	65.26	-	-	14,267	72.65	5,372	27.35
Costa Rica	2,664	753	28.27	-	-	648	86.06	105	13.94
Cuba	10,192	3,435	33.70	3,435 c)	100.00	-	-	-	-
Chile	12,075	308	2.55	308	100.00	-	-	-	-
Dominica	80	16	20.00	16 c)	100.00	-	-	-	-
Ecuador	9,179	5,569	60.67	-	-	2,413	43.33	3,156	56.67
El Salvador	4,806	4,325	89.99	-	-	-	-	4,325	100.00
United States of America	226,575	64,687	28.55	64,687 c)	100.00	-	-	-	-
Grenada	100	40	40.00	40 c)	100.00	-	-	-	-
Guadaloupe	336 b)	299	88.99	299 c)	100.00	-	-	-	-
Guatemala	8,195	3,333	40.67	-	-	-	-	3,333	100.00
French Guiana	84 b)	84	100.00	44	52.38	34	40.48	6	7.14
Guyana	796	796	100.00	729	91.58	-	-	67	8.42
Haiti	5,579	4,925	88.28	-	-	-	-	4,925	100.00
Honduras	4,511	4,182	92.71	-	-	-	-	4,182	100.00
Cayman Islands	20 b)	-	-	-	-	-	-	-	-
Falkland Islands	2 b)	-	-	-	-	-	-	-	-
Turks and Caicos Islands	8 b)	-	-	-	-	-	-	-	-
Virgin Islands (USA)	96	96	100.00	96 c)	100.00	-	-	-	-
Virgin Islands (UK)	13 b)	-	-	-	-	-	-	-	-
Jamaica	2,346	1,995	85.04	1,995 c)	100.00	-	-	-	-
Martinique	329 b)	205	62.31	205 c)	100.00	-	-	-	-
Mexico	80,169	42,570	53.10	-	-	-	-	42,570	100.00
Montserrat	12 b)	-	-	-	-	-	-	-	-
Nicaragua	3,371	3,371	100.00	-	-	-	-	3,371	100.00
Panama	2,227	2,146	96.36	-	-	1,957	91.19	189	8.81
Paraguay	3,340	2,838	84.97	775	27.31	1,368	48.20	695	24.49
Peru	20,207	6,692	33.12	-	-	-	-	6,692	100.00
Puerto Rico	3,186	3,186	100.00	3,186 c)	100.00	-	-	-	-
Dominican Rep.	6,381	6,337	99.31	6,187	97.63	53	0.84	97	1.53
St. Cristopher-Nevis-Ang.	47 b)	-	-	-	-	-	-	-	-
St. Pierre et Miquelon	6 b)	-	-	-	-	-	-	-	-
St. Vincent	105 b)	-	-	-	-	-	-	-	-
Saint Lucia	132 b)	112	84.85	112 c)	100.00	-	-	-	-
Suriname	402	296	73.63	259	87.50	5	1.69	32	10.81
Trinidad and Tobago	1,200	1,144	95.33	1,144 c)	100.00	-	-	-	-
Uruguay	3,035 b)	-	-	-	-	-	-	-	-
Venezuela	17,791	13,951	78.42	13,187 d)	94.52	148	1.06	616	4.42
T o t a l	662,983	263,371	39.73	116,143	44.10	43,717	16.60	103,500	39.30

a) Population in thousands. b) Population estimated by PAHO. c) Population living in areas where malaria eradication has been regidtered by PAHO/WHO. d) Includes an area with 10,170,640 inhabitants where malaria eradication has been registered by PAHO/WHO.

TABLE 3

STATUS OF MALARIA PROGRAMS IN THE AMERICAS, BY AREA, 1986
(Area in Km2)

Country or other political or administrative unit	Total area	Originally malarious areas							
		Total Mal. area		Maintenance		Consolidation		Attack	
		Total	%	Total	%	Total	%	Total	%
Antigua	280	-	-	-	-	-	-	-	-
Netherlands Antille	961	-	-	-	-	-	-	-	-
Argentina	4,024,458	349,051	8.67	337,776	96.77	-	-	11,275	3.23
Bahamas	11,396	-	-	-	-	-	-	-	-
Barbados	430	-	-	-	-	-	-	-	-
Belize	22,965	22,965	100.00	-	-	7,150	31.13	15,815	68.87
Bermuda	53	-	-	-	-	-	-	-	-
Bolivia	1,098,581	821,346	74.76	-	-	-	-	821,346	100.00
Brazil	8,511,965	6,898,045	81.04	190,469	2.76	1,226,413	17.78	5,481,163	79.46
Canada	221,016	-	-	-	-	-	-	-	-
Colombia	1,138,914	970,849	85.24	-	-	156,863	16.16	813,986	83.84
Costa Rica	50,900	35,446	69.64	-	-	27,832	78.52	7,614	21.48
Cuba	110,860	37,502 a)	33.83	37,502 b)	100.00	-	-	-	-
Chile	756,626	58,073	7.68	58,073	100.00	-	-	-	-
Dominica	751	152 a)	20.24	152 b)	100.00	-	-	-	-
Ecuador	291,906	175,462	60.11	-	-	27,797	15.84	147,665	84.16
El Salvador	21,041	19,153	91.03	-	-	-	-	19,153	100.00
United States of America	9,365,604	2,309,876	24.66	2,309,876 b)	100.00	-	-	-	-
Grenada	344	103 a)	29.94	103 b)	100.00	-	-	-	-
Guadaloupe	1,950	1,244	63.79	1,244 b)	100.00	-	-	-	-
Guatemala	108,889	80,350	-	-	-	-	-	80,350	100.00
French Guiana	90,000	90,000	100.00	50	0.06	82,350	91.50	7,600	8.44
Guyana	215,025	215,025	100.00	7,012	3.26	-	-	208,013	96.74
Haiti	27,750	24,496	88.27	-	-	-	-	24,496	100.00
Honduras	112,088	101,351	90.42	-	-	-	-	101,351	100.00
Cayman Islands	183	-	-	-	-	-	-	-	-
Falkland Islands	11,961	-	-	-	-	-	-	-	-
Turks and Caicos	522	-	-	-	-	-	-	-	-
Virgin Islands (USA)	345	345	100.00	345 b)	100.00	-	-	-	-
Virgin Islands (UK)	174	-	-	-	-	-	-	-	-
Jamaica	10,991	10,028 a)	91.24	10,028 b)	100.00	-	-	-	-
Martinique	1,080	300 a)	27.78	300 b)	100.00	-	-	-	-
Mexico c)	1,967,183	1,150,000	58.46	190,952	16.60	546,433	-	412,615	35.88
Montserrat	84	-	-	-	-	-	-	-	-
Nicaragua	127,358	118,358	92.93	-	-	-	ERR	118,358	100.00
Panama	77,082	71,272	92.46	-	-	35,290	49.51	35,982	50.49
Paraguay	406,752	406,552	99.95	271,010	66.66	80,749	19.86	54,793	13.48
Peru	1,285,215	961,171	74.79	-	-	195,418	-	765,753	79.67
Puerto Rico	8,896	8,896	100.00	8,896	-	-	-	-	-
Dominican Rep.	48,442	47,562	98.18	44,281	93.10	1,096	2.30	2,185	4.59
St. Cristopher-Nevis.-Ang	396	-	-	-	-	-	-	-	-
St. Pierre et Miquelon	240	-	-	-	-	-	-	-	-
St. Vincent	389	-	-	-	-	-	-	-	-
Saint Lucia	620	510	82.26	510 a)	100.00	-	-	-	-
Suriname	163,820	163,750	99.96	43,705	26.69	45	0.03	120,000	73.28
Trinidad and Tobago	5,630	5,449	96.79	5,449	100.00	-	-	-	-
Uruguay	186,926	-	-	-	-	-	-	-	-
Venezuela	915,741	600,000	65.52	460,054 b)	76.68	343	0.06	139,603	23.27
T o t a l	31,404,783	15,754,682	50.17	3,977,787	25.25	2,387,779	15.16	9,389,116	59.60

a) Estimated. b) Areas where malaria eradication has been certified by PAHO/WHO.
c) The division of the program into phases is for 1985
d) Includes an area of 407,945 km2 where malaria eradication has beeb certified by PAHO/WHO.

TABLE 4

MORBIDITY FROM MALARIA IN THE AMERICAS
1958 - 1986

Year	Population (Thousands)		Blood Slides			Morbidity per 100,000 Inhabitants	
	National Total	Malarious Area	Examined	Positives	Percentages	National Total	Malarious Area
1958	387,276	135,409	1,716,103	56,705	3.30	14.64	41.88
1959	394,606	145,920	2,749,117	75,612	2.75	19.16	51.82
1960	400,500	143,586	3,955,149	79,998	2.02	19.97	55.71
1961	416,008	147,292	5,341,004	99,639	1.87	23.95	67.65
1962	427,919	153,742	7,221,367	177,089	2.45	41.38	115.19
1963	434,950	152,021	7,903,156	227,026	2.87	52.20	149.34
1964	447,665	158,642	8,156,290	254,572	3.12	56.87	160.47
1965	455,527	146,389	9,069,950	241,462	2.66	53.01	164.95
1966	463,649	166,469	11,797,983	333,280	2.82	71.88	200.21
1967	474,868	169,901	11,609,228	369,388	3.18	77.79	217.41
1968	484,664	174,704	12,522,696	282,773	2.26	58.34	161.86
1969	491,483	176,325	12,179,190	323,782	2.66	65.88	183.63
1970	505,819	181,257	9,925,162	344,170	3.47	68.04	189.88
1971	513,544	185,492	10,134,212	338,416	3.34	65.90	182.44
1972	524,774	190,448	9,695,953	284,813	2.94	54.27	149.55
1973	535,109	195,528	9,400,682	280,276	2.98	52.38	143.34
1974	544,865	200,755	8,997,318	269,003	2.99	49.37	134.00
1975	555,676	205,872	9,276,878	356,692	3.84	64.19	173.26
1976	565,249	211,086	9,352,775	379,364	4.06	67.11	179.72
1977	576,942	215,550	9,274,480	398,925	4.30	69.14	185.07
1978	587,704	220,153	9,493,751	468,923	4.94	79.79	213.00
1979	600,263	226,361	8,630,653	515,271	5.97	84.47	227.63
1980	610,021	231,366	8,943,369	602,836	6.74	98.82	260.56
1981	627,375	239,260	9,100,529	629,629	6.92	100.36	263.16
1982	635,954	245,307	8,826,418	715,177	8.10	112.46	291.54
1983	639,212	249,327	9,113,611	830,700	9.11	129.96	333.18
1984	659,535	257,276	9,422,827	914,171	9.70	138.61	355.33
1985	665,777	259,600	9,342,769	884,617	9.47	132.87	340.45
1986	662,983	263,371	10,050,976	950,471	9.46	143.36	360.89

Table 5

CASE DETECTION BY COUNTRY AND PHASE OF THE PROGRAM, 1986

Country or other political or administrative unit	Total		Maintenance		Consolidation		Attack phase		Non-malarious areas	
	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive
Argentina	26,345	2,000	12,923	795	-	-	13,422	1,205	-	-
Bahamas	2	2	-	-	-	-	-	-	2	2
Barbados	3	3	-	-	-	-	-	-	3	3
Belize	20,859	2,779	-	-	2,333	286	18,526	2,493	-	-
Bermuda	1	1	-	-	-	-	-	-	1	1
Bolivia	101,878	20,993	-	-	-	-	101,878	20,993	-	-
Brazil	3,363,962	443,627	105,058	1,471	751,651	7,856	2,449,154	427,377	58,099	6,923
Canada	302	302	-	-	-	-	-	-	302	302
Colombia	477,503	89,251	-	-	154,732	5,962	322,771	83,289	-	-
Costa Rica	113,720	790	-	-	73,294	585	37,712	101	2,714	104
Cuba	1,088,122	401	1,088,122	401	-	-	-	-	-	-
Chile	2	2	1	1	-	-	-	-	1	1
Dominica	7	1	7	1	-	-	-	-	-	-
Ecuador	275,865	51,430	-	-	84,888	3,301	190,260	48,056	717	73
El Salvador	182,622	23,953	-	-	-	-	182,622	23,953	-	-
United States	918	918	918	918	-	-	-	-	-	-
Grenada	3,469	1	1,225	0	-	-	-	-	2,244	1
Guadeloupe	...	...	-	-	-	-	-	-	-	-
Guatemala	453,401	42,609	-	-	-	-	432,258	39,872	21,143	2,737
French Guiana a)	6,436	979	-	-	-	-	6,436	979	-	-
Guyana	84,763	16,388	...	4,662	-	-	...	11,726	-	-
Haiti	262,582	14,363	-	-	-	-	262,582	14,363	-	-
Honduras	411,150	29,130	-	-	-	-	411,150	29,130	-	-
Cayman Islands	246	3	-	-	-	-	-	-	246	3
Jamaica	584	10	584	10	-	-	-	-	-	-
Martinique	...	...	-	-	-	-	-	-	-	-
Mexico	1,217,848	130,915	-	-	-	-	1,217,803	130,870	45	45
Nicaragua	510,289	20,308	-	-	-	-	510,289	20,308	-	-
Panama	388,485	1,060	-	-	204,480	76	184,005	984	0	0
Paraguay	102,912	4,329	5,098	29	46,956	573	50,426	3,695	432	32
Peru	184,636	36,866	-	-	-	-	184,636	36,866	-	-
Puerto Rico	2	2	2	2	-	-	-	-	-	-
Dominican Rep.	427,694	1,360	351,686	424	14,628	89	61,367	847	13	0
Saint Lucia	0	0	-	-	-	-	-	-	-	-
Suriname	50,969	1,316	1	0	2,838	37	37,819	1,092	10,311	187
Trinidad and Tobago	3,895	18	3,895	18	-	-	-	-	-	-
Venezuela	289,504	14,361	157,436	9,510	4,314	47	125,120	4,372	2,634	432
TOTAL	10,050,976	950,471	1,726,956	18,242	1,340,114	18,812	6,800,236	902,571	98,907	10,846

a) Incomplete information.

Table 6

EPIDEMIOLOGICAL SITUATION OF THE 21 COUNTRIES WITH ACTIVE MALARIA PROGRAMS, 1986

Country	Population malarious areas	Slides		Especie of Parasites				Epidemiological Indicators			
		Examined	Posit.	P. falc.	P. vivax	P.mal.	Mixed	ABER	SPI	API	% of P.falc.
Argentina	3,915	26,345	2,000	1	1,999	-	-	0.67	7.59	0.51	0.05
Belize	171	20,859	2,779	136	2,643	0	0	12.20	13.32	16.25	4.89
Bolivia	2,588	101,878	20,993	1,621	19,319	-	53	3.94	20.61	8.11	7.72
Brazil	59,367	3,363,962	443,627	240,664	199,857	9	3,097	5.67	13.19	7.47	54.25
Colombia	19,639	477,503	89,251	30,235	58,612	113	291	2.43	18.69	4.54	33.88
Costa Rica	753	113,720	790	19	768	0	3	15.10	0.69	1.05	2.41
Ecuador	5,569	275,865	51,430	11,985	39,445	-	-	4.95	18.64	9.24	23.30
El Salvador	4,325	182,622	23,953	2,324	21,558	-	71	4.22	13.12	5.54	9.70
Guatemala	3,333	453,401	42,609	1,387	41,184	-	38	13.60	9.40	12.78	3.26
French Guiana	84	6,436	979	731	241	-	7	7.66	15.21	11.65	74.67
Guyana	796	84,763	16,388	9,277	7,052	-	59	10.65	19.33	20.59	56.61
Haiti	4,925	262,582	14,363	14,363	-	-	-	5.33	5.47	2.92	100.00
Honduras	4,182	411,150	29,130	1,111	27,892	-	127	9.83	7.09	6.97	3.81
Mexico	42,570	1,217,848	130,915	1,062	129,808	-	45	2.86	10.75	3.08	0.81
Nicaragua	3,371	510,289	20,308	1,064	19,212	-	32	15.14	3.98	6.02	5.24
Panama	2,146	388,485	1,060	58	1,001	-	1	18.10	0.27	0.49	5.47
Paraguay	2,838	102,912	4,329	9	4,319	-	1	3.63	4.21	1.53	0.21
Peru	6,692	184,636	36,866	68	36,783	15	-	2.76	19.97	5.51	0.18
Dominican Rep.	6,337	427,694	1,360	1,359	-	1	-	6.75	0.32	0.21	99.93
Suriname	296	50,969	1,316	1,002	314	-	-	17.22	2.58	4.45	76.14
Venezuela	13,951	289,504	14,361	3,131	11,221	1	8	2.08	4.96	1.03	21.80
T O T A L	187,848	8,953,423	948,807	321,607	623,228	139	3,833	4.77	10.60	5.05	33.90

ABER: Annual Blood Examination Rate.
SPI: Slide Positive Index.
API: Annual Parasite Incidence.
a) Incomplete information.

Table 7

MALARIA CASES REGISTERED IN THE REGION OF THE AMERICAS, 1983-1986

GROUPS		Population 1986 a) Malarious Areas	Registered Cases 1983	1984	1985	1986
GROUP I	Countries and terr. w/o evidence of transm. & where erad. has been certified by PAHO/WHO	75,523	914	1,206	1,532	1,664
GROUP II	Argentina	3,915	535	437	774	2,000
	Costa Rica	753	245	569	734	790
	Panama	2,146	341	125	126	1,060
	Subtotal	6,814	1,121	1,131	1,634	3,850
GROUP III	Brazil	59,367	297,687	378,257	401,904	443,627
	French Guiana	84	1,051	1,021	691	979 c)
	Guyana	796	2,102	3,017	7,900	16,388
	Paraguay	2,838	49	554	4,568	4,329
	Suriname	296	1,943	3,849	1,635	1,316
	Subtotal	63,381	302,832	386,698	416,698	466,639
GROUP IV	Subregion A:					
	Haiti	4,925	53,954	69,863	16,662	14,363
	Dominican Rep.	6,337	3,801	2,370	816	1,360
	Subregion B:					
	Belize	171	4,595	4,117	2,800	2,779
	El Salvador	4,325	65,377	66,874	44,473	23,953
	Guatemala	3,333	64,024	74,132	54,958	42,609
	Honduras	4,182	37,536	27,332	33,828	29,130
	Mexico	42,570	75,029	85,501	116,016	130,915
	Nicaragua	3,371	12,907	15,702	15,130	20,308
	Subregion C:					
	Bolivia	2,588	14,441	16,338	14,354	20,993
	Colombia	19,639	105,360	55,268	55,791	89,251
	Ecuador	5,569	51,606	78,599	68,989	51,430
	Peru	6,692	28,563	33,724	35,026	36,866
	Venezuela	13,951	8,400	12,242	14,305	14,361
	Subtotal	117,653	525,593	542,062	473,148	478,318
	T O T A L	263,371	830,460	931,097	893,012	950,471

a) Population in thousands.
b) Incomplete information.

MAP 1

GROUP I. COUNTRIES WITH NO EVIDENCE OF TRANSMISSION

GROUP I	Population (1986) Originally malarious area	REGISTERED CASES 1983	1984	1985	1986
Bahamas	-	-	-	1	2
Barbados	-	-	-	1	3
Bermuda	-	-	-	-	1
Canada	-	-	-	219	302
Cuba	3,435	298	401	457	401
Chile	308	0	0	0	2
Dominica	16	0	0	2	1
U. S. A.	44,687	605	792	1,037	918
Puerto Rico	3,186	2	2	1	2
Virgin Is.	96	0	0	0	0
Grenada	40	0	0	1	1
Guadaloupe	299	1	0	0	...
Cayman Is.	-			2	3
Jamaica	1,995	4	5	2	10
Martinique	205	1	0	13	...
Saint Lucia	112	0	0	0	0
Trinidad & T.	1,144	3	6	19	18
T O T A L	75,523	914	1,206	1,534	1,664

MAP 2

GROUP II. COUNTRIES IN WHICH MALARIA TRANSMISSION HAS BEEN REDUCED AND FAVORABLE SITUATION MAINTAINED

GROUP II	Population (1986) Originally malarious area	REGISTERED CASES 1983	1984	1985	1986
Argentina	3,915	535	437	774	2,000
Costa Rica	753	245	569	734	790
Panama	2,146	341	125	126	1,060
T O T A L	6,814	1,121	1,131	1,634	3,850

MAP 3

GROUP III. COUNTRIES IN WHICH MALARIA STILL INCREASING IN ENDEMIC AREAS

GROUP III	Population (1986) Originally malarious area	REGISTERED CASES 1983	1984	1985	1986	
Brazil	59,367	297,687	378,257	401,904	443,627	
French Guiana	84	1,051	1,021	691	979	a)
Guyana	796	2,102	3,017	7,900	16,388	
Paraguay	2,838	49	554	4,568	4,329	
Suriname	296	1,943	3,849	1,635	1,316	
T O T A L	63,381	302,832	386,698	416,698	466,639	

MAP 4

GROUP IV. COUNTRIES WITH SERIOUS SOCIOECONOMIC, POLITICAL, TECHNICAL, ADMINISTRATIVE, AND FINANCIAL PROBLEMS

GROUP IV	Population (1986) Originally malarious area	REGISTERED CASES 1983	1984	1985	1986
Subregion A:					
Haiti	4,925	53,954	69,863	16,662	14,363
Dominican Rep.	6,337	3,801	2,370	816	1,360
Subregion B:					
Belize	171	4,595	4,117	2,800	2,779
El Salvador	4,325	65,377	66,874	44,473	23,953
Guatemala	3,333	64,024	74,132	54,958	42,609
Honduras	4,182	37,536	27,332	33,828	29,130
Mexico	42,570	75,029	85,501	116,016	130,915
Nicaragua	3,371	12,907	15,702	15,130	20,308
Subregion C:					
Bolivia	2,588	14,441	16,338	14,354	20,993
Colombia	19,639	105,360	55,268	55,791	89,251
Ecuador	5,569	51,606	78,599	68,989	51,430
Peru	6,692	28,563	33,724	35,026	36,866
Venezuela	13,951	8,400	12,242	14,305	14,361
TOTAL	117,653	525,593	542,062	473,148	478,318

Table 8

MALARIOMETRIC INDICES - NORTH AMERICA

Group/Country	Total population a)	ABER					API					HSR				
		1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
GROUP I:																
Canadá	25,694	0	0	0	0	0	0.01	0.01	0.01	0.01	0.01	-	-	-	-	-
United States	241,031	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
GROUP IV:																
México	80,971	1.97	2.12	1.42	1.29	1.29	0.68	1.00	1.11	1.47	1.62	11.35	8.17	4.39	3.54	7.63

GROUP I: Countries with no evidence of transmission
GROUP IV: Countries with serious socioeconomic, political, technical, administrative and financial problems.
a) Total population in 1986, in thousands of inhabitants as estimated by PAHO on basis of the United Nations Demographic Yearbook.
ABER: Annual blood examination rate, per 100 inhabitants.
API: Annual parasite rate, per 1000 inhabitants.
HSR: House spraying rate, per 1000 inhabitants.

Table 9

MALARIOMETRIC INDICES - CARIBBEAN

Group/Country	Total population a)	ABER					API					HSR				
		1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
GROUP I:																
Bahamas	234	0	0	0	0.21	0	0.01	0.05	0.01	0	0.01	-	-	-	-	-
Barbados	254	-	0	0	0	0	0	0.01	0.01	0	0.01	-	-	-	-	-
Bermuda	81	-	-	-	0	-	-	-	-	0.01	-	-	-	-	-	-
Cuba	10	3.67	4.04	5.53	8.13	10.75	0.03	0.02	0.04	0.05	0.04	-	-	-	-	-
Dominica	77	-	0	-	0	0.01	-	0	-	0.03	0.01	-	-	-	-	-
Grenada	113	-	0.01	3.92	0.84	1.08	0	0	0	0	0	-	-	-	-	-
Guadaloupe	336	0	0	-	-	-	0	0	-	-	-	-	-	-	-	-
Cayman Islands	20	0.04	0.02	-	-	1.23	0.44	0.17	-	-	0.15	-	-	-	-	-
Virgin Isl. (US)	107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jamaica	2,372	0.19	0.23	0.06	0.02	0.02	0	0	0	0	0	-	-	-	-	-
Martinique	329	0	0	-	0	...	0.02	0	-	0.04	...	-	-	-	-	-
Puerto Rico	3,502	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
Saint Lucia	132	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trinidad & T.	1,204	0.60	0.68	0.54	0.49	0.32	0	0	0.01	0.02	0.01	-	-	-	-	-
GROUP III:																
French Guiana	84	17.85	14.84	14.91	8.33	7.66	16.57	25.01	14.38	8.64	11.65	129.35	0.00	87.89	...	...
Guyana	971	9.73	6.53	3.12	5.58	8.73	1.89	2.29	3.23	8.27	16.88	6.56	6.29	1.34	5.22	7.39
Suriname	380	15.22	16.68	18.98	15.39	13.41	8.01	5.54	10.97	4.42	3.46	49.12	281.37	44.13	21.23	12.61
GROUP IV:																
Belize	167	21.30	19.93	18.99	13.07	12.49	25.79	28.72	25.10	17.50	16.64	106.36	50.29	172.12	143.34	218.28
Haiti	6,758	5.83	5.81	7.14	4.35	3.89	12.57	10.18	12.94	3.20	2.13	5.32	47.78	25.59	34.38	28.78
Dominican Republic	6,386	4.38	5.40	6.73	6.44	6.70	0.81	0.64	0.39	0.13	0.21	5.78	6.22	18.51	0.00	0.00

GROUP I: Countries with no evidence of transmission.
GROUP III: Countries in which malaria still increasing in endemic areas.
GROUP IV: Countries with serious socioeconomic, political, technical, administrative and financial problems.
a) Total population in 1986, in thousands of inhabitants as estimated by PAHO on basis of the United Nations Demographic Yearbook.
ABER: Annual blood examination rate, per 100 inhabitants.
API: Annual parasite rate, per 1000 inhabitants.
HSR: House spraying rate, per 1000 inhabitants.

Table 10

MALARIOMETRIC INDICES - CENTRAL AMERICA AND PANAMA

Group/Country	Total population a)	ABER					API					HSR				
		1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
GROUP II:																
Costa Rica	2,666	5.98	5.05	4.14	4.62	4.27	0.05	0.10	0.023	0.28	0.30	9.39	5.95	5.98	6.78	6.59
Panamá	2,227	20.10	18.99	17.48	16.87	17.44	0.17	0.17	0.06	0.06	0.48	28.54	29.63	22.84	18.71	18.14
GROUP IV:																
El Salvador	5,000	7.03	5.86	5.00	4.15	3.19	17.24	12.50	12.37	9.18	4.18	10.80	0.00	9.00	16.00	8.33
Guatemala	8,195	6.08	5.58	6.45	5.55	5.78	10.05	8.07	9.07	6.90	5.20	104.68	87.74	16.24	62.13	15.82
Honduras	4,514	8.16	8.24	10.68	9.38	9.11	14.53	9.18	6.46	7.73	6.45	59.09	59.58	32.65	32.15	46.79
Nicaragua	2,955	10.15	13.32	13.97	12.99	15.08	5.28	4.16	4.86	4.63	6.00	48.37	18.15	63.54	13.87	22.87

GROUP II: Countries in which malaria transmission has been reduced and a favorable situation maintained.
GROUP IV: Countries with serious socioeconomic, political, technical, administrative and financial problems.
a) Total population in 1986, in thousands of inhabitants as estimated by PAHO on basis of the United Nations Demographic Yearbook.
ABER: Annual blood examination rate, per 100 inhabitants.
API: Annual parasite rate, per 1000 inhabitants.
HSR: House spraying rate, per 1000 inhabitants.

Table 11

MALARIOMETRIC INDICES - ANDEAN GROUP

Group/Country	Total population a)	ABER					API					HSR				
		1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
GROUP IV:																
Bolivia	6,547	2.81	2.49	1.58	1.33	1.56	1.13	2.38	2.61	2.23	3.21	20.69	14.73	8.98	8.74	16.79
Colombia	29,325	1.86	1.95	1.48	1.17	1.63	2.89	3.83	2.01	1.95	3.04	18.63	13.81	15.62	9.82	12.34
Ecuador	9,647	4.30	4.90	4.27	3.95	2.86	1.64	5.58	8.21	7.35	5.33	3.38	10.84	27.81	42.76	5.95
Peru	20,208	1.16	1.20	1.34	1.08	0.91	1.12	1.53	1.76	1.78	1.82	7.26	5.10	14.01	10.22	10.72
Venezuela	17,790	1.61	1.38	1.58	1.59	1.63	0.29	0.51	0.75	0.83	0.81	16.26	11.04	10.96	14.86	14.48

GROUP IV: Countries with serious socioeconomic, political, technical, administrative and financial problems.
a) Total population in 1986, in thousands of inhabitants as estimated by PAHO on basis of the United Nations Demographic Yearbook.
ABER: Annual blood examination rate, per 100 inhabitants.
API: Annual parasite rate, per 1000 inhabitants.
HSR: House spraying rate, per 1000 inhabitants.

Table 12

MALARIOMETRIC INDICES - BRAZIL

Group/Country	Total population a)	ABER					API					HSR				
		1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
GROUP IV:																
Brazil	138,502	2.11	2.22	2.47	2.55	2.43	1.75	2.30	2.85	2.96	3.20	18.41	14.66	14.24	16.53	15.82

GROUP IV: Countries with serious socioeconomic, political, technical, administrative and financial problems.
a) Total population in 1986, in thousands of inhabitants as estimated by PAHO on basis of the United Nations Demographic Yearbook.
ABER: Annual blood examination rate, per 100 inhabitants.
API: Annual parasite rate, per 1000 inhabitants.
HSR: House spraying rate, per 1000 inhabitants.

Table 13

MALARIOMETRIC INDICES - SOUTHERN CONE

Group/Country	Total population a)	ABER					API					HSR				
		1982	1983	1984	1985	1986	1982	1983	1984	1985	1986	1982	1983	1984	1985	1986
GROUP I:																
Chile	12,227	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-
Uruguay	3,035	-	0	-	-	-	-	0	-	-	-	-	-	-	-	-
GROUP II:																
Argentina	31,032	0.10	0.09	0.08	0.08	0.08	0.02	0.02	0.01	0.03	0.06	0.39	0.27	0.21	0.18	0.53
GROUP III:																
Paraguay	3,789	2.80	2.44	3.01	4.00	2.72	0.02	0.01	0.15	1.39	1.14	15.37	13.16	18.55	17.05	12.35

GROUP I: Countries with no evidence of transmission.
GROUP II: Countries in which malaria transmission has been reduced and a favorable situation maintained.
GROUP III: Countries in which malaria still increasing in endemic areas.
a) Total population in 1986, in thousands of inhabitants as estimated by PAHO on basis of the United Nations Demographic Yearbook.
ABER: Annual blood examination rate, per 100 inhabitants.
API: Annual parasite rate, per 1000 inhabitants.
HSR: House spraying rate, per 1000 inhabitants.

Table 14

SLIDES EXAMINED AND POSITIVES BY SPECIES AND CLASSIFICATION
MAINTENANCE PHASE, 1986

Country	Blood slides examined	Total positives	Parasite species				Origin of infection							
			P. falc.	P.vivax	P. mal.	Mixed Inf.	Autoch-thonous	Relaps-ing	Imported From abroad	Imported Other areas	In-duced	Intro-duced	Criptic and un-classif.	Not inves-tigated
Argentina	12,923	795	1	794	-	-	630	13	50	5	1	17	2	77
Brazil	105,058	1,471	449	976	1	45	101	50	11	1,213	3	2	-	91
Cuba	1,088,122	401 a)	252	144	-	-	-	-	364	-	-	37	-	-
Chile	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Dominica	7	1	1	-	-	-	-	-	1	-	-	-	-	-
United States	918	918 b)	233	578	34	3	-	-	909	-	2	7	-	-
Grenada	1,225	0	-	-	-	-	-	-	-	-	-	-	-	-
Guadaloupe	...	...	-	-	-	-	-	-	-	-	-	-	-	-
French Guiana	...	...	-	-	-	-	-	-	-	-	-	-	-	-
Guyana	...	4,662	3,832	832	-	12	31	1	4	1,948	-	8	3	2,681
Jamaica	584	10 c)	7	-	2	-	-	-	10	-	-	-	-	-
Martinique	...	...	-	-	-	-	-	-	-	-	-	-	-	-
Paraguay	5,098	29	-	29	-	-	5	2	1	21	-	-	-	-
Puerto Rico	2	2	...	...	...	...	-	-	2	-	-	-	-	-
Dominican Rep.	351,686	424	423	-	1	-	205	-	88	-	-	2	-	129
Saint Lucia	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Suriname	1	0	-	-	-	-	-	-	-	-	-	-	-	-
Trinidad & Tobago	3,895	18	13	2	3	-	-	-	18	-	-	-	-	-
Venezuela	157,435	9,510 d)	2,152	7,355	-	3	2,312	2	100	348	5	4,541	-	-
T o t a l	1,726,955	18,242	7,363	10,710	41	63	3,284	68	1,558	3,535	11	4,614	5	2,978

... No information available
a) Five cases in Cuba without diagnosis of species. b) USA, 17 cases P. ovale and 53 cases of unknown species.
c) One case P. ovale. d) Classification not stablished for 2,202 cases

Table 15

SLIDES EXAMINED AND POSITIVES, BY SPECIES AND CLASSIFICATION
CONSOLIDATION PHASE, 1986

Country	Blood slides examined	Total positives	Parasite species				Origen of infection							
			P. falc.	P.vivax	P. mal.	Mixed Inf.	Autoch-thonous	Relaps-ing	Imported From abroad	Imported Others areas	In-duced	Intro-duced	Criptic and un-classif.	Not in-vesti-gated
Belize	2,333	286	68	158	-	-	-	-	2	284	-	-	-	-
Brazil	751,651	7,856	3,876	3,870	-	110	861	12	28	6,052	6	213	9	675
Colombia	154,732	5,962	1,478	4,451	9	24	1,130	4	7	-	2	58	298	4,463
Costa Rica	73,294	585	11	572	-	2	386	-	197	2	-	-	-	-
Ecuador	84,888	3,301	730	2,571	-	-	810	1	-	1,724	-	129	-	637
Panama	204,480	76	38	38	-	-	36	-	7	25	-	-	-	8
Paraguay	46,956	573	2	571	-	-	490	2	14	64	-	2	-	1
Dominican Rep.	14,628	89	89	-	-	-	27	-	-	-	-	-	-	62
Suriname	3,838	37	32	4	-	1	-	-	1	14	-	-	-	22
Venezuela	4,314	47	1	46	-	-	1	-	7	27	-	-	-	12
Total	1,341,114	18,812	6,325	12,281	9	137	3,741	19	263	8,192	8	402	307	5,880

Table 16

SLIDES EXAMINED AND POSITIVES, BY SPECIES
ATTACK PHASE, 1986

Country	Blood slides			Parasite species			
	Examined	Positives	%	P. falci parum	P.vivax	P. malariae	Mixed infec.
Argentina	13,422	1,205	8.98	-	1205	-	-
Belize	18,526	2,493	13.46	68	2,425	-	-
Bolivia	101,878	20,993	20.61	1,621	19,319	-	53
Brazil	2,449,154	427,377	17.45	233,710	190,875	4	2,788
Colombia	322,771	83,289	25.80	28,757	54,161	104	267
Costa Rica	37,712	101	0.27	1	100	-	-
Ecuador	190,260	48,056	25.26	11,249	36,807	-	-
El Salvador	182,622	23,953	13.12	2,324	21,558	-	71
Guatemala	432,258	39,872	9.22	1,315	38,527	-	30
French Guiana a)	6,436	979	15.21				
Guyana	...	11,726	-	5,445	6,220	-	47
Haiti	262,582	14,363	5.47	14,363	-	-	-
Honduras	411,150	29,130	7.09	1,111	27,892	-	127
Mexico	1,217,803	130,870	10.75	1,062	129,763	-	45
Nicaragua	510,289	20,308	3.98	1,064	19,212	-	32
Panama	184,005	984	0.53	20	963	-	1
Paraguay	50,426	3,695	7.33	6	3,688	-	1
Peru	184,636	36,866	19.97	68	36,783	15	-
Dominican Rep.	61,367	847	1.38	847	-	-	-
Suriname	37,819	1,092	2.89	807	284	-	1
Venezuela	125,120	4,372	3.49	929	3,439	1	3
T O T A L	6,800,236	902,571	13.27	304,767	593,221	124	3,466

a) Incomplete information.

Table 17

SLIDES EXAMINED AND POSITIVES, BY SPECIES
NONMALARIOUS AREAS, 1986

Country	Blood slides			Parasite species			
	Examined	Positives	%	P. falci parum	P.vivax	P. malariae	Mixed infec.
Bahamas	2	2	100.00	...	...	...	...
Barbados	3	3	100.00	...	...	...	...
Bermuda	1	1	100.00	...	...	...	...
Brazil	58,099	6,923	11.92	2629	4136	4	154
Canada	302	302	100.00	...	...	...	...
Costa Rica	2,714	104	3.83	7	96	0	1
Chile	1	1	100.00	-	1	-	-
Ecuador	717	73	10.18	6	67	-	-
Grenada	2,244	1	0.04	-	1	-	-
Guatemala	21,143	2,737	12.95	72	2,657	-	8
Cayman Islands	246	3	1.22	-	3	-	-
Mexico	45	45	100.00	-	45	-	-
Paraguay	432	32	7.41	1	31	-	-
Dominican Rep.	13	0	0.00	-	-	-	-
Suriname	10,311	187	1.81	161	26	-	-
Venezuela	2,634	432	16.40	49	381	-	2
T O T A L	98,907	10,846	10.97	2,925	7,444	4	165

... Information unavailable.

Table 18

COMPARATIVE RESULTS OF ACTIVE AND PASSIVE DETECTION
UNDER MALARIA PROGRAMS IN THE AMERICAS, 1986

Country	Number of Evaluators	Active case detection			Pasive case detection				TOTAL			
		Blood slides examined	Positives	%	Product. notific. Posts	Blood slides examined	Positives	%	Average monthly slides per post	Blood slides examined	Positives	%
Argentina	98	17,155	805	4.69	214	9,190	1,195	13.00	3.58	26,345	2,000	7.59
Bahamas	-	-	-	-	-	...	2	-	-	2	2	-
Barbados	-	-	-	-	-	...	3	-	-	3	3	-
Belize	11	7,244	603	8.32	259	13,615	2,176	15.98	4.38	20,859	2,779	13.32
Bermuda	-	-	-	-	-	...	1	-	-	1	1	-
Bolivia	61	73,454	9,290	12.65	2,257	28,424	11,703	41.17	...	101,878	20,993	20.61
Brazil	...	1,633,883	50,580	3.10	24,009	1,730,079	393,047	22.72	6.00	3,363,962	443,627	13.19
Canada	-	-	-	-	-	...	302	-	-	302	ERR	-
Colombia	1,346	105,077	8,098	7.71	3,618	372,426	81,153	21.79	8.58	477,503	89,251	18.69
Costa Rica	109	103,906	533	0.51	463	9,814	257	2.62	1.77	113,720	790	0.69
Cuba	-	-	-	-	-	1,088,122	401	0.04	-	ERR	ERR	ERR
Chile	-	-	-	-	-	2	2	-	-	2	2	-
Dominica	-	-	-	-	-	7	1	14.29	-	ERR	ERR	ERR
Ecuador	...	16,154	641	3.97	3,360	259,711	50,789	19.56	6.44	275,865	51,430	18.64
El Salvador	95	9,476	513	5.41	2,563	173,146	23,440	13.54	5.63	182,622	23,953	13.12
United States	-	-	-	-	-	918	918	-	-	ERR	ERR	ERR
Grenada	-	-	-	-	-	3,469	1	0.03	-	ERR	ERR	ERR
Guatemala	84	16,519	1,960	11.87	7,042	436,882	40,649	9.30	5.17	453,401	42,609	9.40
French Guiana a)	...	...	...	...	...	...	...	...	...	6,436	979	15.21
Guyana a)	44	...	...	...	...	...	...	...	...	84,763	16,388	19.33
Haiti a)	...	...	...	...	...	...	...	...	...	262,582	14,363	5.47
Honduras	138	357,766	28,326	7.92	...	53,384	804	1.51	...	411,150	29,130	7.09
Cayman Islands	-	-	-	-	-	246	3	1.22	-	246	ERR	ERR
Jamaica	-	-	-	-	-	584	10	1.71	-	ERR	ERR	ERR
Mexico	1,019	243,561	29,959	12.30	6,699	974,287	100,956	10.36	12.12	1,217,848	130,915	10.75
Nicaragua	179	85,574	458	0.54	2,400	424,715	19,850	4.67	14.75	510,289	20,308	3.98
Panama	297	184,958	790	0.43	212	203,527	270	0.13	80.00	388,485	1,060	0.27
Paraguay	...	46,571	1,134	2.43	793	56,341	3,195	5.67	5.92	102,912	4,329	4.21
Peru	33	65,240	5,238	8.03	574	119,396	31,628	26.49	23.11	184,636	36,866	19.97
Puerto Rico	-	-	-	-	-	2	2	-	-	2	2	100.00
Dominican Rep.	167	337,160	975	0.29	3,112	90,534	385	0.43	2.42	427,694	1,360	0.32
Suriname	45	20,108	167	0.83	49	30,861	1,149	3.72	52.48	50,969	1,316	2.58
Trinidad & Tob.	-	-	-	-	-	3,895	18	-	-	ERR	ERR	ERR
Venezuela	714	191,739	4,246	2.21	489	97,765	10,115	10.35	22.21	289,504	14,361	4.96
T o t a l	-	3,515,545	144,316	4.11	-	6,181,342	774,425	12.53	-	10,050,976	950,471	9.46

a) Incomplete information

Table 19

INSECTICIDES USED IN THE MALARIA PROGRAMS, 1986 AND ESTIMATED 1987

Country	D D T (Kg)				DDT (Liters)		Propoxur 50% (Kg.)		Fenitrothion 40% (Kg.)		O t h e r s	
	1986		1987		1986	1987 (Est.)	1986	1987 (Est.)	1986	1987 (Est.)	1986	1987 (Est.)
	100%	75%	100%	75%								
Argentina	278	6,938	-	-	-	-	-	-	-	-	-	-
Belize	7,500	15,000	-	-	-	-	-	-	-	-	-	-
Bolivia	-	57,408	-	-	-	-	-	-	-	-	-	-
Brazil	76,036	1,430,375	180,000	1,800,000	11,000	30,000	-	-	-	-		
Colombia	1,214	177,209	8,000	400,000	-	-	-	-	24,639	30,000	913.00 a)	-
Costa Rica	-	-	-	-	-	-	322	500	-	-	10,442 b)	20,000 b)
Ecuador	12	105,694	-	100,000	-	-	-	-	38,942	120,000	9,820 c)	15,000 c)
El Salvador	-	-	-	-	-	-	30,476	60,000	-	-	9,997 d)	14,800 d)
Guatemala	-	-	-	-	-	-	-	-	-	-	11,742 e)	87,430 e)
French Guiana	...	... ..	...	...	...	...	...	...	...	...	...	...
Guyana	-	2,700	-	4,000	-	-	-	-	-	-	-	-
Haiti	-	-	-	-	-	-	-	-	164	228	-	-
Honduras	-	-	-	-	-	-	-	-	202,823	200,000	99,129 c)	100,000 c)
Mexico	9,000	9,400	341,275	350,000	-	-	-	-	-	-	9,855 f)	12,000 f)
Nicaragua	-	3,377	-	17,243	-	-	33,236	56,028	-	-	9,809 g)	15,280 g)
Panama	12,046	20,000	5,000	20,000	-	-	1,367	10,000	1,146	10,000	-	-
Paraguay	-	18,351	-	60,000	-	-	-	-	2,177	23,500	-	10,000 h)
Peru	-	153,802	-	1,060,000	-	-	-	-	4,000	8,000	-	-
Dominican Rep.	-	-	-	-	-	-	-	-	-	-	-	-
Suriname	271	399	200	400	-	-	-	-	-	-	-	-
Venezuela	-	107,280	-	108,353	31,246	34,371	3,761	4,137	74,462	81,908	48,760 i)	53,636 i)
T O T A L	106,357	2,107,933	534,475	3,919,996	42,246	64,371	69,162	130,665	348,353	473,636	210,467	328,146

a) Kg. of K-Otrina at 25%. b) In 1986 includes, 8,642 Kg. de Malathion 11 50% and 1,000 l. of liquid malathion at 57%, and in 1987 an estimated 15,000 Kg. of malathion and 5,000 l. of malathion.
c) Liters of fenitrothion at 50%. d) In 1986 includes 2,650 l. of pyrethroids, 912 l. of Abate emulsion and 6,435 lb. of granular Abate, and in 1987 an estimated 5,600 l. of Pyrethroids, 1,200 l. of Abate emulsion and 8,000 lb. of granular Abate,
e) In 1986 includes 10,862 Kg. of Deltamethrin at 5% and 880 Kg. of Cyflutrin at 10%. f) kg. of bendiocarb at 80%. g) In 1986 includes 5,913 Kg. of Deltamethrin and 3,896 Kg. of Clorfoxim, and in 1987 an estimated 10,122 Kg. of deltamethrin and 5,158 Kg. of Clorfoxim. h) Liters of malathion. i) In 1986 includes 39,222 l. of pencothion 25%, 9,354 l. pencothion, 10,289 l. of Folithion, and 185 l. of K'otrina.

Table 20

SPRAYINGS OF RESIDUAL INSECTICIDES IN 1985 AND 1986
IN COUNTRIES OF THE AMERICAS

Country	Sprayings in 1985				Sprayings in 1986			
	DDT	PROPOXUR	FENI-TROTHION	OTHERS	DDT	PROPOXUR	FENI-TROTHION	OTHERS
Argentina	5,374	-	-	-	16,381	-	-	-
Belize	22,935	-	-	-	36,452	-	-	-
Bolivia	56,205	-	-	-	109,926	-	-	-
Brazil	2,241,251	-	-	-	2,190,413	-	-	-
Colombia	250,531	-	5,602	24,855 a)	341,455 b)	-	20,955	-
Costa Rica	2,955	1,076	-	13,783 c)	-	856	-	16,703 c)
Ecuador	322,948	-	38,753	39,459 a)	4,270 a)	-	52,983	-
El Salvador	-	77,497	-	-	-	47,684	-	-
Guatemala	-	-	131,314	363,339 d)	-	-	-	129,627 d)
French Guiana	... ...	...	...	...	... ...	...	...	...
Guyana	4,982	-	-	-	7,179	-	-	-
Haiti	-	-	179,230	-	-	-	194,512	-
Honduras	5,629	952	134,212	-	2,257	9,331	199,626	-
Mexico	278,628	-	-	-	520,017	-	10,764	87,049 e)
Nicaragua	17,610	-	13,626	14,120 d)	6,313	41,544	-	29,566 d)
Pamama	30,980	5,700	4,122	-	31,021	5,243	4,128	-
Paraguay	42,712 a)	-	-	13,277 c)	-	-	-	46,813 f)
Peru	201,473	-	-	-	216,665	-	-	-
Dominican Rep.	- -	-	-	-	-	-	-	-
Suriname	7,835	-	-	-	4,790	-	-	-
Venezuela	257,598	-	-	-	243,767 g)	-	-	-
T O T A L	3,749,646	85,225	483,509	468,833	3,730,906	104,658	482,968	309,758

a) Includes sprayings of DDT and fenitrothion. b) Includes sprayings of DDT, deltamethrin and fenitrothion. c) Sprayings of malathion. d) Sprayings of deltamethrin. e) Sprayings of bendiocarb. f) Includes sprayings of sumithion 40%, malathion 96%, and DDT 75%. g) Sprayings of DDT down to September.

Table 21

INDOOR RESIDUAL SPRAYINGS IN 21 COUNTRIES

Insecticide	1983		1984		1985		1986	
	Number of countries	Sprayings	Number of countries	Sprayings	Number of countries	Sprayings	Number of countries	Sprayings
DDT	18	3,629,088	18	3,725,155	16	3,749,646	13	3,730,906 b)
FENITROTHION	5	1,027,150	6	524,279	9	547,823 a)	6	529,781 c)
PROPOXUR	4	13,942	3	78,972	4	85,225	5	104,658
CLORFOXIM	2	52,863	1	103,500	-	-	-	-
MALATHION	2	40,404	1	2,263	2	27,060	1	16,703
CARBARIL	1	...	-	-	-	-	-	-
DELTAMETHRIN	1	...	2	62,713	2	377,459	2	159,193
HCH	-	-	-	-	-	-	-	-
DIELDRIN	-	-	1	2,916	1	-	-	-
BENDIOCARB	-	-	-	-	-	(d)	1	87,049 e)
T O T A L	-	4,763,447	-	4,499,798	-	4,787,213	-	4,541,241

... Data unavailable.
a) Figures for Colombia and Venezuela included in DDT sprayings. b) Includes sprayings of DDT and fenitrothion for two countries and of DDT, fenitrothion and deltamethrin for one other country. c) Includes sprayings of fenitrothion, malathion and DDT for Paraguay. d) The number of dieldrin sprayings in Venezuela is included in the DDT sprayings. e) Mexico.

Table 22

USE OF ANTIMALARIAL DRUGS IN 21 COUNTRIES OF THE AMERICAS, 1982-1986

Drug		QUANTITIES				
		1982	1983	1984	1985	1986
4-Aminoquinolines:						
Chloroquine 150 mg.	Tabs.	26,945,700	24,627,900	35,092,360	44,296,200	29,729,100
Amodiaquine 150 mg.	Tabs.	6,018,400	6,628,800	9,382,000	9,943,000	13,356,000
8-Aminoquinolines:						
Primaquine 15 mg.	Tabs.	4,623,900	7,097,300	10,058,800	8,375,900	8,756,100
Primaquine 05 mg	Tabs.	3,921,400	3,340,700	5,055,700	3,352,800	5,600,900
Chloroquine/Primaquine (150/15)	Tabs.	9,340,200	10,706,500	10,521,400	8,410,400	7,036,900
Chloroquine/Primaquine (75/7.5)	Tabs.	5,779,400	4,990,200	3,219,300	2,268,700	1,485,600
Pyrimethamine 25 mg.	Tabs.	1,617,100	650,200	121,600	315,200	392,100
Sulfadoxine 500 mg.	Tabs.	425,600	181,100	109,030	130,671	854,500
Sulfadoxine/Pyrimethamine	Tabs.	104,400	464,400	527,050	742,755	1,246,500
Chloroquine/Pyrimethamine	Tabs.	187,400	143,000	23,600	797,790	13,000
Amodiaquine/Primaquine	Tabs.	-	1,360,000	110,000	44,600	-
Mefloquine	Tabs.	-	-	-	-	13,600
Paludrine	Tabs.	-	4,000	11,000	4,000	12,000
Tetracycline	Tabs.	-	-	810	1,666	3,624
Lapudrine 20 mg.	Tabs.	-	-	-	14,000	10,000
Quinine/Sulfate (200,300 & 500 mg)	Tabs.	-	272,600	416,300	532,461	909
Quinine	Kilos	-	10	10	-	-
Quinine - Sulfate	Ampolletas	900	-	13,800	11,300	-

Table 23

USE OF ANTIMALARIAL DRUGS IN 1986 AND REQUIREMENTS FOR 1987

Country	Chloroquine 150 mg.		Primaquine 15 mg.		Primaquine 05 mg		Chloroquine/Primaquine combined Adult doses		Chloroquine/Primaquine combined Infant doses		Pyrimethamine 25 mg		Fanasil 500 mg	
	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)
Argentina	10.1	10.0	11.3	5.0	5.2	5.0	-	-	-	-	-	-	-	-
Belize	130.0	140.0	53.0	57.0	43.0	43.0	-	-	-	-	-	-	-	-
Bolivia	899.7	1,500.0	583.9	750.0	350.0	450.0	-	-	-	-	-	-	-	-
Brazil	16,600.0 b)	17,000.0 b)	3,200.0	4,500.0	900.0	1,500.0	300.0	600.0	300.0	600.0	-	-	-	-
Colombia	1,580.0 b)	2,000.0 b)	385.3	800.0	46.2	60.0	150.0	1,000.0	-	-	303.3	200.0	-	-
Costa Rica	785.0	1,000.0	105.0	200.0	75.0	100.0	65.5	200.0	7.7	50.0	-	-	-	-
Ecuador	100.8	1,900.0	282.3	463.5	152.0	250.0	-	150.0	-	15.0	10.2	5.0	30.5	-
El Salvador	295.8	621.0	24.4	152.0	234.0	76.0	2.7	3.9	270.1	889.0	5.5	6.0	-	-
Guatemala	2,446.4	4,500.0	265.0	1,200.0	398.0	500.0	667.0	800.0	48.0	60.0	-	-	-	-
French Guiana	5.0	...	4.0	...	...	...	...	...	...	...	...	...	...	...
Guyana	333.0	600.0	185.0	300.0	26.0	-	17.0	-	76.0	-	19.0	-	24.0	-
Haiti	1,226.0	- -	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	2,720.0	2,500.0	963.0	1,200.0	850.0	1,050.0	600.0	1,200.0	31.0	60.0	-	-	-	-
Mexico	7,407.0	13,550.0	943.0	1,708.0	1,571.0	2,848.0	2,805.0	3,620.0	491.0	682.0	-	-	-	-
Nicaragua	4,585.0	6,000.0	1,099.0	1,000.0	618.0	600.0	-	-	-	-	-	-	-	-
Panama	88.0 b)	620.0 b)	66.0	100.0	17.0	25.0	115.0	200.0	23.0	50.0	17.0	25.0	800.0	-
Paraguay	359.0	2,570.0	44.3	165.0	16.3	33.0	-	-	-	-	-	-	-	-
Peru	1,060.2	2,400.0	341.0	420.0	202.1	280.0	-	-	-	-	-	-	-	-
Dominican Rep.	934.6	...	6.1	...	1.0	...	905.6	...	3.5	...	...	...	...	...
Suriname	159.0 b)	200.0 b)	8.0	10.0	1.0	4.0	-	-	-	-	-	-	-	-
Venezuela	1,360.5	3,460.0 b)	186.5	150.0	95.1	120.0	1,409.1	1,040.0	235.3	600.0	37.1	70.0	-	-
TOTAL	43,085.1	60,571.0	8,756.1	13,180.5	5,600.9	7,944.0	7,036.9	8,813.9	1,485.6	3,006.0	392.1	306.0	854.5	0.0

a) Estimates. b) Includes Amodiaquine 150 mg.

TABLE 23 (Pag. 2)

Country	Sulfadoxine/Pyrimet. Fansidar		Chloroquine/Pyrimeth. Darachlor		Mefloquine		Quinine sulfate 500 mg.		Quinine ampoules		Quinine capsules	
	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)	1986	1987 a)
Argentina	-	-	-	-	-	-	-	-	-	-	-	-
Belize	-	-	-	-	-	-	-	-	-	-	-	-
Bolivia	6.5	10.0	-	-	-	-	-	-	-	-	-	-
Brazil	1,050.0	1,500.0	-	-	13.6	300.0	850.0	1,500.0	-	-	-	-
Colombia	162.5	150.0	-	-	-	-	-	-	14.3	15.0	6.0	10.0
Costa Rica	-	-	-	-	-	-	-	-	-	-	-	-
Ecuador	3.9	26.0	-	-	-	-	-	-	-	-	-	-
El Salvador	-	-	-	-	-	-	-	-	-	-	-	-
Guatemala	-	-	-	-	-	-	-	-	-	-	-	-
French Guiana	...	...	1.0	...	...	...	... ..	... ..	...	...	...	...
Guyana	24.0	100.0	12.0	-	-	-	55.0 c)	400.0 c)	1.0	5.0	60.0	-
Haiti	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	-	-	-	-	-	-	-	-	-	-	-	-
Mexico	-	-	-	-	-	-	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	-	-	-	-	-	-	-
Panama	-	-	-	-	-	-	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-	-	-	-	-	-	-
Peru	-	-	-	-	-	-	-	-	-	-	-	-
Dominican Rep.	...	...	...	...	...	...	... ..	... ..	...	...	...	...
Suriname	4.0	8.0	-	-	-	-	-	- -	-	-	-	-
Venezuela	2.1	5.0	-	-	-	-	-	2.4	-	-	-	-
T O T A L	1,253.0	1,799.0	13.0	0.0	13.6	300.0	905.0	1,902.4	15.3	20.0	66.0	10.0

a) Estimates. c) Quinine sulfate 300 mg.
Guyana also requires 2,000 tablets tetracycline 200 mg in 1986 and 198[illegible]
Suriname also estimates 12,000 tabs. paludrine 100 mg, 10,000 tabs. lapudrine 20 mg, 4,000 caps. quinine/tetracycline 250 mg, and 3,000 caps. quinine 200 mg.

FIGURE 1

MALARIOMETRIC RATES IN 21 COUNTRIES
IN THE REGION OF THE AMERICAS

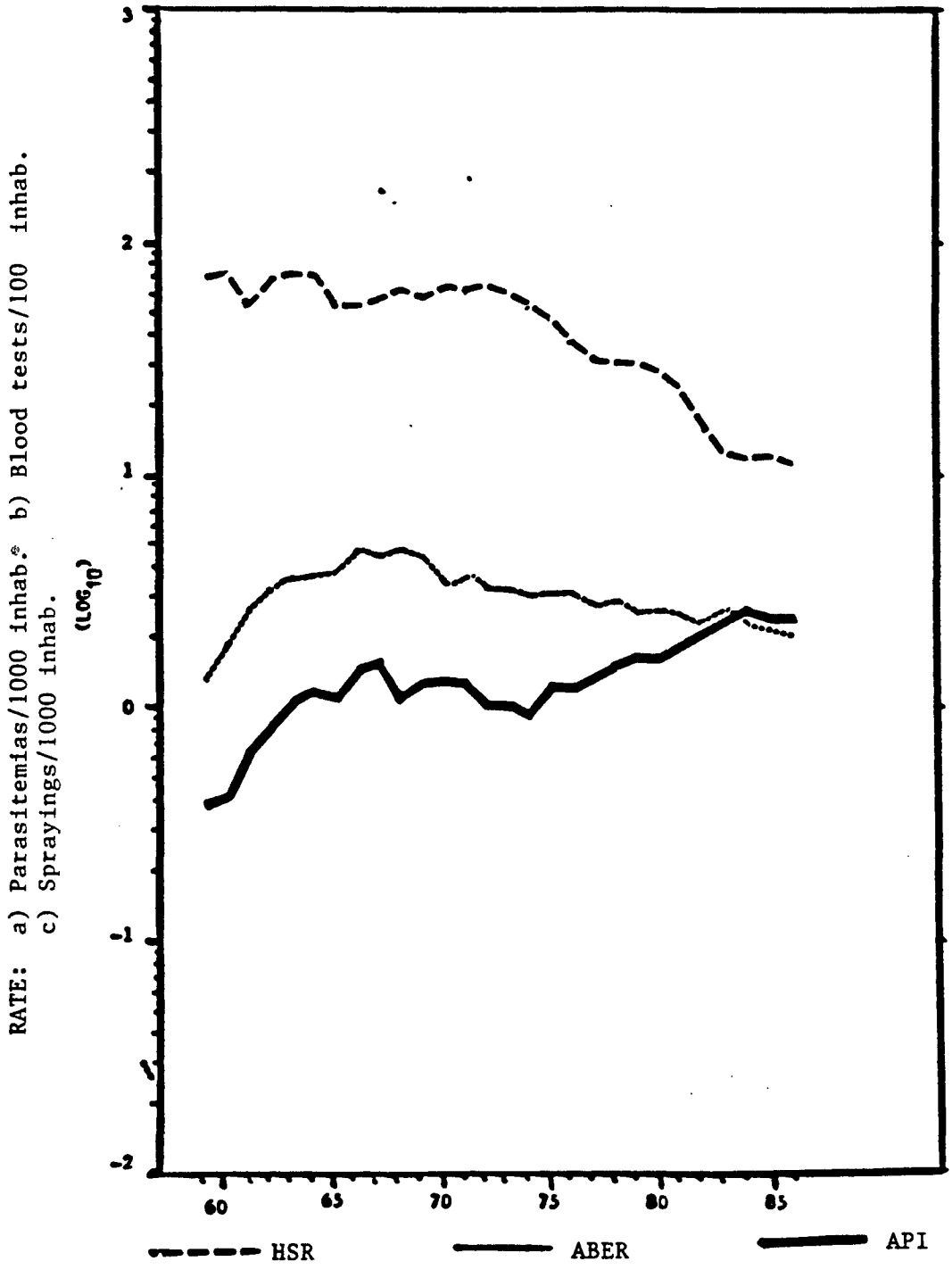

Table 24

PERSONNEL EMPLOYED IN MALARIA PROGRAMS IN THE AMERICAS
1985 AND 1986

Category	1985	1986
Engineers	39	49
Spraying chiefs	452	494
Sector chiefs	565	541
Squad chiefs	1,342	1,445
Spraymen	8,464 b)	6,627 b)
Draftsman	51	54
Medical officers	111	139
Entomologists	54	57
Assistant entomologists	301	269
Statisticians & statist. assist.	459	387
Evaluation inspectors	2,384 b)	2,125 b)
Evaluators	7,666 b)	7,769 b)
Microscopists	1,127	1,207
Administrators	51	51
Administrative assistants	266	303
Accountants	43	37
Disbursing officers	29	39
Storekeepers	58	52
Storekeepers' assistants	39	43
Secretaries	237	209
Other	327	416
Transport chiefs, Mechanics and Assistant mechanics	212	229
Drivers	867	1,011
Motorboat operators	234	256
Boatmen	56	60
T O T A L	25,434	23,869

a) The administration of some malaria programs is under the national health services.

b) In some programs this personnel performs larvicide sprayings and does epidemiological work.

Table 25

NATIONAL AND INTERNATIONAL CONTRIBUTIONS TO MALARIA PROGRAMS

Country	Country expenditures a)			Loans and grants			PAHO/WHO regular funds	
	1985	1986	1987	1985	1986	1987	1984-85 b)	1986-1987 c)
Argentina	144,307	260,216	248,618	-	-	-	-	179,200 d)
Belize	300,505	297,500	297,500	-	-	-	17,908	27,300 e)
Bolivia	5,550	...	...	176,161	...	...	138,250	440,600 d)
Brazil	86,056,600	62,409,005	11,642,304	7,792	1,575,889	...	346,850	665,800 f)
Colombia	8,983,623	8,694,543	3,164,050	-	-	...	378,870	316,900 e)
Costa Rica	1,214,583	1,116,696	1,069,822	-	-	...	-	-
Ecuador	40,363	30,092	22,807	9,465	4,973	4,974	-	594,600 d)
El Salvador	1,096,360	969,242	1,215,090	-	-	-	151,892	203,500 f)
Guatemala	1,002,179	1,815,858	2,852,476	-	-	-	115,412	164,100 f)
Fr. Guiana	1,288,095	...	...	-	-	-	-	-
Guyana	123,908	1,400,000	420,841	-	-	-	110,804	160,300 f)
Haiti	39,280	39,312	...	-	220,000	356,600	495,280	600,900 f)
Honduras	3,397,476	3,397,476	2,565,520	329,404	329,702	465,000	-	-
Mexico	3,167,641	...	...	-	-	-	41,080	194,100 f)
Nicaragua	...	...	...	-	-	-	-	292,500 d)
Panama	2,193,961	2,321,980	3,340,564	-	-	-	16,000	34,300 e)
Paraguay	1,545,459	1,043,859	1,155,267	-	-	-	19,772	102,100 d)
Peru	892,908	...	...	15,000	...	...	-	1,315 f)
Domin. Rep.	402,773	485,567	...	-	-	-	-	465,900 d)
Suriname	...	...	...	-	-	-	-	64,500 d)
Venezuela	6,054,939	13,506,695	13,640,029	-	-	-	-	168,400 d)
Regional projects	-	-	-	350,000	1,680,400	1,200,000	758,000	2,940,500 g)
Total	117,950,510	97,788,041	41,634,888	887,822	3,810,964	2,026,574	2,590,118	7,616,815

a) Conversion to US dollars at official exchange rate of each year, spent in 1985 and 1986, and estimated for 1987. b) Estimate based on expenditures for the malaria program during the biennium 1984-1985. c) Figures from Official Document 210, PAHO/WHO. d) Amount allocated to Communicable Diseases Program, including malaria. e) Malaria is included under vector control. f) Malaria alone. g) Includes MAL/ICP and MCP projects plus 50% of the funds assigned to VBC.

Table 26

GEOGRAPHICAL AREAS WITH TECHNICAL PROBLEMS, 1986

Country and areas	Population of affected areas	Area km2	Insecticide		Number of cases	Principal vectors	Causes of the problem
			Type used	Years of coverage			
Argentina: Tartagal, Oran Iruya, Santa Victoria (areas de frontera)	93,879	11,275	DDT	27	1205	A. pseudopunct.	Internal & external migrations, difficult access to affected areas; climatological and socio-economic problems; international borders
Bolivia: Departamento Beni Prov. Vaca Diez a)	56,706	22,434	DDT	28	3031	A. darlingi	Migrations; poor housing; insufficient insecticide coverage; P.falciparum resistance to 4-aminoquinolines
Brasil: Acre, Amapa, Amazonas, Goias, Maranhao, Mato Grosso, Para, Rondonia, Roraima	15,728,555	5,112,940	DDT	19	424,527	A. darlingi	Intense population movements; poor housing; P. falciparum resistance high anophelinic density
Colombia: Magdalena Medio; Catatumbo; Sarare; Amazonia; Litoral Pacifico; Uraba; Bajo Cauca	1,995,863	305,659	DDT Prop. Malat. Fenit.	20 a 27	60,740	A. darlingi A. nunestovari A. albimanus A. evansae A. neivai	Low spraying coverage; social problems; vectors and parasite resistance; poor housing; colonization and lack of coverage because of social problems
Ecuador: These areas are not properly defined. Epidemiological evaluation will identify areas with technical problems a measure to be adopted. ...							
El Salvador: Costa del Pacifico	856,056	4,819	Propoxur	9	21,198	A. albimanus	Vector resistance to almost all insecticides; population movements; poor housing; lack of human, material and financial resources
Subtotal	18,731,059	5,457,127	-	-	510,701	-	

a) Bolivia population figures are for 1983

Table 26 (Pag. 2)

GEOGRAPHIC AREAS WITH TECHNICAL PROBLEMS, 1986

Country and areas	Population of affected areas	Area km2	Insecticide		Number of cases	Principal vectors	Causes of the problem
			Type used	Years of coverage			
Guatemala:							
Zonas Norte, Sur y Centro-Oriental	1,242,914	80,350	Prop. Clorf. Fenit. Deltam.	De 4 a 6	42,602	A. albimanus A. vestitipennis A. darlingi A. vestitipennis	Vector resistance to insect. Population movements; insufficient funds; insufficient insecticides.
Guayana Francesa:							
Twanke, Antecome, Maripo-soula, Grand Santi, Camopi, Trois Sauts, St. George, Ramire, Montjoly, Macouria and Montsinery	11,360	217	DDT	De 4 a 16	759	A. darlingi	Internal and external migrations
Guyana:							
Rupununi, Region Noroeste, Mazaruni/Cuyuni/Potaro Pomeroon	69,564	34,200	DDT	Mas de 20	...	A. darlingi	Receptivity and vulnerability nomadism
Haiti:							
No hay informacion	...	...	...	...	...	...	...
Honduras:							
No hay informacion	...	...	...	...	...	...	...
Mexico:							
Estados de: Campeche, Chiapas, Guerrero, Michoa-can, Nayarit, Oaxaca Puebla, Quintana Roo, Sinaloa y Tabasco	19,792,151	539,385	DDT y dieldrin	29	115,213	A. psudopunct. A. albimanus	Considerable increase of materials and equipment; vector resistant to DDT; behavior of vector and human popula-tion; inappropriate housing, internal and external migration; diagnosis and treatment of cases not made in time and number.
Subtotal	21,115,989	654,152	-	-	158,574	-	

Table 26 (Pag. 3)

GEOGRAPHIC AREAS WITH TECHNICAL PROBLEMS, 1986

Countries and areas	Population of affected areas	Area ka2	Insecticide		Number of cases	Principal vectors	Causes of the problem
			Type used	Years of covrage			
Nicaragua: Depto. Chinandega, Leon Managua. Depto. Granada y Rivas	3,371,290	118,358	DDT Propoxur Deltam.	27 17 5	20,308	A. albimanus A. pseudopunct.	Technical administrative problems Migrations, military conflict; economic crisis
Panama:	7,516	1,718	Propoxur Fenit-	12 2 y 3	146 661	A. albimanus	Migrations; poor housing;
Paraguay: Area especial, Zona II y Zona III (Parte Depto.	245,122	20,000	DDT	16	241	A. darlingi	Residual foci; internal and external migration; construction of lakes and hydroelectric daes
Republica Dominicana: No hay informacion	...	...	...	...	...	...	...
Peru: Colon. San Lorenzo; Bigote, Chinchipe, Bagua Santiago, Ene-Satipo, Bajo Maranon Pucalpa	248,527	143,350	DDT	20-25	11,403	A. albimanus A. pseudopunct. A. rangeli A. benarrochi	High vulnerability; poor housing; migration of laborers; temporary shelters; agressions to sprayed surfaces; insufficient coverage
Venezuela: Areas Occidental y Meridional	616,305	139,603	DDT	39	3,399	A. nuneztovari A. darlingi	Vector exophily; population movements; antropological problems
Subtotal	4,488,760	423,029	-	-	36,158	-	-
T o t a l	44,335,808	6,534,308	-	-	705,433	-	-

Note: In the Americas, there are also regions with all types of special characteristics, such as the Amazon basin which includes areas of Bolivia, Colombia, Peru and large extensions of Brazil; in the latter country, for example, a large scale plan for socio-economic development which contemplates construction of unlimited number of highways and projects of colonization, makes it necessary that anti-malarial campaign be carried out as long-term program.

Table 27

INTERNATIONAL TRAINING ACTIVITIES, 1986

Number of participants in international courses

Country	Vector control	Malario-logy	Entomo-logy	Insect appli. & eqmt. handl.	Nal. mgt. & control methds	Educnl. tech.	Research methods	Malaria epidem.	Immun-ology	Total
Argentina	-	-	-	-	-	-	-	-	-	-
Belize	20	-	-	-	-	-	2	-	-	22 a)
Bolivia	-	1	1	-	-	-	-	-	-	2
Brazil	-	-	-	-	-	-	-	-	-	0
Colombia	1	21	-	-	-	-	-	-	-	22
Costa Rica	1	-	1	1	3	8	3	-	-	17 a)
Ecuador	5	1	2	-	-	-	-	-	1	9 a)
El Salvador	1	2	1	-	-	6	-	-	-	10 a)
Guatemala	1	-	-	1	-	-	3	-	-	5 a)
French Guiana	-	-	-	-	-	-	-	-	-	0
Guyana	-	-	-	-	-	-	-	-	-	0
Haiti	-	-	1	1	-	-	-	-	-	2 a)
Honduras	-	1	-	1	3	6	-	-	-	11 a)
Mexico	1	-	-	-	-	-	-	-	-	1
Nicaragua	-	-	-	-	-	2	6	-	-	8
Panama	1	-	2	1	3	6	3	-	-	16 a)
Paraguay	10	-	-	-	-	-	-	6	-	16
Peru	1	1	-	-	-	-	-	-	-	2
Dominican Rep.	-	-	-	1	-	-	-	-	-	1
Suriname	-	-	-	-	-	-	-	-	-	-
Venezuela	1	-	-	-	-	-	-	-	-	1
T O T A L	43	27	8	6	9	28	17	6	1	145

a) USAID fellowships.

Table 28

TRAINING ACTIVITIES IN COUNTRIES, 1986

Country	Parasit Lab. Microscop.		Malaria epidem.		Ento-mology		Insect eqmnt. handl.		Mal. cntrl. Prog. mgmnt.		Vector control		Clin. mgmnt of mal.		Vol. & comm. collabn.		research methods		TOTAL	
	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P
Argentina	4	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	101
Belize	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	1	2
Bolivia	1	105	-	-	1	12	-	-	-	-	1	180	-	-	-	-	-	-	3	297
Brazil	-	-	2	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	55
Colombia	-	-	3	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	65
Costa Rica	-	-	-	-	-	-	-	-	-	-	1	140	-	-	-	-	-	-	1	140
Ecuador	-	-	1	26	-	-	-	-	1	113	-	-	1	155	-	-	1	22	4	316
El Salvador	-	-	1	25	-	-	1	25	-	-	-	-	-	-	-	-	-	-	2	50
Guatemala	-	-	3	60	-	-	-	-	1	5	-	-	-	-	-	-	-	-	4	65
French Guiana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Guyana	2	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	24
Haiti	1	15	2	60	-	-	1	69	1	10	1	24	-	-	-	-	-	-	6	178
Honduras	-	-	4	130	1	18	2	25	-	-	-	-	-	-	14	305	-	-	21	478
Mexico	-	-	2	42	-	-	-	-	-	-	1	30	-	-	-	-	-	-	3	72
Nicaragua	1	30	1	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	70
Panama	-	-	9	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	208
Paraguay	-	-	4	283	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	283
Peru	3	57	1	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	78
Dominican Rep.	1	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8
Suriname	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
Venezuela	...	20	1	2	-	-	...	20	-	-	-	-	-	-	-	-	-	-	1	42
T O T A L	13	360	34	1,017	2	30	4	139	4	130	4	374	1	155	14	305	1	22	77	2,532

C = Number of courses.
P = Number of participants.