directing council

PAN AMERICAN HEALTH ORGANIZATION

XXVI Meeting

regional committee

WORLD HEALTH ORGANIZATION

XXXI Meeting

Washington, D.C.
September-October 1979

Provisional Agenda Item 30

CD26/12 (Eng.)
2 August 1979
ORIGINAL: SPANISH

HEMISPHERIC PLAN FOR THE PROMOTION AND SUPPORT OF MALARIA PROGRAMS

The XX Pan American Sanitary Conference adopted Resolution XVIII which urged the Governments and the Organization to orient the work of the III Meeting of Directors of National Malaria Eradication Services in the Americas towards the formulation of a hemispheric plan of action against malaria. This resolution also requested support for research and training activities, the convening of a meeting to study the problems of the reinfestation of malaria-free areas and their solution, and emphasized that malaria eradication was the objective of the program in the Americas. In order to expedite the activities of this program, 1980 was declared "Year of Frontal Struggle with Malaria in the Americas."

In the light of these directives, the III Meeting of Directors of National Malaria Eradication Services in the Americas, which met in Oaxtepec, State of Morelos, Mexico, from 26 to 31 March 1979, laid the basis for the development of a hemispheric plan of action against malaria covering the following aspects:

a) Epidemiological stratification of malarious areas, based on an analysis of physical, ecological, epidemiological, sociocultural and economic characteristics, area by area, to determine action priorities and to select the most appropriate attack measures.

b) Selection and application of malaria measures, based on the above-mentioned epidemiological stratification and bearing in mind the operational constraints.

c) Financing of the program with national and international funds, including the use of legislative measures to ensure that the public or private entities of the sector that are executing development works contribute sufficient funds for the prevention of malaria or its treatment in the other sectors and in their area of influence.

d) Field research to clarify or solve existing problems and to develop new measures.

e) Education and training of personnel, based on better use of existing teaching resources and field research which should be strengthened, when necessary, to obtain a network of centers for the training of professional and teaching personnel in the fields of epidemiology of metaxenous diseases, medical entomology, malaria engineering, and public health administration.

The keystone of the proposed action plan is the revision of national programs with a view to the epidemiological stratification of their malarious areas and the selection and application of malaria measures geared to local conditions. The formulation of a hemispheric plan based on these principles is conceived as the blending of various national plans tailored to the special characteristics of each country, both from the epidemiological, operational, cultural, anthropological, and sociological points of view, as well as from that of the human and material resources available.

Some countries, particularly those with more serious problems, have been taking steps to develop malaria strategies geared to local conditions. After the Oaxtepec meeting, a number of other countries began exhaustive reviews of their programs on the above-mentioned bases. Special mention should be made of the reviews of the programs of Colombia and Haiti by international multidisciplinary groups with the assistance of the Organization.

It is to be hoped that the countries affected by malaria will focus their attention in 1980, which has been declared the "Year of Frontal Struggle with Malaria," on completing the reformulation of their national plans. Subject to the availability of funds, the Organization will carry out the following activities:

1. Cooperation in national multidisciplinary reviews of the malaria strategy, as well as in national seminars and meetings for reorienting program staff in the new methods.

2. Meeting of a working group to exchange experiences gained in the countries that have initiated epidemiological stratification studies and to prepare methodological guidelines, subject to the possibility of obtaining financial support.

3. Convocation of a study group to draw up a regional plan of research on malaria.

4. Preparation and development of a hemispheric program for manpower development in the various disciplines necessary for the execution of a

malaria program. This program will consist in the identification of a network of training centers established through the coordination, promotion and support of all the existing resources in the Region.

5. Promotion and coordination of technical cooperation among developing countries and contacts with possible donors of funds and other resources for strengthening malaria activities.

6. Collection and dissemination of information. The Oaxtepec meeting recommended the establishment of a regional information bulletin.

7. Conduct of special research studies through the reorientation of regional resources for cooperating in the solution of the important problems encountered in the malaria campaign as well as through promotion of and cooperation in national efforts in this field. The following research projects are being executed or developed:

7.1 A study on new methods of antimalaria work has been started in Chiapas (Mexico) in cooperation with the Governments of Mexico and the Central American countries.

7.2 Clinical trials of new malaria drugs are being started in Belem (Brazil) in cooperation with the Government of Brazil and the WHO Special Research and Training Program, UNDP, and the World Bank.

7.3 A research project on the biology and control of Anopheles nuñeztovari, which is being developed in cooperation with the Government of Venezuela.

7.4 A study of the taxonomic value of the determination of cariotypes and of the identification of isoenzymes in South American anophelines, in collaboration with the Malaria Services of Venezuela, Brazil, Colombia, Guyana and Suriname and with the University of Illinois and the Entomological Laboratory of the State of Florida in Vero Beach (USA).

7.5 Studies on the use of systems analysis for designing and evaluating malaria programs, which are being developed in collaboration with the Malaria Services of Costa Rica, Guatemala and Honduras and with the University of North Carolina (USA).

To sum up, the progress made in the malaria programs of the Americas has varied from country to country because of their different epidemiological, ecological, sociocultural and economic characteristics. In some countries, the disease has been eradicated, whereas in others transmission persists.

The review of individual programs with a view to preparing national plans geared to local conditions is essential to the formulation of a hemispheric plan of action against malaria, and its success is dependent upon joint action by all the countries. Within the framework of technical cooperation, the Organization will promote and support this endeavor.

Annex

III MEETING OF THE DIRECTORS OF NATIONAL MALARIA ERADICATION SERVICES IN THE AMERICAS

R E C O M M E N D A T I O N S

Oaxtepec, State of Morelos, Mexico

26-31 March 1979

BASES FOR THE FORMULATION OF A HEMISPHERIC PLAN OF ACTION AGAINST MALARIA

As bases for an action plan, general recommendations applicable to most of the countries are presented below, followed by specific recommendations for different groups of countries according to their epidemiological situation.

A. GENERAL RECOMMENDATIONS

1. Objective

The countries of the Americas have considered it necessary to continue their malaria campaign and to reaffirm that the final objective is to achieve and maintain eradication in accordance with the resolutions of the XX Pan American Sanitary Conference and the Thirty-first World Health Assembly.

2. Epidemiological Stratification

Recognizing the very favorable results obtained by malaria eradication programs and at the same time the difficulties and obstacles that have been encountered, the Meeting considers a review of the programs necessary.

This review should be based on an analysis of the physical, ecological, epidemiological, sociocultural and economic characteristics of the different regions as well as on an administrative and operational evaluation of the malaria programs. This analysis will make it possible to stratify the various areas and thus to determine action priorities and select the most appropriate attack measures.

3. Selection and Application of Antimalaria Measures

The selection of the malaria measures most appropriate to local conditions should be based on the epidemiological stratification and of an examination of the operational determinants, including:

- Indications, expected effects, constraints, risks and methods of applying each possible control measure.

- Magnitude of the malaria problem and its impact on the socioeconomic development process.

- Available human and material resources and training requirements. Possibilities of obtaining additional resources, either national or foreign.

- Present status of the coverage of primary health care services and their capacity to participate in the execution of the malaria measures required.

- Present status and development of community participation in various aspects of the malaria campaign.

- Participation of other government or private services, especially economic development projects.

A number of other countries have begun to stratify their malaria areas in order to select campaign measures based on all or some of the foregoing factors. It is deemed necessary to exchange experiences in order to develop practical methodological guidelines for stratification and selection of measures; therefore it is recommended that PAHO/WHO establish from among national technical personnel a working group to consolidate those experiences and prepare the above-mentioned methodological guidelines.

The malaria programs should cooperate in the work of the primary health care services and ensure that those services give due priority to the malaria problem and make maximum use of this resource for the execution of malaria activities.

It is considered necessary to include malaria control activities in community development programs; to define the role that community participation can play in the malaria campaign; and to establish appropriate mechanisms for orienting, coordinating, supervising and evaluating community action.

Programs for the control of other vectors should be integrated into malaria programs, particularly into those that retain their vertical structure, in accordance with the epidemiological conditions and requirements of each country.

When the use of combined attack measures is justified, excessive combinations that harm their execution, quality and supervision should be avoided.

4. Financing

The National Malaria Eradication Services (SNEM) should take the initiative in exploring possible sources of financing, both national and international, either directly assigned to the SNEM or to other services collaborating in the malaria campaign.

Use should be made of legislative resources to ensure that public or private sector agencies that execute development projects contribute sufficient funds for the prevention of malaria or its treatment in the other sectors and in their area of influence.

PAHO/WHO will be requested to study the possibility of convening a meeting of possible donors of funds or other resources for strengthening malaria activities and to foster technical cooperation among developing countries.

It is recommended that, as part of this technical cooperation, the countries report through PAHO the resources they can offer.

Since some countries are adversely affected by the problems of neighboring countries, it is recommended that those countries cooperate in executing malaria activities in border areas.

In view of the technical, operational and administrative difficulties of some countries, long-term financial aid will be necessary to achieve eradication of malaria.

5. Field Research

Each country should conduct field research programs to clarify or solve existing problems and may request orientation and assistance from PAHO/WHO in conducting them. PAHO/WHO will coordinate the research activities and will cooperate in establishing priorities in accordance with the needs of the countries.

The results obtained in the research undertaken by the national malaria eradication services of the countries, on their own account or with the assistance of PAHO/WHO, should be disseminated through publications with a wide distribution.

6. Education and Training of Personnel

It is recommended that, with the assistance of PAHO/WHO, the countries prepare a regional training program based on the best possible use of the teaching and field research resources available and that they strengthen them, when necessary, in order to establish a network of centers for the training of professional and teaching personnel in the fields of epidemiology of metaxenous diseases, medical entomology, malaria engineering, and public health administration.

For the execution of this regional program, the following are recommended:

- Definition in each country, in accordance with the activities to be undertaken, of the type and number of personnel it is necessary to train in order to plan, execute, supervise and evaluate the program.

- Definition of the teaching objectives and determination of national resources for training.

- Through PAHO/WHO, establishment of a regional inventory of training resources.

- Exploration of possible sources of financing.

- Encouragement of all training centers to have a research component, and all research centers to have a training component.

B. SPECIFIC RECOMMENDATIONS

In accordance with the present epidemiological situation, the countries are classified into four groups (Item 1: Status of Malaria in the Countries of the Region, Including the Application of New Control Strategies, pp. 16-98); on this basis the following recommendations are made:

1.1 Group I

To continue surveillance to prevent the reintroduction of malaria and to adapt it to the prevailing epidemiological conditions, especially on the basis of the vulnerability and receptivity of the different areas of the country.

Surveillance can be carried out routinely by the general health services, but at different levels there should be a group of specialized personnel responsible for this activity.

1.2 Group II

a) To continue surveillance in the areas in the consolidation and maintenance phases and to execute measures for the prevention and elimination of residual and new foci. This surveillance should be carried out by the personnel of the malaria services until such time as the general health services are able to guarantee the efficient execution of these measures.

b) To increase coordination with neighboring countries through action agreements, including mutual aid, for preventing or reducing the entry of imported cases, as far as possible.

1.3 Group III

a) To eliminate the existing foci in the areas in the consolidation and maintenance phases.

b) To carry out preventive activities to avoid the occurrence of active foci in those areas.

c) To continue the most efficient attack measures possible, according to the prevailing epidemiological conditions, in the areas in which malaria endemicity persists in order to interrupt transmission wherever possible.

d) If there are areas in the country in which problems prevent transmission being interrupted by means of the measures available, activities should be directed towards reducing the incidence of malaria, so that it does not have adverse effects on health rates or interfere with the social and economic development of the areas affected, and conducting the necessary research to identify the determinants and to endeavor to solve the problem.

1.4 Group IV

For those countries that are in a difficult position because of serious technical, administrative and financial problems, it is recommended:

a) That they endeavor to prevent deaths due to malaria and to reduce the incidence of the disease to a point where it does not interfere with the economic and social development of the population.

b) That they endeavor to obtain resources from Governments, national organizations responsible for development problems, international assistance and lending agencies, and from other countries interested in cooperating with those programs.

c) The meeting expressed its concern about the possibility that some countries in this group were prematurely integrating their programs into the general health services, which could reduce the efficiency of the campaign measures and considerably increase the incidence of the disease.

d) To maintain the objective of eradication in accordance with Resolution XVIII of the XX Pan American Sanitary Conference (1978) and the decision of the Thirty-first World Health Assembly (1978).

e) That, since the problems affecting the countries in this group frequently have an unfavorable impact on the progress of the program in neighboring countries, the two countries affected cooperate, through PAHO/WHO, in carrying out efficient malaria measures in the areas responsible for the problems.

C. OTHER RECOMMENDATIONS

Legislation

The Directors reaffirmed recommendation No. 12 (page 144 of the Report of the II Meeting of Directors of SNEM, Quito, 1975), which reads as follows:

"That since the indiscriminate use of pesticides in agriculture is an important factor in triggering the resistance of vectors to the insecticides used in the eradication of malaria, it is recommended that

the National Malaria Eradication Services promote close coordination with the services of the Ministry of Health responsible for the control of insecticides, with the services for the protection of the environment, and with the Ministry of Agriculture, in order to ensure the regulation and supervision of the use of those compounds and thus avert hazards in their management and maintain the effectiveness of the insecticides necessary for health campaigns."

Financial Resources

To explore the possibility of obtaining financial cooperation from such other assistance institutions as "Compañeros de las Americas," "Amigos de las Americas," etc.

To obtain financing for training potential research workers and for promoting the development of appropriate protocols for applied field research. It is advisable to encourage cost/effectiveness analyses of programs wherever possible.

Malaria programs that have a budgetary deficit should increase their efforts to obtain supplementary financing from internal resources and international agencies.

Strategy

To establish the necessary salary and career service incentives within the public health organization for the personnel of the SNEM, at all levels.

To support the study and planning of anti-larvae operations by physical, chemical and biological methods.

To evaluate the results of the use of insecticides and combinations thereof. To evaluate, on a continuing basis, the susceptibility of P. falciparum by in vivo and in vitro methods in areas in which those infections persist.

To assign high priority to primaquin in research for developing formulations with repository effects.

Information systems

To use modern information techniques to speed up communications in each country and with PAHO/WHO for the purpose of evaluation and the adoption of timely corrective measures.

It was recommended that a periodical publication be established, for example, a regional information bulletin for the American Hemisphere.

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XXXI Meeting

Washington, D.C.
September-October 1979

Provisional Agenda Item 30

CD26/12, ADD. (Eng.)
28 August 1979
ORIGINAL: ENGLISH-SPANISH

STATUS OF MALARIA PROGRAMS IN THE AMERICAS

XXVII REPORT

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REPORT ON THE STATUS OF MALARIA ERADICATION IN THE AMERICAS

XXVII REPORT

Introduction

A summary of the comments received from the Member Governments on the document presented by the Government of Mexico and entitled "Control versus Eradication in Malaria Programs" was presented to the XX Pan American Sanitary Conference held in September-October 1978 in St. George's, Grenada. After examining the summary presented, the Conference reiterated that malaria eradication was the objective of the program in the Americas and adopted a number of resolutions reaffirming that goal. It requested the Governments to assign their malaria programs sufficient national priority to obtain the necessary financing and asked the Director, when organizing the III Meeting of Malaria Eradication Services in Mexico in 1979, to ensure that its work be oriented toward the formulation of a Hemisphere-wide plan of action.

In compliance with the resolution approved by the Conference, the III Meeting of Directors of National Malaria Eradication Services in the Americas (NMES) was held in Oaxtepec, State of Morelos, Mexico, in March 1979. It was attended by delegates from 17 countries, staff members and consultants of PASB/WHO, and representatives of the United States Agency for International Development (AID) and of the Center for Disease Control (CDC). The meeting reviewed program developments, evaluated the progress achieved in each country and in the Region as a whole, and prepared the "Bases for the development of a Hemispheric Plan of Action against Malaria" in the Americas; it also made specific recommendations applicable to countries in different epidemiological and operational situations.

In recent years, the malaria programs in the Americas have not made great headway. Although there has been no widespread deterioration throughout the Region, epidemic outbreaks have occurred in some countries either because attack measures were not applied correctly, or because they had lost their effectiveness.

To find possible solutions to the complex problems which will be presented in the second chapter, the Organization, together with the Governments, has been conducting research and field trials of possible supplementary or alternative measures as well as of combinations of measures that might be adapted to the epidemiological conditions of each country and of each area within a country.

This report describes the present status of the programs at mid-1979 and summarizes the statistical information available up to the end of 1978. The Report is divided into five chapters. The first contains information on the status of the program in general and summaries of the malaria situation, country by country. The second chapter analyzes the problems affecting the progress of the programs, and the third deals with field research and trials. The fourth chapter summarizes personnel training activities and distribution of information, and the fifth covers international cooperation and coordination.

The information presented in this Report was obtained from the reports submitted by the countries at the III Meeting of NMES Directors; replies from Governments to the questionnaire that is sent to them each year; and the monthly statistical reports that are received from the NMES of each country.

I. PRESENT STATUS OF MALARIA ERADICATION PROGRAMS

A. General Information

During the period covered by this report there was a certain stagnation in the epidemiological situation in most of the countries although in some of them slow progress continued to be made. On the basis of the present level of progress, the magnitude of the problems, and the resources available, the 34 political units of the originally malarious areas may be classified into the following four groups: (Table 1).

Group I consists of twelve countries or political units in which malaria eradication has been achieved in their entire territories: Chile, Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Martinique, Puerto Rico, St. Lucia, Trinidad-Tobago, United States of America (continental), United States Virgin Islands. The population in the originally malarious areas of this group amounts to 73,631,000 inhabitants or 32.6% of the total population of the malarious areas of the Americas. Since eradication was achieved in the countries concerned, transmission has not been reestablished in any of them, although there were two Plasmodium malariae outbreaks: one in Tobago in 1966 with 39 cases and another, in Grenada, in 1978 with 58 cases. Both outbreaks were confined to small areas and considered to be local in origin.

In these countries, receptivity and vulnerability are generally low and, so far, imported or introduced cases have been diagnosed and treated effectively.

Group II comprises eight political units in which transmission has been virtually interrupted. However, the continuing importation of cases from neighboring countries and the high level of receptivity that exists within the country itself, has made it necessary for the National Malaria Eradication Service to maintain costly epidmiological surveillance and to continue DDT sprayings as a preventive measure in the most vulnerable regions. The countries in this group are: Argentina, Belize, Costa Rica, French Guiana, Guyana, Panama, Paraguay and Dominican Republic. The population of these countries together amounts to 14,176,000 inhabitants or 6.4% of the total of the originally malarious area of the Region. Experience shows that, when epidemiological surveillance activities are reduced or suspended, or delay in the application of emergency measures, transmission is quickly reestablished and easily spreads to other receptive areas. In recent years there has been a setback in the epidemiological situation in Guyana and Belize owing to a reduction in surveillance activities. Attack measures have again been begun in all the affected areas. In the Dominican Republic, the number of cases has increased in the last three years because of the rise in imported cases. Transmission is concentrated and no difficulties are foreseen in eliminating it.

Group III consists of five countries in which malaria eradication persists and in which activities are continuing at the same level as in earlier years, if not at a higher level. Malaria activities are being carried out on a national scale, and the most appropriate methods are selected in the light of local epidemiological conditions. The countries in this group are: Brazil, Ecuador, Mexico, Suriname, and Venezuela; the population of their malarious areas amounts to 95,154,000 inhabitants or 43.2% of the total population of the malarious areas of the Americas. In these countries, malaria transmission has been interrupted over a large part of their territories and the foci are limited. There are technical problems such as vector resistance to DDT in the southern regions of Mexico, P. falciparum resistance to chloroquine in the countries of South America, evasive behavior of vectors, and serious problems of human ecology. Despite the fact that some of these problems are difficult to solve, slow progress continues to be made since the programs are receiving adequate support and resources from the governments concerned.

Group IV includes the rest of the countries of the malarious area: Bolivia, Colombia, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, and Peru; their total population amounts to 39,192,000 inhabitants or 17.8% of the total in the malarious area. In most of the countries in this group, the epidemiological situation has considerably deteriorated because of serious technical, administrative, financial, and operational problems.

Since 1975, there has been a slight increase in the number of cases reported in the Region, the number fluctuating in each country. The principal factors that have been incriminated as causes of the increase in the number of cases are as follows: a) increase in vector resistance to insecticides (Central America and Haiti); b) reduction in malaria activities; and c) problems of human ecology connected with economic development projects such as land settlements schemes, highway construction, hydroelectric plants, irrigation systems, etc. These projects often cause ecological changes that favor the proliferation of vectors, migratory movements, and settlement of new population groups in makeshift housing. It is usually difficult to appropriately protect these communities by means of malaria measures. Table 1 shows the number of cases recorded (last four years) by group, country and year. As may be seen, in 1978, there were 292,232 cases in Group IV or 64.3% of the total recorded in the Region. In Group III, Brazil has shown a gradual increase in the number of cases since 1975. This increase has taken place in areas in which economic development projects and land settlement schemes are being carried out and where there has been a rapid increase in the population, which lives in makeshift houses and where epidemic outbreaks occur. However, in the remainder of the country, substantial progress has been made in recent years.

The estimated population of the Americas at 31 December 1978, was 587,704,000 inhabitants, of which 220,153,000 (35.5%) are living in originally malarious areas. Of the last mentioned figure, 105,611,000 (48.0%) live in areas in which the disease has been eradicated (maintenance phase); 59,734,000 (27.1%) in areas in which transmission has been interrupted although the reservoir of parasites has not yet been exhausted (consolidation phase); and 54,808,000 (24.9%) live in areas in which transmission has not yet been interrupted (attack phase).

Table 2 shows the population in the malarious areas of the Americas by program phase and by year since 1958. Tables 3 and 4 summarize the population and the area in square kilometers by country and by program phase at the end of 1978 and Maps 1 and 2 show the geographical extent of the areas in the various phases at December 1977 and 1978.

Despite all the difficulties encountered in 1978, some areas in the attack phase were shifted into the consolidation phase (341,254 Km^2 with 3.2 million inhabitants in Brazil, 43,687 Km^2 with one million inhabitants in Colombia and 72,920 Km^2 with 4.5 million inhabitants in Mexico). To sum up, at 31 December 1978, 165,345,000 inhabitants were living in areas in the consolidation and maintenance phases, i.e. 75.1% of the total population of the originally malarious areas (72.0% in 1977).

In 1978, a total of 9,446,827 blood slides were examined and 469,911 were diagnosed as positive, the annual blood examination rate (ABER) being 4.3% and the annual parasite incidence (API) being 2.13 per 1,000 population calculated on the basis of the population of the originally malarious areas. Table 5 summarizes the number of slides examined, the number found positive, and the morbidity from malaria since 1958, and Table 6 shows the results of the examinations of blood slides in 1978 by country and by phase of the program. Tables 7, 8, 9, and 10 show the results of the examinations, positive blood slides, parasite species, and classification of cases in each phase of the program.

B. Field Operations

In 1978, total house sprayings with insecticides amounted to 9,657,404 which, as compared to 10,327,187 in 1977, is a reduction of 669,783. The sharpest reduction in DDT sprayings is accounted for by Brazil and Mexico, since in those countries use of this insecticide was suspended over a large area of their territories because transmission had been successfully interrupted. In the Central American countries the use of propoxur was substantially reduced, from 569,012 sprayings in 1977 to 81,179 in 1978; this was primarily due to the increase in the problem of vector resistance and the high cost of this insecticide. Fenitrothion was introduced into the malaria program in 1977 in trials on a limited scale in Ecuador and Guatemala. In 1978, the use of fenitrothion was increased in a large area of Guatemala although still on a trial basis. In Haiti, trials of fenitrothion were begun in the second half of 1978. In Nicaragua, the field testing and evaluation of chlorfoxim was begun in areas of multiple resistance; this trial was carried out by the NMES in cooperation with AMRO-0901 in early 1978 but it was not possible to complete the experiment. Table 11 summarizes the sprayings made in 1977 and 1978 by country and type of insecticide used, and Table 12 shows the amount of insecticides used in 1978 and that estimated for 1979 by country and type of insecticide.

As more problems of insecticide resistance emerge, the use of antimalaria drugs is taking on greater importance. Drugs continue to be used in presumptive treatments, radical cure, and on a mass scale in selected localities either because of epidemic outbreaks or for the protection of vulnerable populations in land settlement areas or in the encampments of workers building roads, dams, etc.

Since 1976, antilarval measures, such a drainage and landfill of breeding places, have been increasing in Nicaragua. By late 1978, such measures had been undertaken in 6 localities and had benefitted 522,800 inhabitants; in those localities, the number of malaria cases fell from 8,389 in 1976 to 1,499 in 1977 and, in the first half of 1978, there were only 274 cases. In the remainder of the country there was also a reduction in the number of cases, although it was much less substantial, from 17,839 in 1976 to 10,085 in 1977 and to 3,509 in the first half of 1978. In Haiti, 19 localities were selected for the application of antilarval measures and, in the Dominican Republic, larvivorous fish continues to be used in areas that are highly receptive and vulnerable.

Table 13 summarizes the results of active and passive case detection and Table 14, the personnel of the malaria programs by category. Table 15 shows the means of transportation used in the malaria programs, country by country.

C. Budget

Table 16 summarizes by country the expenditures made by the Governments in 1977 and 1978 and the estimated budget for the malaria programs in 1979. The PAHO/WHO and the US/AID contributions assigned to each country in the same years are also shown. Funds for the malaria programs totaled $94,695,412 in 1977 and $114,947,224 in 1978 and the estimated amount for 1979 is $89,311,880. These funds are directly allocated for program execution. In addition, there are special contributions for specific research and training projets. These are: a) AID contribution to the Immunology Research project in Colombia, $198,200 for the period July 1977-July 1979; b) contribution from the Special program for Research and Training in Tropical Diseases of WHO, UNDP and the World Bank (TDR) for hemispheric studies on the susceptibility of P. falciparum to antimalarial drugs, $83,000 in 1978 and $73,000 in 1979; c) from the same TDR to the project on the clinical trial with mefloquine in Brazil $55,750 for 1979; and d) from the TDR to the training in continuous in vitro cultivation of P. falciparum, $39,000 for the course held in the Gorgas Commemorative Laboratory in Panama in June 1979.

Table 17 shows the expenditures made by PAHO/WHO in 1978 and 1979 and the budget for the two-year periods 1980/81 and 1982/83.

Between 1957 and 1978, a total of $1,190,792,557 was invested in the malaria programs in the Americas; of this amount, 86.8% was provided by national governments and 13.2% by international cooperation. Graphs 1 and 2 show the funds invested by governments in malaria programs, and the contributions of international agencies in the same years. In addition, between 1971 and 1973, the Government of the Federal Republic of Germany contributed grants amounting to $2,546,000 to the malaria programs in America. In the last two years, the TDR has also contributed the amounts mentioned in the foregoing paragraph. (The contribution has been included as a grant to PAHO).

D. Country Information

ARGENTINA

In the Republic of Argentina there are two originally malarious areas: the Northwestern (or pre-Andean) area with A. pseudopunctipennis and the Northeastern (or river bank) area with A. darlingi and A. albitarsis as the principal vectors.

In the Northeastern area transmission was interrupted at the beginning of the present decade and, so far, there is no indication that the disease has again become endemic. In the Northwestern area, there is a zone in the northern part of the province of Salta in which there are foci of transmission connected with cases imported from the neighboring country. These areas are classified as being in the consolidation and attack phases and they have a total population of 142,000 inhabitants, or 4.5% of the total population in the malarious areas of the country. Malaria is not endemic, but imported cases sometimes produce focal transmission. The principal problems preventing early elimination of the foci are

administrative in nature, such as difficulties in hiring a sufficient number of trained personnel, delays in the release of funds for taking emergency measures, lack of transportation, and inadequate coverage with DDT in highly receptive and vulnerable areas. It is planned to bring the NMES personnel up to full strength, to coordinate activities with the Immigration Department, provincial police and the large farms that employ immigrant farm workers with a view to better control and follow-up of imported cases.

BELIZE

The Malaria Eradication Program was begun in 1957 and by 1963 transmission had been interrupted; in that year, the program was shifted from the attack phase into the consolidation phase. However, since then, epidemiological surveillance has not been sufficiently effective to eliminate the outbreaks caused by imported cases. In recent years, the situation has deteriorated considerably, and transmission has been reestablished in a large area of the territory. The principal problems are: lack of financial resources and of trained personnel, and continuing importation of cases from neighboring countries. To correct this situation, the malaria service is again being reorganized, initial activities consisting of personnel training, procurement of insecticides and drugs, and programming of spraying and evaluation activities.

BOLIVIA

In 1978 transmission continued in all the zones in the malarious areas; there was an increase in the number of cases, especially in the Santa Cruz, Beni and Pando, Caravavi and Chapare areas. Factors contributing to this deterioration are: 1) internal migration; 2) lack of transportation for case detection as well as for treatment; 3) reduction in spraying activities; 4) insufficient funds; and 5) lack of professional malariologists at the zone level. In November 1978, a new NMES Director was appointed and, subsequently, the reorganization of the program was initiated. In 1979, the NMES becomes "the Malaria Division" and is responsible for malaria, Chagas' disease, and yellow fever control activities. The provinces in which transmission has been interrupted come under the jurisdiction of the health units for the purpose of maintenance and epidemiological surveillance. An application for a loan has been submitted to USAID for the purpose of intensifying malaria activities.

BRAZIL

The malarious area of the country is divided into two: a short-term eradication area and a long-term eradication area. The population of the short-term eradication area amounts to 36 million inhabitants, of whom 31.8 million (88%) are already free of transmission. In the long-term eradication area (Amazon Region) there are 9.6 million inhabitants, of whom 2.8 million are in areas in which transmission has been interrupted. In recent years 90% of all cases in the country have occurred in the long-term eradication area, especially in 46 municipalities (13% of the total municipalities in the Amazon Region) in which large-scale land settlement and agricultural and livestock activities are going on as well as mining operations and the construction of highways, dams and hydroelectric plants. These economic development activities entail a number of problems that interfere with the application of effective and timely malaria measures. The Government has assigned high priority to the malaria program and allocated the necessary funds to it. In 1980, transmission is expected to be focalized in the new land settlement areas. To achieve this goal, a number of activities have been programmed, based on the methods available, Research projects, and field trials of new measures are being proposed, to be undertaken in cooperation with the Organization.

COLOMBIA

The population of the malarious area amounts to 15.8 million inhabitants; of these, 3.1 million are in the high risk area in which more than 85% of the total number of cases in the country have occurred in recent years. There are many reasons for the persistance of transmission; the principal ones are insufficient funds, intensive land settlement, sometimes on an unorganized basis, and inaccessibility of certain areas in which malaria campaign activities cannot be carried out because of the negative attitude of the population. These problems occur in 9 regions with a total of 1.4 million inhabitants. There are also other important problems such as the presence of a P. falciparum strain resistant to chloroquine, evasive behavior of vectors in the presence of insecticides, and

high turn-over of operating personnel. In 1979,a new Director of the Services was appointed and, at his request, in April 1979, a group of national technical personnel and, PASB and CDC staff members reviewed the program. The group recommended a reorganization of the service based on a broad program for the training of personnel and development of a plan that includes epidemiological studies for identifying highly endemic areas and selecting measures in accordance with the epidemiological indications and resources available. It is proposed to promote intersectoral coordination, health education and community participation. It is also proposed to conduct research on vectors in relation to their behavior and biology and to study the susceptibility of malaria parasites to antimalarial drugs.

COSTA RICA

The population of malarious areas amounts to 608,000 inhabitants, of which 429,000 (70.6%) live in the area in the consolidation phase. Even in the rest of the country (in the attack phase) transmission is limited to foci caused by imported cases from abroad, as the result of the immigration of workers, principally farm workers. Between 1970 and 1977, 40% of the cases were classified as imported. To control this situation, a malaria surveillance card has been used since 1974 with good results. There are still localities in which A. albimanus is resistant to DDT, however, no major difficulties have been observed as most of these localities are in the consolidation phase. In the past decade, the NMES has not been faced with either administrative or financial difficulties. The budgets have covered the requirements of the program and the transportation equipment is sufficient to carry out the field operations required.

DOMINICAN REPUBLIC

Of the population of the malarious area, 91.4%, live in areas in the maintenance phase; 2.26% in the consolidation phase; and only 4.51% in the attack phase. Malaria transmission has been virtually interrupted throughout the country, but the continuing importation of cases from the neighbouring country has made it necessary for the NMES to maintain on-going epidemiological surveillance in order to prevent the reestablishment of the transmission. DDT spraying continues along the border (area in the attack phase) as a preventive measure. In the last three years an increase in the number of cases has been observed but there has been no general deterioration in the malaria situation in the country, because the emergency measures taken have been effective. Along the border and in highly receptive and vulnerable areas, antilarval measures, such as drainage and landfill of breeding places and distribution of larvivorous fish, have been applied with good results. The principal problems are the importation of cases from the neighbouring country, and the decline in the susceptibility of vectors to DDT in the border area. In the future it is planned to increase larval control measures and to reduce the use of insecticides. As long as the frequent importation of cases continues, it will be necessary to maintain ongoing epidemiological surveillance.

ECUADOR

Malaria transmission has been focalized in the provinces of Esmeraldas and Napo, which have a population of 291,173 inhabitants or 7.1% of the total in the malarious area; however, these provinces account for 63% of the total cases reported in the country. In addition, these areas export cases to the rest of the country. Because of various epidemiological factors, DDT spraying, the only measure adopted, has not been able to interrupt transmission in these provinces, although the vectors are still susceptible to this insecticide. A new insecticide (fenitrothion) is being tested in order to evaluate its effectiveness in the area in which transmission persists. In addition, in the areas in which the population is concentrated, antilarval measures, such as drainage and landfill of the principal breeding places, are being applied. The problems which affect the progress are those of administrative (labor) nature and those of new human settlements in which timely and adequate coverage is not achieved.

EL SALVADOR

Since 1959, the vector shows physiological resistance to insecticides; this has led to the replacement of dieldrin by DDT, malathion trials, mass distribution of malarial drugs as a supplementary measure, and propoxur sprayings. Since 1975, attempts have been made to apply measures or combinations of measures following identification of the local epidemiological, entomological and etiological factors involved in transmission. The problems hindering the advance of the program

are multiple physiological resistance of A. albimanus to the insecticides (chlorinated, phosphorous, and carbamates), ecological changes in the areas due to economic development works (construction of dams, highways, ports and airports, etc.), insufficient funds to cover the increase in operating costs and to purchase equipment and materials in time. Epidemiological studies are being made by locality; selected measures based on epidemiological criteria are being applied and preferential attention is being given to economic development areas.

FRENCH GUIANA

French Guiana covers an area of 9,000 km^2 and has a population of 56,000 inhabitants, of whom 34,000 live in the capital (maintenance phase), 18,000 on the coastal strip (consolidation phase), and 5,000 in the interior (attack phase). In 1978, a total of 266 cases was reported (124 cases in the attack area, 90 in the consolidation area, and 52 in the maintenance area). Of these 266 cases, 32 were classified as imported. The principal problem impeding the elimination of foci of transmission in the consolidation and maintenance areas is the continuing importation of cases from abroad.

Intra-domiciliary DDT sprayings will be continued in semi-annual cycles in the area in the attack phase (Maroni and Oyapock Rivers), and epidemiological surveillance will be continued in the consolidation and maintenance areas. So far, no problems of vector resistance to DDT or of parasites to antimalarial drugs have been detected.

GUATEMALA

Since 1975, the malaria situation in the country has gradually deteriorated, primarily because of the problem of vector resistance to insecticides, insufficient coverage with control measures because of insufficient funds, shortage of drugs in recent years, and administrative problems.

In the past three years (1976-1978), studies have been made to delimit the extension of the foci of transmission. In accordance with the situation in each area, various measures have been applied, such as intra-domiciliary sprayings with fenitrothion at 2 g/m^2 in the southern zone, at 1 g/m^2 in the northern zone, with DDT in the central-eastern zone, and with chlorfoxim in the south zone as a trial. In addition, copper sulphate has been used on a limited scale.

The measures applied failed to reduce the intensity of transmission. Intra-domiciliary spraying with DDT, fenitrothion and propoxur are planned wherever the vector is susceptible, and other measures such as the use of larvicides (fenthion), sowing of Lemna minor, use of larvivorous fish, use of insecticides at ultra low volume, and chemotherapy will be tried.

GUYANA

Malaria transmission on the coast, where 823,354 inhabitants live (93.8% of the population of the country), was interrupted in the 1950's and so far the area has remained free of the disease. The rest of the population lives in three districts in the interior of the country. In 1961, chloroquinized salt was distributed to the population and good results obtained. In 1966, because of the appearance of P. falciparum resistance to chloroquine in the Rupununi District, it was necessary to replace chloroquinized salt by intra-domiciliary DDT sprayings. In view of the good results obtained, the three districts in the interior were shifted into the consolidation phase in 1970, but DDT spraying was maintained in the Rupununi district in which some outbreaks were observed. Following suspension of malaria activities in 1974-1975, transmission was again reestablished in 1975 throughout the inhabited area of the Rupununi distric. Attack measures were resumed in 1976, and there has been a reduction in transmission in the past two years. Plans have been made to expand the passive case detection system by using the services of volunteers, update geographical reconnaissance, establish laboratory diagnostic facilities in the interior in order to accelerate the treatment of cases, increase epidemiological surveillance activities among the balata bleeders who work in the jungle from March to October, and improve administrative aspects.

HAITI

The malarious area of Haiti covers 919,000 $Km.^2$, approximately 70% of the total area of the country; its population is more than 4 million inhabitants. The principal vector is A. albimanus and the only parasite species responsible for malaria is P. falciparum. In the past, intra-domiciliary DDT spraying was used

and antimalarial drugs,were distributed on a mass or selective scales, but, because of vector resistance to this insecticide and low acceptance of drugs by the population, the results obtained were below those expected. In the past three years, DDT spraying has been supplemented by antilarval measures such as drainage, landfill of channels, drainage of swampy areas and use of larvivorous fish. Trials of fenitrothion as a substitute for DDT was initiated in 1978. In April-May 1979, The Haitian program was evaluated by a group of national technical personnel and of WHO and AID staff members. Based on the recommendations of this evaluation, new activities are planned, including a study to identify areas for application of DDT, malathion and fenitrothion; an increase in antilarval operations; and a better use of antimalarial drugs. In addition to technical problems, the program has had to face a number of operational and administrative problems.

HONDURAS

The malarious area measures 101,351 Km.^{2} and has a population of 2,670,035 inhabitants. At present, 490,475 inhabitants live in the area in the consolidation phase and 2,169,560 in the area in the attack phase. The area in the attack phase is divided into two the area in which the vector (A. albimanus) is resistant, which has 326,245 inhabitants, and the area in which the vector is susceptible to DDT, which has 1,943,315 inhabitants. Since 1975, there has been a deterioration in the malaria situation in the country, primarily because of insufficient coverage with antimalarial measures. The principal difficulty has been the lack of funds for purchasing the necessary insecticides. During the last year the malaria situation in the southern zone of the country has been complicated by the arrival of refugees from the neighbouring country. A plan of operations has been prepared, reflecting the integration of malaria activities into the health services and community participation. Since early 1979, courses have been held to train the personnel of the health services in malaria activities.

MEXICO

The malarious area is divided into three regions: the region of the Gulf of Mexico slope and the Yucatan peninsula (region 1); the region of the southern slope of the Pacific Ocean (region 2) and the northwestern region of the country (region 3). At present, transmission is considered interrupted in region 1 and focalized in regions 2 and 3. There are seven areas in which transmission persists, two in region 2 and five in region 3. In these foci there are 3.5 million inhabitants or 10% of the total population of malarious areas and they accounted for 11,074 cases of malaria, or 58% of the total reported in the country in 1978. In addition to vector resistance to DDT, there are epidemiological factors in these foci that have contributed to the persistence of the disease. A number of field trials have been planned for the purpose of finding possible solutions to the problem of the persistence of transmission. In 1979, PAHO will establish a project AMRO-0901 -Technical Cooperation for a Research Program on New Methods of Malaria Control or Eradication- in Tapachula, Mexico. Its purpose is to collaborate with the Governments of Mexico and of the Central American countries in field research programs on new methods for malaria control.

NICARAGUA

Between 1970 and 1973 the incidence of malaria was significantly reduced through the application of propoxur as a substitute for DDT in the areas of the Pacific Coast where vector resistance to DDT had appeared. In 1973, the vector became resistant to propoxur and, consequently, the malaria situation deteriorated in the following years (1974-1976). In 1975, the program was reviewed and a decision was reached to apply deversified measures tailored to the different epidemiological, ecological and socio-economic situations, especially in the four departments of the Pacific Coast where 70% of the total cases in the country occur. Since then, antilarval measures and chemotherapy have been used in areas in which the vector is resistant; but insecticides have continued to be used in areas in which the vector A. albimanus is still susceptible. As a result of the application of combined measures in the past three years, positive results have been achieved and the number of cases was reduced from 24,692 in 1975 to 10,633 in 1978. The sharpest reduction in incidence has ocurred in the urban areas or in those areas in which the population is concentrated. Among the problems affecting the program, mention must be made of the physiological resistance of the principal vector to insecticides, migratory movements due to the hiring of labor for harvesting cotton and sugarcane and, since mid-1978, public security problems. In the period 1977-1979, PAHO conducted a research project on insecticides, resistance and the new methods of anopheline control, including field trials of new insecticides (chlorfoxim, permitrim), pathogenic agent for mosquitoes (Bacillus sphaericus) and local larvivorous fish (Poecilia sphenops).

PANAMA

The malaria program has made satisfactory progress during the last five years. At present, 84.2% of the inhabitants of the originally malarious areas live in regions in which transmission of the disease has been interrupted. Transmission is focalized in the province of Darien, which receives a large number of imported cases from the neighbouring country. In 1978, a total of 263 cases were reported in Panama, of which 108 were classified as imported. There are a number of technical problems such as vector resistance to DDT and P. falciparum resistance to chloroquine. However in most areas with technical problems, transmission has been interrupted by means of alternative measures and there are no serious difficulties in conducting the program; the major problem is migratory movements in the border areas in the eastern part of the country (Darien). The Government has assigned high priority to the program which receives financial and other necessary resources. Epidemiological surveillance for case detection is being increased, and research, treatment and application of adequate and timely measures for preventing transmission are being carried out.

PARAGUAY

Malaria transmission was interrupted at the beginning of the present decade, and effective surveillance has been continued to date. With the exception of imported cases and a very small number of secondary cases, there has been no resurgence of the disease in the country. However, intra-domiciliary DDT sprayings as a preventive measure have been continued in areas that are highly receptive and vulnerable. As a result of the eradication of the malaria, it has been posible to undertake a number of socio-economic development projects and land settlement projects in large areas. These projects have in turn interfered with the epidemiological surveillance of malaria because of large population movements, settlement of colonists in makeshift housing, and the loss of the personnel of the malaria service to construction firms paying higher wages. So far, all the measures applied have produce satisfactory results. Epidemiological surveillance is being increased and the general health services are playing an active part in it in order to prevent the reestablishment of transmission.

PERU

The malarious areas of the country are divided into three regions: the coast, the intra-Andean valleys, and the Amazonian Plain, all of which have very different ecological conditions. The measures applied in the 1960's were very effective and by 1969 transmission was interrupted in the region of the coast and in most of the inter-Andean valleys. However, because of administrative and operational problems that prevented the timely application of adequate measures, the malaria situation has deteriorated in recent years and transmission has been reestablished in the regions of the northern coast and in the inter-andean valleys. In addition, in the malarious areas there are a number of socio-economic and cultural factors such as makeshift housing, migratory movements, unorganized land settlements, as well as customs and beliefs that hinder the progress of the program. In the second half of 1977 the malaria eradicarion program was transferred to the regional health services, and the NMES was converted into an advisory and policy-making office which is a component of the Direction of the Communicable Disease Eradication and Control (DECET) of the General Health Programs Direction. In 1978, the DECET was integrated into the epidemiology and population programs to form the Epidemiology and Programming Direction.

SURINAME

For the execution of the malaria program, the country is divided into 25 operational areas or which five are in the attack phase, eleven in the consolidation phase, eight in the maintenance phase, and one (the capital), in the non-malarious area. Since the beginning of the present decade, transmission has been focalized along the principal rivers (Suriname Marowijne, Tapanahony and Lawa) and in isolated localities in the interior that have a total population of 31,530 inhabitants or 16.6% of the population of the malarious area. In the last three years, even more marked focalization has been observed in the border region with French Guiana. The principal problems are: a) operational and administrative difficulties that prevent the regular application of attack measures; b) little collaboration from the population in spraying and drug treatment; and c) constant

movement of the population on the border. In 1978, of the 876 cases reported in the country, 85.3% were infected in the Tapanohony River area which has a population of 9,700 inhabitants. It is planned to solve the administrative and operational problems of the malaria service and to increase attack measures in close collaboration with French Guiana.

VENEZUELA

Of 9,789,000 inhabitants that live in the malarious area, 9,206,869 or 94.1% live in the area where malaria has been eradicated, (maintenance phase) and 582,329 (5.9%) in the area in the attack phase. The last-mentioned area is divided into two regions, the western region with 489,963 inhabitants (5.0%) and the southern region with 92,366 inhabitants (0.09%). In the area in the maintenance phase no problems have ocurred and it has remained free of transmission. In the area in the attack phase, there are two regions that have different vectors and different epidemiological conditions. In the western region, the vector is A. nuñeztovari, which, because of its high exophilia, eludes contact with insecticides and as results malaria is partially refractory to attack measures. In the southern region, the vector is A. darlingi, which also shows evasive behavior so that, together with problems of human ecology, it is difficult to control transmission. In addition to the above-mentioned technical problems, there are administrative and operational problems that seriously interfere with the normal conduct of the program.

II. PROBLEMS AFFECTING THE PROGRESS OF THE PROGRAM

The reports presented by the Directors of the NMES at the III Meeting held in Oaxtepec, Mexico, in March 1979, paid special attention to the problems affectign progress in each country. Many of these problems have common aspects, especially among countries in the same group shown in Table 1. A summary of these problems by country group is presented below:

GROUP I

With the exception of late recrudescence of P. malariae and the occasional importation of cases from abroad, no serious problems have ocurred in this group.

GROUP II

Importation of cases from abroad in connection with population movements in border areas and with migration of the labor force.

Suspension or reduction in epidemiological surveillance activities or preventive measures.

Delayed action in eliminating foci due to delays in release of funds and in purchasing equipment and material.

GROUP III

Internal movements of the population and makeshift housing in land settlement areas and labor encampments for the construction of highways, hidroelectric plants, irrigation systems, and agricultural and mining projects.

Labor problems within the NMES, increase in trade union demands not provided for in the planning of the program, frequent changes of personnel and lack of professional personnel.

Problems of accessibility and logistics.

Physiological resistance of vectors to DDT.

Evasive behavior of the vector to residual insecticides.

P. falciparum resistance to chloroquine.

Little cooperation on the part of the population.

GROUP IV

Vector resistance to insecticides.

Evasive behavior of vectors.

P. falciparum resistance to chloroquine.

Internal movements of the population and makeshift housing associated with land settlements schemes, employment of seasonal workers, and construction of highways, dams and airports.

Construction of irrigation systems.

Lack or shortage of financial resources.

High turnorver of personnel and lack of professional personnel.

Inadequate transportation.

Population hostile to antimalarial measures, and civil commotions.

Technical problems and problems connected with population movements associated with economic development projects, such as crop farming and live stock development projects and construction of highways and dams, continue to be the most serious obstacles to the interruption of transmission. Accordingly, they warrant special discussion:

A) In the Central American countries, especially in Guatemala, Honduras and Haiti, vector resistance to insecticides increased in 1978, which means that other more expensive measures with more limited indications must be used. In some countries in South America, the evasive behavior of the vector to residual insecticides means that intra-domiciliary spraying of insecticides could not be completely effective. In addition, in most of the countries there are problems connected with economic development projects which envolve populations movements, makeshift housing, and sometimes the production of large man-made breeding places. Table 18 and Map 3 show areas with technical problems and their geographical distribution. In addition to the areas shown in Table 18, it should be borne in mind that in the Amazon basin, wich includes areas in Bolivia, Colombia, Ecuador, Peru and vast tracks in Brazil, there are special problems connected with the low population density and economic development projects such as crop farming and live stock development projects and highways construction. In these areas, difficulty in gaining access and the high cost of the operations are a major problems in achieving adequate coverage. Map 4 shows the distribution of A. (N) albimanus and resistance to DDT and propoxur and Map 5, the distribution of A. (A) pseudopunctipennis and DDT resistance.

B) P. falciparum resistance to chloroquine is a widespread phenomenon in Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Suriname and Venezuela. However, so far this problem has not been found either in Mexico or in the countries of Central America and the Caribbean area. To obtain a better knowledge of the geographical distribution of the resistance strains, a project of hemispheric studies on the susceptibility of P. falciparum to antimalarial drugs has been initiated and has been receiving financial support from TDR. (See Map 3).

III. RESEARCH

The principal research activities undertaken in 1978 are summarized below.

A) Field insecticide trials

With the cooperation of AMRO Project-0901, a field trial of chlorfoxim was begun in Nicaragua in 90 localities with 5,000 cases in the municipality of El Viejo, Department of Chinandega (Stages VI and VII). Between 11 January and 6 November, three cycles were sprayed. For reasons unconnected with the NMES, the cycles could not be made on a regular basis and eventually it was necessary to terminate the trial.

In Guatemala different insecticides were tested, depending on the resistance spectrum, such as sprayings with fenitrothion at 2 g/m^2 in three-monthly cycles in the southern zone and at 1 g/m^2 in the northern zone, and

with chlorfoxim in some localities in the southern zone. Widespread resistance to fenitrothion was discovered in the southern zone, but conclusive results have not yet been obtained.

In Ecuador, a trial with fenitrothion was carried out in 41 localities with 3,200 houses in the province of Esmeraldas where transmission persisted. The insecticide was applied in four-monthly cycles at 2 g/m^2 . No cases of poisoning were noted among the operators or the inhabitants. It is not yet possible to draw a conclusion about its effectiveness since the entomological and epidemiological studies have not been completed.

In Haiti, fenitrothion was also used in 179 localities with 14,263 houses in zone III (South). The first cycle was ended on 9 November 1978 and for various reasons its effectiveness could not be evaluated. The multidisciplinary evaluation group recommended a comparative study of DDT, malathion and fenitrothion.

B. Biological control studies

In the Dominican Republic Poecilia reticulata (guppy) was widely seeded in bodies of water both in the northern zone and in the southern zone. The results have been satisfactory. In view of this experience, this species has been taken to Haiti where similar trials will begin.

In Nicaragua, a trial with Poecilia sphenops was begun in the Department of Chichigalpa. The results obtained are promising but for reasons unconnected with the NMES, it has not been possible to extend the distribution of this species to other places in the country.

In Colombia, a survey was made of mosquito pathogens in which technical personnel of the National Health Institute, the Malaria Eradication Service, and the Insects Affecting Man Research Laboratory of the United States Department of Agriculture, and PAHO/WHO took part. As part of this survey, a seminar was held on methods of collecting and identifying mosquito pathogens and was attended by entomologists from five countries..

In Nicaragua, in collaboration with project AMRO-0901 and the WHO Reference Center on the Biological Control of Human Disease Vectors, preliminary trials were carried out on the control of A. albimanus through the use of a strain of Bacillus sphaericus found by AMRO-0901 in Central America. Although the results were promising, it has not been possible to continue with the field experiments.

C. Immunological studies

In 1978 the installation of the laboratories for the research project on malaria immunology in Colombia was completed, as was the training and orientation of the technical personnel.

They began the studies programmed such as the continuous in vitro cultivation of P. falciparum, susceptibility tests of different species of Aotus to plasmodia, and studies on new serological methods (ELISA) and colonization of anophelines.

D. Malaria chemotherapy

In September 1978, an agreement was signed by the Government of Brazil and PAHO/WHO for clinical trials of mefloquine in the Barros Barreto Hospital in Belem, Brazil; TDR support is being provided. During the first half of 1979, the necessary materials and equipment were purchased, and the training and orientation of the professional and technical staff was completed.

In August 1978, an agreement was signed by PHO/WHO/TDR and the Gorgas Commemorative Institute relating to hemispheric studies of the susceptibility of P. falciparum to antimalarial drugs. In 1978, four training courses on methods for susceptibility tests were held.

E. Serological studies

The Governments of Mexico, Panama, Brazil and Costa Rica continued their sero-epidemiological studies in 1978 with the technical cooperation of PAHO. The serological laboratory for serodiagnosis of malaria was installed in CAREC and serological surveys were made in Grenada in connection with the study of an outbreak of P. malariae that occurred in early 1978. The Government of Cuba has

expressed interest in installing a serological laboratory to supplement its malaria epidemiological surveillance activities.

F. Entomological studies

The University of Illinois and the Florida Medical Entomology Laboratory, with the cooperation of the Government of Brazil and of PAHO/WHO, carried out a wide survey for the purpose of studying the cytotaxonomy and the taxonomic value of identifying isoenzymes in South American anophelines. In June/July 1979, similar surveys were made in French Guiana, Guyana, Suriname, Colombia and Venezuela and a base was established for those studies in the laboratories of project AMRO-0902 in Maracay, where a seminar on the Cytogenetics of Anophelines was held.

IV. PERSONNEL TRAINNING AND INFORMATION DISTRIBUTION

Since the beginning of the hemispheric malaria eradication program, professional personnel for the program have been trained in international centers in Brazil, Guatemala, Jamaica, Mexico and Venezuela. According to an analysis made at the III Meeting of Directors of NMES held in Mexico, in the period of 1957-1977 a total of 3,964 professional and technical personnel received training in malariology; of these, 829 were physicians, 438 engineers, 110 entomologists, 1,796 inspectors and 1,719 biologists, microscopists, and others. In the group consisting of physicians,engineers, and entomologists, the ratio of persons active in the malaria program to those trained was 28.6%.Obviously, this situation is in part the result of factors such as retirements for age and death, but there is no doubt that the exodus exist of trained personnel to the private sector or to other activities of the health sector because of the reduction in activities of the malaria services and even compulsory reductions of personnel due to financial difficulties which are a major cause of this low ratio.

At present, training in malaria at the international level may be obtained in Brazil (entomology, epidemiology), Mexico (master's degree in public health with major in malaria and other parasitic diseases), Panama (short courses on serological diagnosis, preparation of antigens, in-vitro culture of parasites), and Venezuela (malariology and environmental sanitation, vector control).

There are other organizations that provide training and are able to accept candidates from other countries. This has been done on certain occasions, at the request of the governments concerned.

In 1978, the School of Malariology and Environmental Sanitation in Maracay, Venezuela, held its XXXIV International Course for Malaria and Environmental Sanitation. In addition to national participants there were two professionals from Brazil and Panama which received fellowships from the Government of Venezuela with the support from the Organization. The course began on 16 January and ended on 27 October, 1978.

A course on Immunology of Parasites was held in CEPIALET, Venezuela in 1978 and was attended by five WHO/TDR fellows from Bolivia, Colombia, Costa Rica, Cuba and Peru.

The School of Public Health of the Department of Health and Welfare of Mexico held its third "Master's Degree Course in Public Health with emphasis on malaria and other parasitic diseases" from 13 February to 14 December, 1978. It was attended by 11 physicians: 6 from Mexico and 5 PASB fellows; one from Brazil, two from Cuba, one from Haiti and one from El Salvador.

As the initial phase of the research project "Continental Studies on the Susceptibility of P. falciparum to Antimalarial Drugs" four training courses were given on methods for susceptibility tests in 1978 (2 in Bõa Vista, Brazil from 18 to 28 July; one course in Villavicencio, Colombia, 3-13 September; and one course in San Salvador, El Salvador, 20-20 November). Financial support for the courses was provided by WHO/TDR, and cooperation was received from the Gorgas Commemorative Institute.

A training course on the continuous in vitro cultivation of P.falciparum was held from 11 to 29 June, 1979 in the Gorgas Commemorative Laboratory in Panama City, Panama, with financial support from WHO/TDR; it was attended by 7 professional laboratory workers from Brazil (2), Colombia, Cuba, Mexico, Iran and from the University of California, USA.

A special number of the PASB Bulletin was published in November 1978 dealing with malaria in the Americas (Vol. LXXXV, No. 5). A manual entitled "Orientaciones sobre Quimioterapia de la Malaria Humana" was also published as Scientific Publication No. 373 of PAHO. In addition, publications received from WHO and other institutions which dealt with malaria, other parasitic diseases and vector control were distributed.

A course on the Epidemiology and Control of Chagas Disease was held in Venezuela from 21 May to 1 June, 1979, for staff members of the Malaria and Other Parasitic Diseases Service; it was attended by 12 officials from Argentina, Bolivia, Brazil, Mexico, Paraguay, Venezuela and 7 from PASB. The purpose was to up-date knowledge, standardize work methods, and promote technical cooperation among developing countries. Some malariologists from countries in which the malaria service is responsible for Chagas' disease control activities participated in this course.

V. INTERNATIONAL COOPERATION AND COORDINATION

Within the framework of technical cooperation PAHO continues to support malaria eradication programs by assigning personnel at the regional, area, and country levels. It also supplies some equipment, antimalarial drugs and materials in cases of need, according to the funds available. In addition, PAHO/WHO cooperates in organizing courses for training national officials and awards fellowships. It took an active part in preparing the III Meeting of Directors of National Eradication Services which was held in March 1979. With the support of the Special Program for Research and Training in Tropical Diseases of WHO/UNDP/World Bank (TDR) research and training projects were promoted and initiated. In 1978, TDR approved two research projects: "Continental Studies on Susceptibility of P. falciparum to Antimalarial Drugs" and "Clinical Trial of Mefloquine". In addition, TDR supported the training course on the Continuous in vitro Cultivation of P. falciparum which was held in Panama in June 1979.

Table 19 shows the distribution of PAHO/WHO technical personnel assigned to malaria programs in the Americas from 1976 to 1979, by categories (medical officers, sanitary engineers, health inspectors, entomologists and others). Table 20 summarizes the amounts of antimalarial drugs supplied by PAHO/WHO to the countries.

The Government of Venezuela awarded 6 fellowships to candidates selected by the Organization to participate in the training courses of the School of Malariology and Environmental Sanitation in Maracay.

Through its International Agency for Development, the United States of America continued to provide financial support to the program in Haiti. In addition, this Agency helped financing a group of 6 consultants that visited Haiti from 2 April to 9 May, 1979 in order to review the program and recommended future action. It also continued its financial assistance to the Research Project in Malaria Immunology in Colombia.

Both the administrative structures and the technical personnel of the malaria programs provide direct support to epidemiological studies and activities for the control of other parasitic diseases transmitted by vectors, in particular:

Chagas' disease: in Argentina, Bolivia, Brazil, Ecuador, Paraguay, Peru and Venezuela.

Schistosomiasis: in Brazil, Dominican Republic, Suriname and Venezuela.

Filarial diseases (Wuchereriasis): in Brazil, Costa Rica and Suriname.

Onchocerciasis: in Colombia, Guatemala, Mexico and Venezuela.

Leishmaniasis: in Brazil, Ecuador, Guatemala, Honduras, Peru and Venezuela.

The National Malaria Eradication Services continue to support activities for the prevention of urban Yellow Fever and Dengue, which are carried out through the programs for the eradication and control of Aedes eagypti in the Region. In addition, this support is extended to other disease such as Trachoma in Brazil and Yaws in Ecuador.

Finally, mention must be made of the logistics support and personnel provided by the Malaria Services in extending the coverage of primary health care services, particularly immunization and information services.

For the coordination of malaria activities among the countries of the Americas and the formulation of a Hemispheric Plan of Action Against Malaria, PAHO/WHO, in cooperation with the Government of Mexico, organized the III Meeting of Directors of National Malaria Eradication Services, which was held in Oaxtepec, Mexico, from 26 to 31 March, 1979. In addition, PAHO assisted the countries concerned in organizing the following border meetings which were attended by the Directors of the NMES and PAHO personnel:

. Belize - Mexico: Chetumal, Quintana Roo, Mexico; 24-26 February, 1978.

. Colombia - Venezuela: San Cristobal, Venezuela; 24-26 October, 1978

. Costa Rica - Panama: Paso Canoas, Costa Rica; weekly during 1978.

. Costa Rica - Panama: Sixaola, Costa Rica; fortnightly during 1978.

. Costa Rica - Panama: Chiriqui and Bocas del Toro; monthly during 1978.

. Ecuador - Peru: Piura, Peru; 18-29 October, 1978.

. Guatemala - Nicaragua: El Salvador, Honduras: Esteli, Nicaragua; 18-21 April, 1978.

. Argentina - Paraguay: Cordoba, Argentina; 18-25 November 1978.

. Brazil - Paraguay: Foz de Iguazu, Brazil; November, 1978.

Table 1

MALARIA CASES REGISTERED, 1975 - 1978

GROUP		Population 1978 in originally malarious areas (in thousands)	Cases registered			
			1975	1976	1977	1978
GROUP I	12 countries or territories in which malaria eradication has been certified	71 631	435	424	531	718
GROUP II	Argentina	3 190	100	70	463	325
	Belize	143	90	199	894	1 218
	Costa Rica	608	290	473	217	313
	Dominican Republic	5 091	159	586	745	1 531
	French Guiana	56	319	394	488	266
	Guyana	877	1 116	4 642	1 563	927
	Panama	1 758	666	727	674	263
	Canal Zone	38	11	7	4	5
	Paraguay	2 415	217	140	156	156
	Sub-total	14 176	2 968	7 238	5 204	5 004
GROUP III	Brazil	46 891	88 630	89 959	104 436	121 577
	Ecuador	4 559	6 555	10 974	11 275	9 815
	Mexico	33 639	27 925	18 153	18 851	19 080
	Suriname	276	2 741	537	993	876
	Venezuela	9 789	5 952	4 768	5 304	5 065
	Sub-total	95 154	131 803	124 391	140 859	156 413
GROUP IV	Bolivia	1 923	6 615	6 714	10 106	10 897
	Colombia	15 778	32 690	39 022	63 888	53 412
	El Salvador	3 906	83 100	83 290	32 243	52 521
	Guatemala	2 561	4 979	9 616	34 907	59 755
	Haiti	4 271	24 733	15 087	27 679	60 472
	Honduras	2 670	30 289	48 804	39 414	34 554
	Nicaragua	2 424	24 692	26 228	11 584	10 633
	Peru	5 659	14 338	18 462	32 410	20 376
	Sub-total	39 192	221 436	247 223	252 231	302 620
TOTAL		220 153	356 642	379 276	398 825	464 755

Table 2

POPULATION IN THE MALARIOUS AREAS
IN THE AMERICAS, 1958-1977

(Population in thousands)

Year	Originally malarious areas					Total population
	Maint. phase	Consolid. phase	Attack phase	Prep. phase or program not yet 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

Table 3

STATUS OF THE MALARIA IN THE AMERICAS, BY POPULATION, 1978

(Population in thousands)

Country or other political or administrative unit	Total population	Population of originally malarious areas							
		Total		Malaria eradication claimed (maintenance phase)		Consolidation phase		Attack phase	
		Total	%	Total	%	Total	%	Total	%
Antigua	72a)	-	-	-	-	-	-	-	-
Argentina	26 400b)	3 190	12.8	3 048	95.5	66	2.1	76	2.4
Bahamas	220a)	-	-	-	-	-	-	-	-
Barbados	254a)	-	-	-	-	-	-	-	-
Belize	143	143	100.0	-	-	76	53.2	67	46.8
Bermuda	58a)	-	-	-	-	-	-	-	-
Bolivia	6 068	1 923	31.7	-	-	1 144	59.5	779	40.5
Brazil	116 760	46 891	40.2	13 485	28.8	16 198	34.5	17 208	36.7
British Virgin Isl..	12a)	-	-	-	-	-	-	-	-
Canada	23 316a)	-	-	-	-	-	-	-	-
Cayman Islands	11a)	-	-	-	-	-	-	-	-
Chile	10 967c)	237c)	2.2	237	100.0	-	-	-	-
Colombia	26 702	15 778	59.1	-	-	11 486	72.8	4 292	27.2
Costa Rica	2 111	608	28.8	-	-	429	70.6	179	29.4
Cuba	9 657c)	3 225d)	33.4	3 225e)	100.0	-	-	-	-
Dominica	80	16d)	20.0	16e)	100.0	-	-	-	-
Dominican Rep.	5 124	5 091	99.4	4 955	97.3	45	1.0	91	1.7
Ecuador	7 433	4 559	61.3	-	-	1 933	42.4	2 626	57.6
El Salvador	4 523	3 906	86.1	-	-	-	-	3 906	100.0
Falkland Islands	2a)	-	-	-	-	-	-	-	-
French Guiana	56	56	100.0	34	60.7	17	30.3	5	9.0
Grenada	110	41d)	37.3	41e)	100.0	-	-	-	-
Guadeloupe	365a)	319d)	87.4	319e)	100.0	-	-	-	-
Guatemala	6 851	2 561	37.4	-	-	-	-	2 561	100.0
Guyana	877c)	877	100.0	823	93.8	16	1.8	38	4.3
Haiti	4 816	4 271	88.7	-	-	-	-	4 271	100.0
Honduras	3 438	2 670	77.7	-	-	490	18.3	2 180	81.7
Jamaica	2 085a)	1 628d)	78.1	1 628e)	100.0	-	-	-	-
Martinique	374a)	233d)	62.3	233e)	100.0	-	-	-	-
Mexico	66 944	33 639	50.2	-	-	22 316	66.3	11 323	33.7
Montserrat	13a)	-	-	-	-	-	-	-	-
Netherland Antilles	252a)	-	-	-	-	-	-	-	-
Nicaragua	2 424	2 424	100.0	-	-	-	-	2 424	100.0
Panama	1 826	1 758	96.3	-	-	1 437	81.7	321	18.3
Canal Zone	38c)	38	100.0	-	-	38	100.0	-	-
Paraguay	2 888	2 415	83.6	650	26.9	1 275	52.8	490	20.3
Peru	16 819	5 659	33.6	1 582	28.0	2 721	48.1	1 356	23.9
Puerto Rico	3 303a)	3 303	100.0	3 303e)	100.0	-	-	-	-
St. Kitts, Nevis, Anguilla	66a)	-	-	-	-	-	-	-	-
St. Lucia	118	99	84.0	99e)	100.0	-	-	-	-
St. Pierre & Miquelon	6a)	-	-	-	-	-	-	-	-
St. Vincent	113b)	-	-	-	-	-	-	-	-
Suriname	435c)	276d)	63.4	196d)	71.0	47d)	17.0	33d)	12.0
Trinidad & Tobago	1 205c)	1 085	90.0	1 085e)	100.0	-	-	-	-
Turks & Caicos Isl..	6a)	-	-	-	-	-	-	-	-
United States of America	216 332f)	61 350	28.4	61 350d)	100.0	-	-	-	-
Uruguay	2 814a)	-	-	-	-	-	-	-	-
Venezuela	13 122	9 789	76.8	9 207g)	94.1	-	-	582	5.9
Virgin Islands (USA)	95	95	100.0	95d)	100.0	-	-	-	-
TOTAL	587 704	220 153	37.5	105 611	48.0	59 734	27.1	54 808	24.9

a) Provisional mid-year 1977, (Population and Vital Statistics Report, United Nations Bulletin, data available as of 1 Jan. 1978. b) 1978 population estimated by PAHO. c) 1977 Population figure provided by country. d) Estimated e) Population in areas where eradication of malaria has been certified by PAHC/WHO. f) Population figure estimated by U.S.A. Dep. of Commerce. g) Includes an area with 7,065,009 inhabitants where eradication of malaria has been certified by PAHO/WHO.

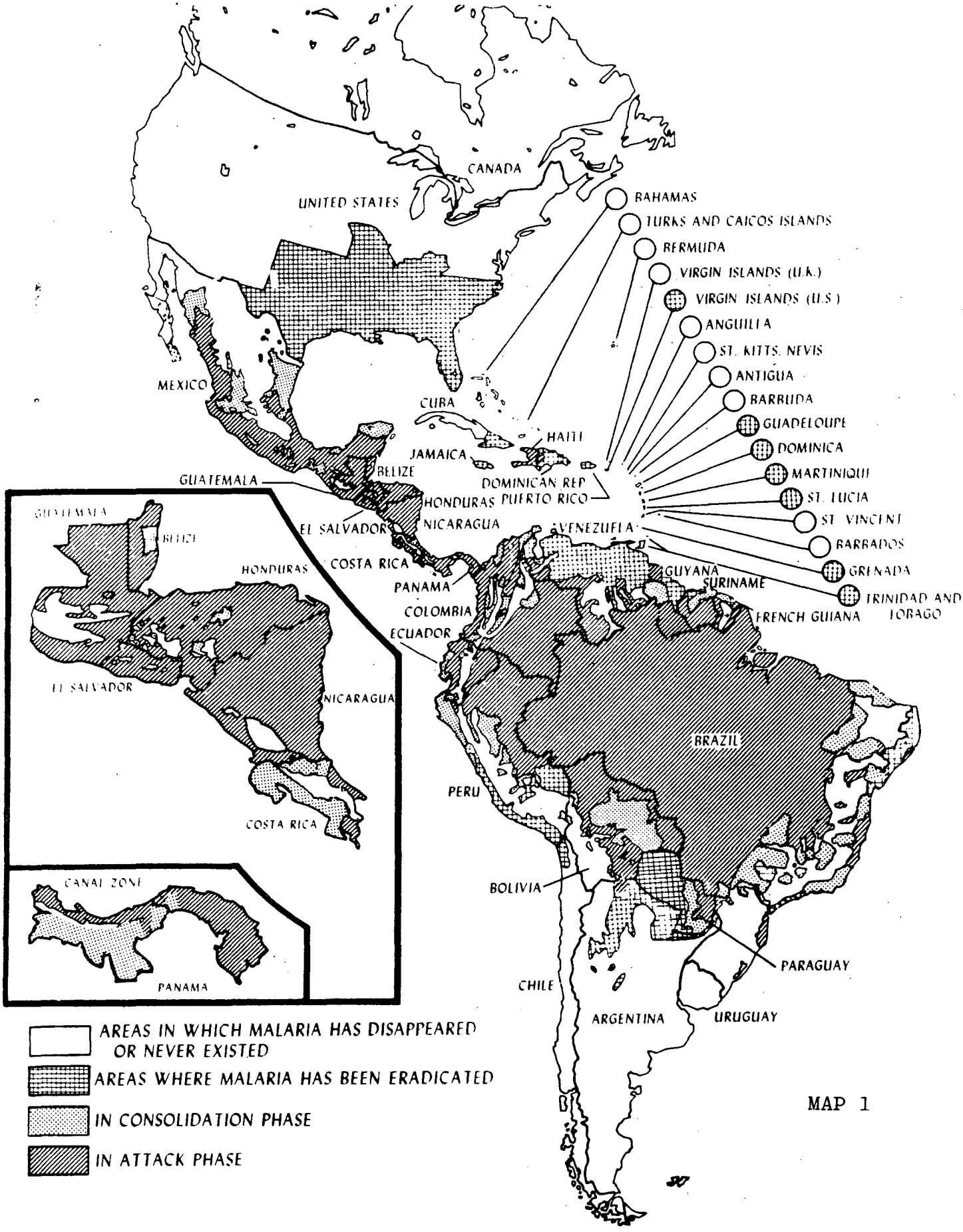
Table 4

STATUS OF THE MALARIA PROGRAM IN THE AMERICAS, BY AREA, 1978
(Area in Km^2)

Country or other political or administrative unit	Total	Originally malarious areas							
		Total		Malaria eradication claimed (maintenance phase)		Consolidation phase		Attack phase	
		Total	%	Total	%	Total	%	Total	%
Antigua	280	-	-	-	-	-	-	-	-
Argentina	4 024 458	349 051	8.7	334 527	95.9	3 249	0.9	11 275	3.2
Bahamas	11 396	-	-	-	-	-	-	-	-
Barbados	430	-	-	-	-	-	-	-	-
Belize	22 965	22 965	100.0	-	-	7 943	34.6	15 022	65.4
Bermuda	53	-	-	-	-	-	-	-	-
Bolivia	1 098 581	821 346	74.8	-	-	367 940	44.8	453 406	55.2
Brazil	8 511 965	6 897 891	81.0	179 189	2.6	826 000	12.0	5 892 702	85.4
British Virgen Isl.	174	-	-	-	-	-	-	-	-
Canada	9 221 016	-	-	-	-	-	-	-	-
Cayman Islands	183	-	-	-	-	-	-	-	-
Chile	756 626	58 073	7.7	58 073	100.0	-	-	-	-
Colombia	1 138 914	970 849	85.2	-	-	156 863	16.2	813 986	83.8
Costa Rica	50 900	35 446	69.6	-	-	22 653	63.9	12 793	36.1
Cuba	110 922	37 502	33.8	37 502a)	100.0	-	-	-	-
Dominica	751	152	20.2	152a)	100.0	-	-	-	-
Dominican Republic	48 442	47 562	98.2	44 281	93.1	1 096	2.3	2 185	4.6
Ecuador	291 906	175 462	60.1	-	-	27 797	15.8	147 665	84.2
El Salvador	21 149	18 656	88.2	-	-	-	-	18 656	100.0
Falkland Islands	11 961	-	-	-	-	-	-	-	-
French Guiana	90 000	90 000	100.0	200	0.2	82 300	91.5	7 500	8.3
Grenada	344	103	29.9	103a)	100.0	-	-	-	-
Guadeloupe	1 779	1 136	63.9	1 136a)	100.0	-	-	-	-
Guatemala	108 889	80 350	73.8	-	-	-	-	80 350	100.0
Guyana	215 025	215 025	100.0	39 437	18.3	84 114	39.1	91 474	42.6
Haiti	27 750	19 100	68.8	-	-	-	-	19 100	100.0
Honduras	112 088	101 351	90.4	-	-	7 023	6.9	94 328	93.1
Jamaica	11 428	10 028	87.7	10 028a)	100.0	-	-	-	-
Martinique	1 080	300	27.8	300	100.0	-	-	-	-
Mexico	1 967 183	1 150 000	58.0	-	-	556 644	48.4	593 356	51.6
Montserrat	84	-	-	-	-	-	-	-	-
Netherland Antilles	961	-	-	-	-	-	-	-	-
Nicaragua	127 358	118 358	92.9	-	-	-	-	118 358	100.0
Panama	75 650	69 840	92.3	-	-	29 705	42.6	40 135	57.4
Canal Zone	1 675	1 432	85.5	-	-	1 432	100.0	-	-
Paraguay	406 752	406 552	99.9	271 010	66.6	80 749	19.9	54 793	13.5
Peru	1 285 215	961 171	74.8	195 418	20.3	222 330	23.1	543 423	56.6
Puerto Rico	8 899	8 899	100.0	8 899a)	100.0	-	-	-	-
St. Kitts, Nevis, Anguilla	396	-	-	-	-	-	-	-	-
St. Lucia	620	510	82.3	510a)	100.0	-	-	-	-
St. Pierre & Miquelon	240	-	-	-	-	-	-	-	-
St. Vincent	389	-	-	-	-	-	-	-	-
Suriname	163 820	163 750	100.0	8 955	5.5	55 345	33.8	99 450	60.7
Trinidad & Tobago	5 605	5 449	97.1	5 444	100.0	-	-	-	-
Turks & Caicos Islands	522	-	-	-	-	-	-	-	-
United States of Am.	9 365 604	2 309 876	24.7	2 309 876a)	100.0	-	-	-	-
Uruguay	186 926	-	-	-	-	-	-	-	-
Venezuela	915 741	600 000	65.5	460 054b)	76.7	-	-	139 946	23.3
Virgen Islands (USA)	345	345	100.0	345a)	100.0	-	-	-	-
Total	40 405 440	15 748 525	39.0	3 965 439	25.2	2 533 183	16.1	9 249 903	58.7

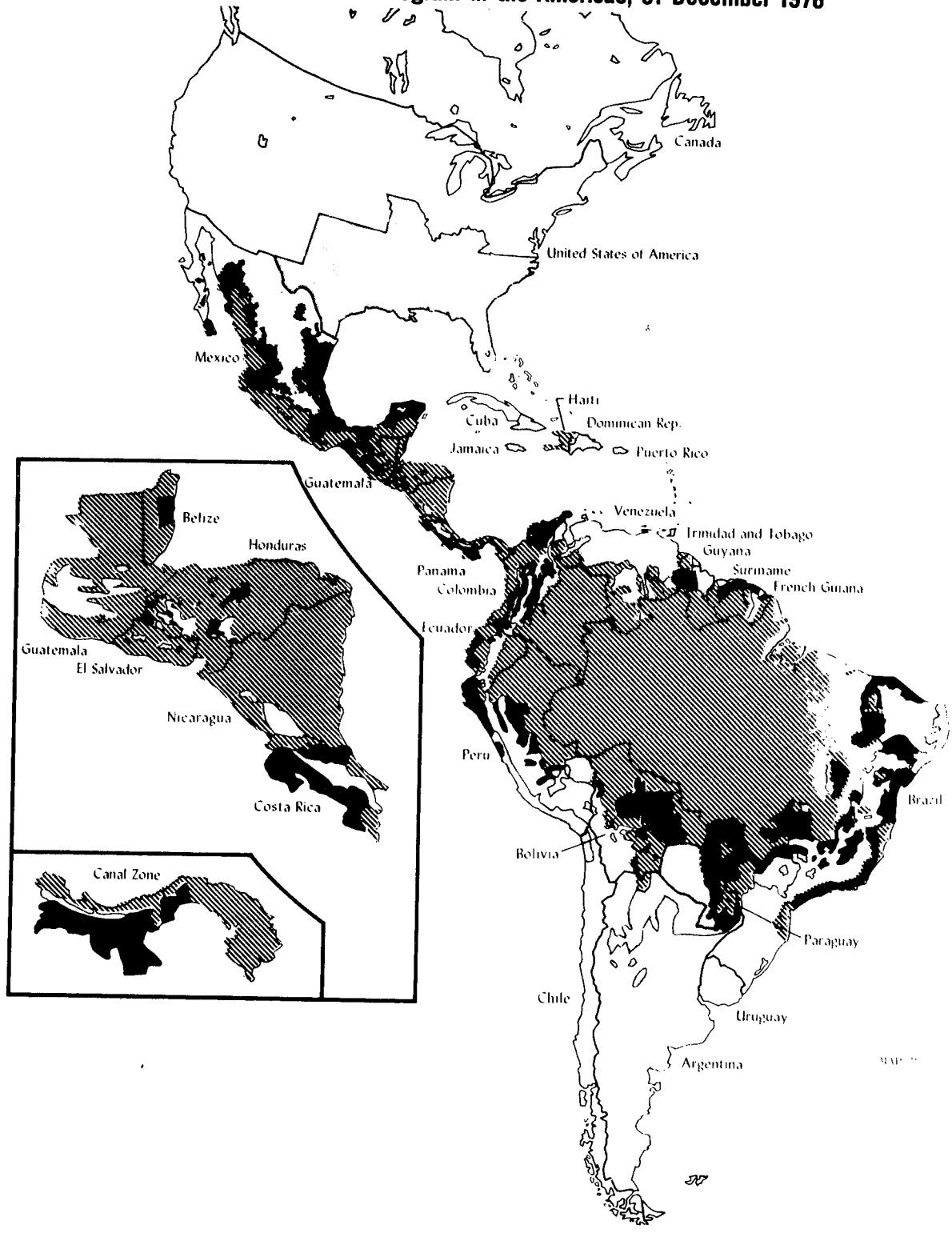
a) Area where eradication of malaria has been certified by PAHO/WHO.
b) Includes an area of 407,945 Km^2, where eradication of malaria has been ertified by PAHO/WHO.

STATUS OF THE MALARIA PROGRAM IN THE AMERICAS, 31 DECEMBER 1977



MAP 1

Status of the Malaria Program in the Americas, 31 December 1978



Including:

- Areas in which malaria has disappeared or never existed — Antigua, Bahamas, Barbados, Barbuda, Bermuda, St. Kitts-Nevis-Anguilla, St. Vincent, Turks and Caicos Islands, Virgin Islands (UK)
- Areas where malaria has been eradicated (Maintenance phase) — Dominica, Grenada, Guadeloupe, Martinique, St. Lucia, Trinidad and Tobago, Virgin Islands (US)
- In consolidation phase
- In attack phase

Table 5

MALARIA MORBIDITY IN THE AMERICAS

1958-1977

Year	Population		Blood Slides			Morbidity per 100,000 inhabitants	
	Total Country	Total malarious area		Positive	%	Total Country	Malarious area
1958	387 276	135 409	1 716 103	56 705	3.3	14.64	41.88
1959	394 606	145 920	2 749 117	75 612	2.8	19.16	51.82
1960	400 500	143 586	3 955 149	79 998	2.0	19.88	55.71
1961	416 008	147 292	5 341 004	99 539	1.9	23.93	67.58
1962	427 919	153 742	7 221 367	177 089	2.5	41.38	115.19
1963	434 950	152 021	7 903 156	227 026	2.9	52.20	149.34
1964	447 666	158 642	8 156 290	254 572	3.1	56.87	160.47
1965	455 527	146 389	9 069 950	241 462	2.7	53.01	164.95
1966	463 649	166 469	11 731 451	333 245	2.8	71.87	200.18
1967	474 868	169 901	11 609 226	369 341	3.2	77.78	217.39
1968	484 664	174 704	12 522 696	282 773	2.3	58.34	161.86
1969	491 483	176 325	12 179 190	323 782	2.7	65.88	183.63
1970	505 819	181 257	9 925 162	344 170	3.5	68.04	189.88
1971	513 544	185 492	10 134 212	338 416	3.3	65.90	182.44
1972	524 774	190 448	9 695 953	284 813	2.9	54.23	149.55
1973	535 109	195 528	9 400 682	280 276	3.0	52.38	143.34
1974	544 865	200 755	8 997 318	269 003	3.0	49.37	134 00
1975	555 676	205 872	9 276 878	356 692	3.8	64.19	173.26
1976	565 249	211 086	9 351 875	379 364	4.1	67.11	179.72
1977	576 942	215 550	9 261 874	398 598	4.3	69.09	184.92
1978	587 319	220 153	9 446 911	464 911	4.9	79 16	211.18

Table 6

CASE DETECTION BY COUNTRY AND PHASE OF PROGRAM, 1978

Country or other political or administrative unit	Total		Maintenance phase		Consolidation phase		Attack phase		Non-malarious areas	
	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive
Argentina	39 922	325	27 964	106	4 878	17	7 080	201	-	1
Belize	30 818	1 218	-	-	8 218	121	22 600	1 097	-	-
Bolivia	124 082	10 897	-	-	38 712	2 159	84 828	8 684	542	54
Brazil	2 825 890	121 577	152 129	903	643 146	1 470	1 978 528	116 576	52 087	2 628
Canada	...	156	-	-	-	-	-	-	-	156
Colombia	381 978	53 412	-	-	154 539	7 369	225 455	45 747	1 984	296
Chile	0	0	-	-	-	-	-	-	-	-
Costa Rica	202 284	313	-	-	139 188	176	61 222	108	1 874	29
Cuba	330 736	158	-	-	-	-	-	-	330 736	158
Dominica	0	0	-	-	-	-	-	-	-	-
Dominican Repub.	489 095	1 531	427 944	1 071	8 566	21	52 345	439	240	0
Ecuador	303 139	9 815	-	-	108 939	646	192 105	9 136	2 095	33
El Salvador	460 313	52 521	-	-	-	-	460 313	52 521	-	-
French Guiana	12 147	266	2 803	52	3 530	90	5 814	124	-	-
Grenada	3 975	58	3 023	57	-	-	-	-	952	1
Guadeloupe	0	0	-	-	-	-	-	-	-	-
Guatemala	463 794	59 755	-	-	-	-	455 968	58 817	7 826	938
Guyana	137 114	927	-	-	-	-	137 114	927	-	-
Haiti	365 202	60 472	-	-	-	-	365 202	60 472	-	-
Honduras	236 650	34 554	-	-	17 082	400	218 429	34 117	1 139	37
Jamaica	13 677	5	13 677	5	-	-	-	-	-	-
Mexico	1 845 554	19 080	-	-	792 742	1 033	1 030 908	17 951	21 904	96
Nicaragua	243 450	10 633	-	-	-	-	243 450	10 633	-	-
Panama	382 942	263	-	-	204 341	49	178 601	214	-	-
Canal Zone	1 080	5	-	-	1 080	5	-	-	-	-
Paraguay	63 070	156	2 509	0	30 914	15	29 554	141	93	0
Peru	201 513	20 376	45 676	635	83 914	4 746	71 923	14 995	-	-
Puerto Rico	1	3	1	3	-	-	-	-	-	-
St. Lucia	4	0	4	0	-	-	-	-	-	-
Suriname	61 358	876	4 623	17	15 902	32	39 061	783	1 772	44
Trinidad & T.	...	1	...	1	-	-	-	-	-	-
United States	493	493	493	493	-	-	-	-	-	-
Venezuela	226 546	5 065	124 866	861	-	-	100 505	3 894	1 175	310
Total	9 446 827	464 911	805 712	4 204	2 255 691	18 349	5 961 005	437 577	424 419	4 781

... Information not available.

Table 7

SLIDES EXAMINED AND POSITIVES, BY SPECIES AND CLASSIFICATION, MAINTENANCE AREAS, 1978

Country or other political or administrative unit	Blood slides examined	Total positive	Specie of parasite				Classification of cases							
			P. falciparum	P. vivax	P. malariae	Mixed infections	Autochthnous	Relapsing	Imported		Induced	Introduced	Criptic and Unclassified	No investigated
									from abroad	from areas within country				
Argentina	27 964	106	-	106	-	-	74	4	6	3	-	7	4	8
Brazil	152 129	903	359	531	-	13	3	-	3	655	4	-	1	237
Dominica	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Dominican Republic ...	427 944	1 071	1 071	-	-	-	35	-	306	-	-	556	-	174
French Guiana	2 803	52	19	32	-	1	3	-	13	29 a)	-	-	3	4
Grenada	3 023	57	-	-	57	-	57	-	-	-	-	-	-	-
Guadeloupe	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Guyana	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Jamaica	13 677	5	5	-	-	-	-	-	5	-	-	-	-	-
Paraguay	2 509	0	-	-	-	-	-	-	-	-	-	-	-	-
Peru	45 676	635	-	635	-	-	539	8	4	78b)	-	-	-	6
Puerto Rico	1	3	2	1	-	-	-	-	3	-	-	-	-	-
St. Lucia	4	0	-	-	-	-	-	-	-	-	-	-	-	-
Suriname	4 623	17	17	-	-	-	-	-	-	17	-	-	-	-
Trinidad and Tobago ..	...	1	...	...	...	...	...	...	...	...	...	...	...	...
United States of Am...	493	493 c)	84	329	33	2	-	-	487	-	-	-	-	-
Venezuela	124 866	861	116	739	1	5	84	-	211	382	14	169	1	-
Total	805 712	4 204	1 673	2 373	91	21	795	12	1038	1 164	18	732	9	429

a) 13 cases imported from Attack phase and 16 from Consolidation phase. b) 68 cases imported from Attack phase and 10 from Consolidation phase. c) Includes also 7 P. ovale, 32 undetermined specie and 6 cases with unknown specie and origin.

Table 8

SLIDES EXAMINED AND POSITIVES, BY SPECIES AND CLASSIFICATION, CONSOLIDATION AREAS, 1978

Country or other political or administrative unit	Population (thousands)	Blood slides examined	Total cases	API*	Specie of parasite				Origin of infections							
					P. falciparum	P. vivax	P. malariae	Mixed infection	autochthonous	Relapsing	Imported		Induced	Introduced	Cryptic	Unclassified or not investigated
											from abroad	from areas within country				
Argentina	66	4 878	17	0.3	-	17	-	-	2	-	-	-	1	4	2	8
Belize	76	8 218	121	1.6	-	121	-	-	87	1	2	14	-	5	-	12
Bolivia	1 144	38 712	2 159	2.0	2	2 156	-	1	234	-	-	155	1	-	-	1 769
Brazil	16 198	643 146	1 470	0.1	278	1 181	-	11	481	10	7	655	4	32	3	278
Colombia	11 486	154 539	7 369	0.6	2 385	4 919	2	63	1 548	12	52	4 594	13	14	228	908
Costa Rica	429	139 188	176	0.4	11	165	-	-	127	-	21	27	-	1	-	-
Dominican Republic	45	8 566	21	0.5	21	-	-	-	11	-	4	-	-	2	-	4
Ecuador	1 933	108 939	646	0.3	219	425	1	1	276	-	-	148	2	-	-	220
French Guiana	17	3 530	90	5.3	42	42	-	6	64	-	13	3	-	-	4	6
Guyana	16	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	490	17 082	400	1.0	20	379	-	1	23	3	-	26	-	-	-	348
Mexico	22 316	792 742	1 033	0.05	1	1 025	7	-	453	62	26	226	11	9	63	183
Panama	1 437	204 341	49	0.03	4	45	-	-	21	3	22	3	-	-	-	-
Canal Zone	38	1 080	5	0.1	1	3	-	1	-	-	5	-	-	-	-	-
Paraguay	1 275	30 914	15	0.01	3	11	-	1	4	-	11	-	-	-	-	-
Peru	2 721	83 914	4 746	1.7	1	4 745	-	-	1 100	18	1	213	1	-	-	3 413
Suriname	47	15 902	32	0.7	32	-	-	-	-	-	-	29	-	-	-	3
Total	59 734	2 255 691	18 349	0.3	3 020	15 234	10	85	4 431	109	164	6 093	33	67	300	7 152

Table 9

SLIDES EXAMINED AND POSITIVES BY SPECIES
ATTACK AREAS, 1978

Country or other political or administrative unit	Slides examined			Species found			
	Total	Positive		P. falciparum	P. vivax	P. malariae	Mixed infections
		Number	Percentage				
Argentina	7 080	201	2.84	-	201	-	-
Belize	22 600	1 097	4.85	2	1 095	-	-
Bolivia	84 828	8 684	10.24	1 033	7 646	-	5
Brazil	1 978 528	116 576	5.89	49 104	66 630	23	819
Colombia	225 455	45 747	20.29	18 812	26 485	69	381
Costa Rica	61 222	108	0.18	15	92	-	1
Dominican Republic	52 345	439	0.84	439	-	-	-
Ecuador	192 105	9 136	4.76	1 963	7 154	-	19
El Salvador	460 313	52 521	11.41	7 891	44 369	-	261
French Guiana	5 814	124	2.13	95	28	-	1
Guatemala	455 968	58 817	12.90	5 050	53 589	-	178
Guyana	137 114	927	0.68	291	633	1	2
Haiti	365 202	60 472	16.56	60 472	-	-	-
Honduras	218 429	34 117	15.62	2 374	31 599	-	144
Mexico	1 030 908	17 951	1.74	193	17 751	2	5
Nicaragua	243 450	10 633	4.37	2 745	7 835	-	53
Panama	178 601	214	0.12	66	145	-	3
Paraguay	29 554	141	0.48	25	108	-	8
Peru	71 923	14 995	20.85	42	14 932	21	-
Suriname	39 061	783	2.00	777	6	-	-
Venezuela	100 505	3 894	3.87	788	3 014	1	91
Total	5 961 005	437 577	7.34	152 177	283 312	117	1 971

Table 10

SLIDES EXAMINED AND POSITIVES BY SPECIES,

NON-MALARIOUS AREAS, 1978

Country or other political or administrative unit	Slides examined			Species found			
	Total	Positive		P. falciparum	P. vivax	P. malariae	Mixed infections
		Number	Percentage				
Argentina	0	1	-	-	1	-	-
Bolivia	542	54	9.96	1	53	-	-
Brazil	52 087	2 628	5.05	966	1 641	3	18
Canada	...	156	-	...	...	...	...
Colombia	1 984	296	14.92	94	196	-	6
Costa Rica	1 874	29	1.55	1	28	-	-
Cuba	330 736	158	0.05	66	83	9	-
Dominican Republic	240	0	-	-	-	-	-
Ecuador	2 095	33	1.58	3	30	-	-
Grenada	952	1	0.11	-	-	1	-
Guatemala	7 826	938	12.00	6	932	-	-
Honduras	1 139	37	3.25	-	35	2	-
Mexico	21 904	96	0.44	1	89	6	-
Paraguay	93	0	-	-	-	-	-
Suriname	1 772	44	2.48	32	10	1	1
Venezuela	1 175	310	26.38	24	279	6	1
Total	424 419	4 781	1.13	1 194	3 377	28	26

... Information not available.

Table 11

SPRAYINGS WITH RESIDUAL INSECTICIDES APPLIED IN 1977 AND 1978 IN THE MALARIA PROGRAMS OF THE AMERICAS

Country or other political or administrative unit	Sprayings applied in 1977			Sprayings applied in 1978			
	DDT	Propoxur	Others	DDT	Propoxur	Fenitrothion	Others
Argentina	18 330	-	-	17 918	-	-	-
Belize	13 300	-	-	17 768	-	-	-
Bolivia	75 191	-	-	82 449	-	-	-
Brazil	4 643 422	-	-	4 191 780	-	-	-
Colombia	611 388	-	-	618 052	-	-	-
Costa Rica.....	22 067	2 016	-	64 545	-	-	-
Dominican Rep.	12 788	-	-	29 965	-	-	-
Ecuador	449 096	-	-	407 719	-	8 827	-
El Salvador ...	26 626	275 775	2 696a)	-	10 000	-	-
French Guyana	3 400	-	-	2 000	-	-	-
Guatemala	...	...	...	67 744	-	436 920	-
Guyana	4 364	-	-	13 578	-	-	-
Haiti	213 793	-	-	232 832	-	14 263	-
Honduras	137 128	150 188	-	239 454	-	-	-
Mexico	2 861 100	-	-	2 354 162	-	-	-
Nicaragua	35 412	131 955	-	38 014	66 091	-	14 363b)
Panama	58 349	9 078	-	55 866	5 088	-	-
Paraguay	120 511	-	-	68 169	-	-	-
Peru	120 235	-	-	192 877	-	-	-
Suriname	2 379	-	-	1 243	-	-	-
Venezuela	322 757	-	3 843c)	396 840	-	-	8 877c)
Total	9 751 636	569 012	6 539	9 092 975	81 179	460 010	23 240

a) Sprayings with Fenitrothion. b) Sprayings with Clorfoxim. c) Sprayings with HCH.

Table 12

INSECTICIDES USED IN THE MALARIA PROGRAMS

1978 AND ESTIMATED 1979

Country or other political or administrative unit	DDT (Kg.)				Propoxur 50% (Kg.)		Other	
	1978		1979 (Est.)		1978	1979 (Est.)	1978	1979 (Est.)
	100%	75%	100%	75%				
Argentina	661	13 111	500	10 000	-	-	-	-
Belize	7 000	2 058	3 400	14 400	-	-	-	-
Bolivia	-	49 722a)	-	102 000	-	-	-	-
Brazil	855 899	4 098 916	320 000b)	2 500 000 b)	-	-	770 000c)	-
Colombia d)	1 330	220 804	2 500	481 660	11 412	14 000	31 709c)	30 630c)
Costa Rica	1 578	21 622	2 000	21 000	2 526	2 500	-	-
Dominican Republic	1 600	18 800	4 000	40 000	-	-	-	-
Ecuador	1 200e)	235 874e)	5 000	300 000	-	-	7 694f)	10 000f)
El Salvador	-	-	-	-	110 000	50 000	-	-
French Guiana	540	252	594	277	-	-	(g)	(g)
Guatemala	695	41 372	907	27 216	-	-	(h)	(h)
Guyana	3 205	2 802	4 989	9 072	-	-	-	-
Haiti	277	99 256	-	-	-	-	3 496i)	5 225i)
Honduras	1 699	51 948	4 800	110 400	70 926	12 800	-	-
Mexico	35 441	1 402 492	46 400	1 672 200	-	-	28j)	60j)
Nicaragua	374	18 772	-	39 545	28 710	48 000	11 678k)	60 000k)
Panama	3 009	32 352	2 000	28 000	8 318	15 000	-	-
Paraguay	-	50 046	-	85 978	-	-	-	-
Peru	-	325 970	-	850 000	-	-	-	-
Suriname	73	373	800	4 200	-	-	-	-
Venezuela	-	216 791	-	329 600	-	-	(1)	(1)
Total	914 581	6 903 333	397 890	6 625 548	231 892	142 300	-	-

a) Amount used up to November. b) Estimated amounts does not include São Paulo State. c) Liters of malathion d) In addition to insecticides shown, 75,200 Kg. of Carbaril were used in 1978 and 15,600 will be used in 1979. e) Amounts used up to October. f) Kilograms of Fenitrothion. g) In 1978 there were used 450 Lt. Dibrón 14, 3,940 Lt. Malathion; 2,360 Lt. Malathion U.L.V; 1,200 Kg. Baytex powder; 3,300 Kg. Abate powder and 107 Lt. Abate emultion. h) In 1978, 205,661 Kg. of Sumithion and 292 Lt. of Fenthion 50% were used and in 1979 it will be used 215,000 Kg. Sumithion and 300 Lt. Fenthion. i) Liters of Malathion, plus 14,909 Kg. Fenitrothion in 1978 and 65,000 in 1979. j) Liters of Abate 500-E. K) Kilograms of Clorfoxim, 50%. 1) In 1978 there were used 80,440 Lt. DDT, C.E; 16,894 Lt. Malathion, 5,355 Kg. HCH, 2,807 Lt. Baytex & 3,361 Lt. Pencotion.

Table 13

COMPARATIVE RESULTS OF ACTIVE AND PASSIVE CASE DETECTION IN MALARIA PROGRAMS IN THE AMERICAS, 1978

Country or other political or administrative unit	Active case detection				Passive case detection						Total	
	Average number of evaluators	Blood slides			Average number of notification posts	Average of notification posts producing slides per month	Blood slides			Average of slides per month per productive notification posts	Blood slides	
		Examined	Positive	Percent			Examined	Positive	Percent		Examined	Positive
Argentina	107	34 503	251	0.7	600	99	5 419	74	1.4	4.6	39 922	325
Belize	10	24 962	522	2.1	128	39	5 856	696	12.0	12.5	30 818	1 218
Bolivia	106	97 808	3 934	4.0	2 992	1 409	26 274	6 963	26.5	1.5	124 082	10 897
Brazil	3 779	1 983 841	28 635	1.4	34 993	14 321	842 049	92 942	11.0	11.2	2 825 890	121 577
Canada	-	-	-	-	-	-	...	156	-	-	...	156
Colombia	...	126 255	11 320	9.0	7 462	4 539	255 723	42 092	16.5	4.7	381 978	53 412
Costa Rica	78	198 677	211	0.1	930	178	3 607	102	2.8	1.7	202 284	313
Cuba	...	14 585	0	-	...	...	316 151	158	0.05	-	330 736	158
Dominican Republic	166	369 494	1 091	0.3	4 388	3 482	119 601	440	0.4	3.0	489 095	1 531
Ecuador	120	112 399	1 649	1.5	6 304	2 824	190 740	8 166	4.3	5.6	303 139	9 815
El Salvador	...	136 335	11 405	8.4	2 942	2 933	323 978a)	41 116a)	12.7	9.2	460 313	52 521
French Guiana	...	8 820	101	1.2	...	...	3 327	165	5.0	-	12 147	266
Grenada	-	3 791	47	1.2	-	-	184	11	6.0	-	3 975	58
Guatemala	136	130 302	9 027	7.0	7 226	3 268	333 492	50 728	15.2	8.5	463 794	59 755
Guyana	64	137 114	927	0.1	58	24	-	-	-	-	137 114	927
Haiti	50	89 389	5 123	5.7	6 488	3 834	275 813	55 349	20.1	6.0	365 202	60 472
Honduras	45	23 168	1 509	6.5	3 147	1 725	213 482	33 045	15.5	10.3	236 650	34 554
Jamaica	...	3 224	0	-	...	...	10 453	5	0.05	-	13 677	5
Mexico	1 277	1 436 888	8 237	0.6	61 299	8 788	408 666	10 843	2.6	3.8	1 845 554	19 080
Nicaragua	99	21 992	410	2.0	4 250	4 250	221 458	10 223	4.6	4.3	243 450	10 633
Panama	275	349 631	196	0.06	1 011	268	33 311	67	0.2	10.4	382 942	263
Canal Zone	...	269	0	-	...	...	811	5	0.6	-	1 080	5
Paraguay	...	27 364	102	0.4	4 414	966	35 706	54	0.2	3.1	63 070	156
Peru	95	114 609	7 616	6.7	5 935	991	86 904	12 760	14.7	7.3	201 513	20 376
Puerto Rico	-	-	-	-	-	-	1	3	-	-	1	3
St. Lucia	-	-	-	-	-	-	4	0	-	-	4	0
Suriname	32	54 658	735	1.3	80	72	6 700	141	2.1	7.7	61 358	876
Trinidad & Tobago	-	-	-	-	-	-	...	1	-	-	...	1
United States of Amer.	-	-	-	-	-	-	493	493	-	-	493	493
Venezuela	416	156 620	2 416	1.3	2 866	455	69 926	2 469	4.7	11.5	226 546	5 065
Total	-	5 656 698	95 464	1.7	-	-	3 790 129	369 447	9.7	-	9 446 827	464 911

a) Estimated

Table 14

PERSONNEL EMPLOYED IN THE MALARIA PROGRAMS IN THE AMERICAS
31 DECEMBER 1977 AND 1978 a)

(Part-time personnel in parentheses)

Title	1977	1978
Engineers	106 (1)	99 (1)
Spraying Chiefs	366 (3)	351
Sector Chiefs	593	481
Squad Chiefs	2 182	1 930
Spraymen	8 477	8 986
Draftsmen	107 (3)	105
Medical Officers	183 (4)	182 (3)
Entomologists	67	58
Assistant Entomologists	184	234
Statisticians and Statisticians Assistants	404	395
Evaluation Inspectors	1 874 (3) b)	2 091 (3) b)
Evaluators	7 583 b)	7 607 b)
Microscopists	912	879 (5)
Administrators	81	63
Administrative Assistants	697	630
Accountants	59	59
Disbursing Officers	55	43
Storekeepers	97	70
Storekeepers' Assistants	85	83
Secretaries	258	275
Others	1 302 (2)	725 (3)
Transport Chiefs, Mechanics and Assistant Mechanics	440	464
Drivers	1 026	962
Motorboat Operators	334	364
Boatmen	51	98
TOTAL	27 523 (16)	27 234 (15)

a) The administration of some of the malaria programs is under the health services.
b) In some programs this personnel performs spraying operations' activities.

Table 15

MEANS OF TRANSPORT IN MALARIA PROGRAMS IN THE AMERICAS, 1978

Country or other political or administrative unit	Trucks (3 tons or more)		Trucks and "Pick-up" (less than 3 tons)		Jeeps		Automobiles and station wagons		Motor-cycles		Bicycles		Motor boats		Boats without motor		Saddle and pack animals	Other	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b		a	b
Argentina	2	-	26	21	20	27	4	3	7	6	-	-	-	-	-	-	-	-	-
Belize	-	-	1	2	1	2	-	-	-	-	-	-	-	3	-	1	-	-	-
Bolivia	-	-	-	-	6	5	2	-	-	-	-	-	12	11	-	-	60	14c)	37c)
Brazil	29	-	340	-	707	-	10	-	215	-	2 105	-	401	-	7	-	712	-	-
Colombia	9	7	20	78	52	108	-	13	23	18	76	35	176	110	20	15	703	-	-
Costa Rica	-	-	8	-	6	3	-	-	42	3	-	6	-	15	-	-	41	-	-
Dominican Rep.	-	1	49	6	2	-	5	2	144	-	1	-	-	-	-	-	50	-	-
Ecuador	-	2	26	34	9	39	3	2	23	13	28	12	25	26	-	-	256	-	-
El Salvador	-	-	13	6	18	14	-	4	6	8	-	-	-	-	-	-	-	-	-
French Guiana	-	-	5	-	5	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Guatemala	2	-	54	-	37	-	21	-	44	29	-	-	13	7	-	-	-	-	-
Guyana	-	1	-	-	-	13	-	-	-	5	3	1	-	12	-	2	4	-	-
Haiti	-	-	5	43	10	38	7	8	-	-	-	-	-	1	1	-	-	-	-
Honduras	2	-	30	20	5	16	4	8	35	9	-	-	2	1	-	1	65	-	-
Mexico	20	12	297	214	425	227	32	3	-	-	-	-	43	11	-	-	1 744	-	-
Nicaragua	-	1	19	8	32	15	12	-	27	9	-	-	6	4	-	-	-	-	-
Panama	1	-	12	10	20	9	2	1	19	6	27	6	38	3	22	7	-	59c)	33c)
Paraguay	1	1	21	5	6	2	15	-	134	9	33	17	10	1	-	-	-	-	-
Peru	-	-	80	67	5	15	7	45	21	24	-	-	18	87	-	-	-	-	-
Suriname	1	-	1	-	-	1	-	1	4	1	-	-	26	-	-	-	-	-	-
Venezuela	12	-	148	-	125	-	59	-	19	-	247	-	126	-	-	-	595	90	-
Total	79	25	1 155	514	1 491	534	185	90	763	140	2 520	77	896	292	50	26	4 230	163	70

a) In good condition. b) In bad condition. c) Out-board motors.

Table 16

NATIONAL AND INTERNATIONAL CONTRIBUTIONS TO THE MALARIA PROGRAMS

OF THE AMERICAS, EXPENSES 1977-1978 AND BUDGET 1979

(U.S. dollars)

Country or other political or administrative unit	Expenditures 1977				Expenditures 1978				Budget 1979			
	National expenses internal financing	PAHO/WHO Contributions	AID/USA Grants	TOTAL	National expenses internal financing	PAHO/WHO Contributions	AID/USA Grants	TOTAL	National budget internal financing	PAHO/WHO Contribution	AID/USA Grants	TOTAL
Argentina	197 920	-	-	197 920	1 093 025	5 685	-	1 098 710	...	20 000	-	20 000
Belize	119 318	44 924	-	164 242	70 287	31 504	-	101 791	138 039	25 400	-	163 439
Bolivia	683 000	76 859	-	759 859	827 498	83 044	-	910 542	936 490	-	-	936 490
Brazil	28 484 870	273 226	-	28 758 096	39 445 121	252 333	-	39 697 454	41 661 403	316 600	-	41 978 003
Colombia	4 147 630	217 973	-	4 365 603	6 296 296	199 882	-	6 496 178	12 592 592	201 800	-	12 794 392
Costa Rica	1 340 264	58 592	-	1 398 856	1 357 209	54 704	-	1 411 913	1 611 913	60 600	-	1 673 183
Dominican Republic	829 420	49 657	-	879 077	865 020	78 367	-	943 387	1 020 000	53 500	-	1 073 500
Ecuador	3 512 902	3 985	-	3 516 887	3 313 207	-	-	3 313 207	3 650 075	-	-	3 650 075
El Salvador	2 723 028	67 179	-	2 790 207	3 227 960	45 264	-	3 273 224	...	37 700	-	37 700
French Guiana	1 408 614	5 963	-	1 414 577	1 549 475	9 600	-	1 559 075	1 704 423	6 900	-	1 711 323
Guatemala	2 812 555	-	-	2 812 555	3 028 898	-	-	3 028 898	3 056 184	-	-	3 056 184
Guyana	286 275	46 098	-	332 373	319 608	20 777	-	340 385	...	55 500	-	55 500
Haiti	800 000	221 434	1 200 000	2 221 434	920 000	170 255	1 200 000	2 290 255	1 020 000	220 900	1 200 000	2 440 900
Honduras	1 681 728	-	-	1 681 728	1 935 405	-	-	1 935 405	...	-	-	...
Mexico	21 579 831	130 566	-	21 710 397	26 447 565	91 273	-	26 538 838	...	128 300	-	128 300
Nicaragua	2 871 428	88 458	-	2 959 886	3 171 428	110 921	-	3 282 349	3 178 428	69 000	-	3 247 428
Panama	1 639 208	84 605	-	1 723 813	1 651 343	84 096	-	1 735 439	1 706 344	92 100	-	1 798 444
Paraguay	1 261 533	44 062	-	1 305 595	1 321 967	27 665	-	1 349 632	...	51 800	-	51 800
Peru	851 482	65 111	-	916 593	769 230	59 840	-	829 070	...	28 000	-	28 000
Suriname	737 778	44 443	-	782 221	773 333	62 819	-	836 152	772 778	49 700	-	822 478
Venezuela	13 481 948	-	-	13 481 948	13 481 948	-	-	13 481 948	13 209 541	-	-	13 209 541
Intercountry Projects & Central Of.	-	521 545	-	521 545	-	493 372	-	493 372	-	435 200	-	435 200
TOTAL	91 450 732	2 044 680	1 200 000	94 695 412	111 865 823	1 881 401	1 200 000	114 947 224	86 258 880	1 853 000	1 200 000	89 311 880

Table 17

ESTIMATED REQUIREMENTS FOR MALARIA PROGRAMS IN THE AMERICAS

	1978[a]	1979[b]	1980/1981[c]	1982/1983[c]
TOTAL COST	114 947 224	89 311 880	-	-
GOV. AND OTHER SOURCES	113 065 823	87 458 880	...	...
PAHO/WHO PORTIONS:				
Personnel costs and travel	1 419 862	1 448 900	3 098 600	3 431 700
Supplies and Materials ...	378 432	271 600	397 300	455 900
Fellowships	49 863	105 000	211 100	341 800
Grants and others	33 244	27 500	85 000	89 100
TOTAL	1 881 401	1 853 000	3 792 000	4 318 500

SOURCES OF PAHO/WHO FUNDINGS

SOURCE	1978[a]	1979[b]	1980/1981[c]	1982/1983[c]
PAHO-Reg	1 201 476	1 225 700	2 322 300	2 616 800
PAHO-PG	83 970	...	...	...
OMS-Reg	595 955	627 300	1 469 700	1 776 400
TOTAL	1 881 401	1 853 000	3 792 000	4 393 200

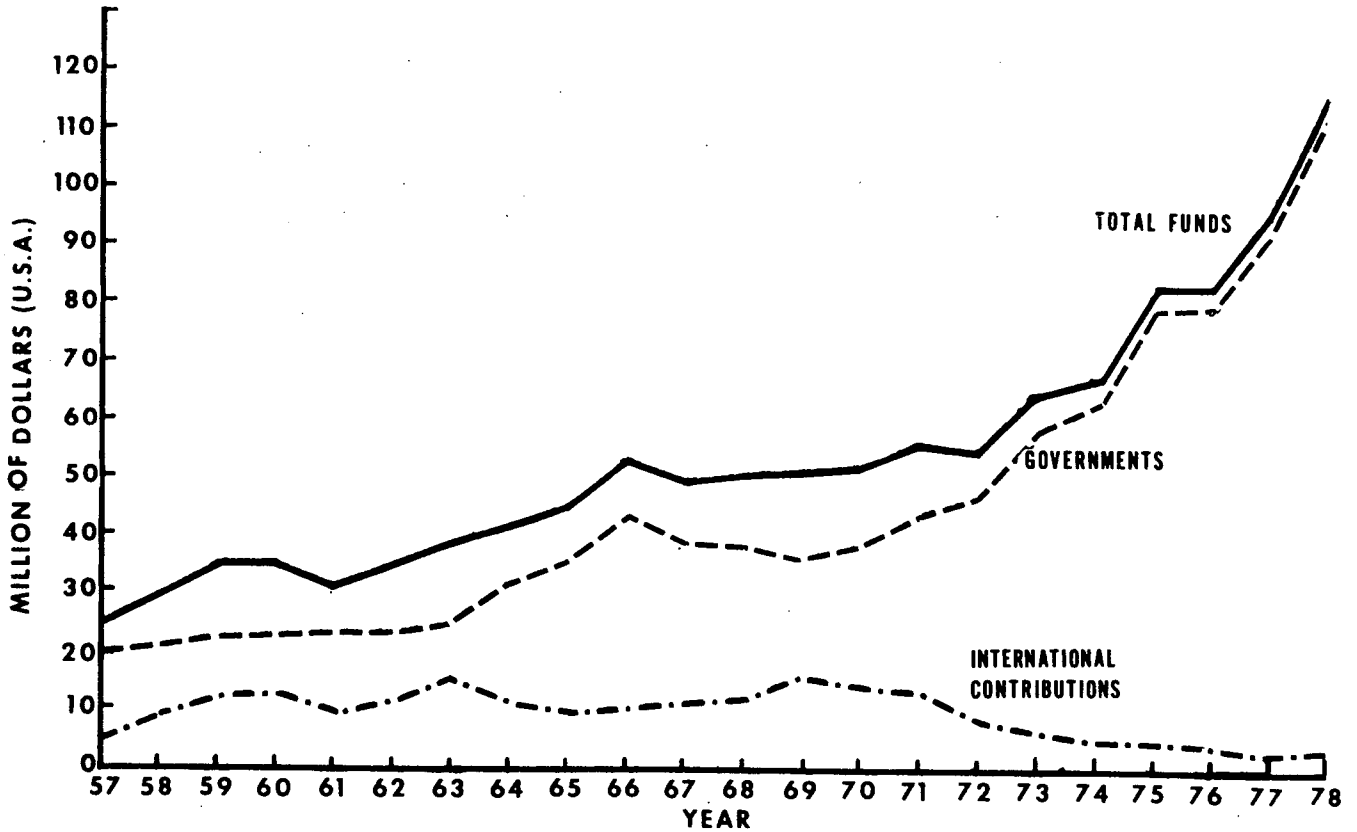
PAHO/WHO PERSONNEL

CATEGORY	1978	1979	1980/1981[c]	1982/1983[c]
Medical Officers	14	14	22	22
Sanitary Engineers	4	4	6	6
Entomologists	6	6	7	4
Parasitologists	1	1	1	1
Sanitary Inspectors	8	7	14	14
Other	4	4	10	10
TOTAL	37	36	60d)	57d)

a) Expenditures. b) Estimated. c) Estimated requirements for two years. d) Totals refer to personnel for two years.

Graph 1

FUNDS INVESTED IN THE MALARIA PROGRAMS IN THE AMERICAS, 1957-1978



GRAPH 2

INTERNATIONAL FUNDS INVESTED IN THE MALARIA PROGRAMS IN THE AMERICAS, 1957-1978

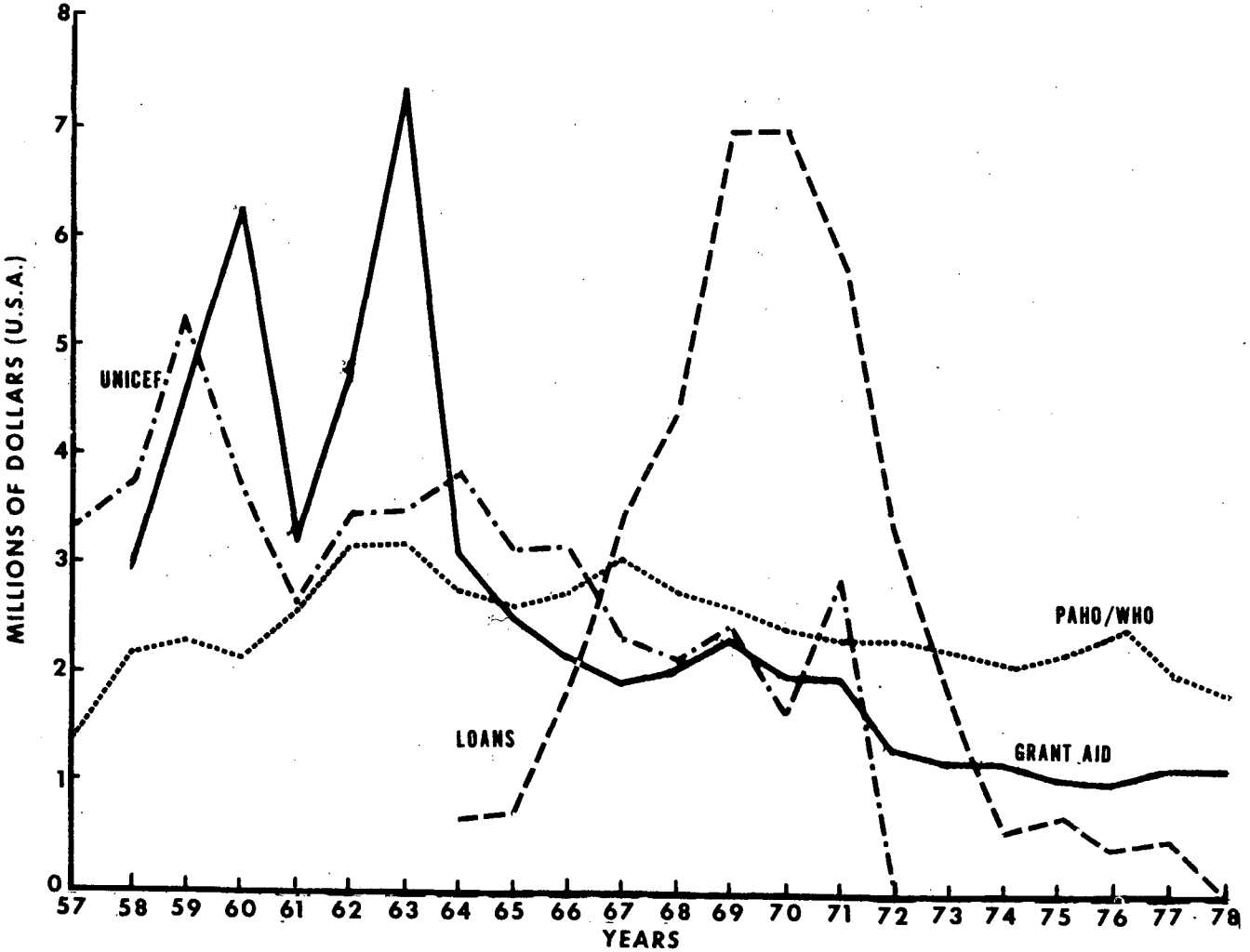


Table 18

GEOGRAPHICAL DISTRIBUTION OF AREAS WITH TECHNICAL PROBLEMS, 1978

Countries and Areas	Population of Affected Areas	Area Involved (Km2)	Insecticides Used		No. of cases in this Area	Principal Vectors	Causes of the Problem
			Type Used	Years of cover-age			
Bolivia							
1. Departament Beni (Guayamerin) Department Tarija (Bermejo)	84 905	27 639	DDT	20	4 334	A. darlingi A. pseudopun	Poor housing colonization; parasite resistance to chloroquine; population movements.
Colombia							
2. Caribbean Coastal Zone; Magdalena River, Pacific Coastal Zone, Catatumbo Eastern Slope of Eastern Mountains, Alto Caqueta, Sarare; Meta River (Alto Vaupes)	787 001	105 923	DDT MLT Propoxur	13-20	17 069	A. darlingi A. puctimac. A. nuneztovari A. albimanus A. pseudopun. A. neivae A. albitarsis	Vector behavior; poor housing; colonization; social problems; parasite resistance to chloroquine; refusal to spraying; movement of people.
Ecuador							
3. Esmeraldas Napo	322 656	46 836	DDT	11	5 714	A. punctimac. A. albimanus	Colonization; poor housing; parasite resistance to Chloroquine.
El Salvador							
4. Coastal Area	1 226 000	7 500	DDT Propoxur	17 6	52 521	A. albimanus	Vector resistance to DDT and Propoxur
Guatemala							
5. Pacific Coastal Zone	814 435	11 456	Propoxur	7	24 740	A. albimanus A. pseudopun. A. vestitipen.	Vector resistance to insecticide.
Haiti							
6. Cite Simone O. Duvalier; Jacmel; Valle de la Coma; Gross-Morne; Southeast area; Petit-Goave; Bois Neuf	1 476 469	3 645	DDT	13	39 979	A. albimanus	Vector resistance to DDT; population movements.
Honduras							
7. South area; Jamastran Valley; Talanga and Cedros Valleys	236 245	5 436	DDT	7	24 166	A. albimanus A. pseudopun.	Vector resistance to insecticides; internal and external population movements

Table 18 (Cont.)

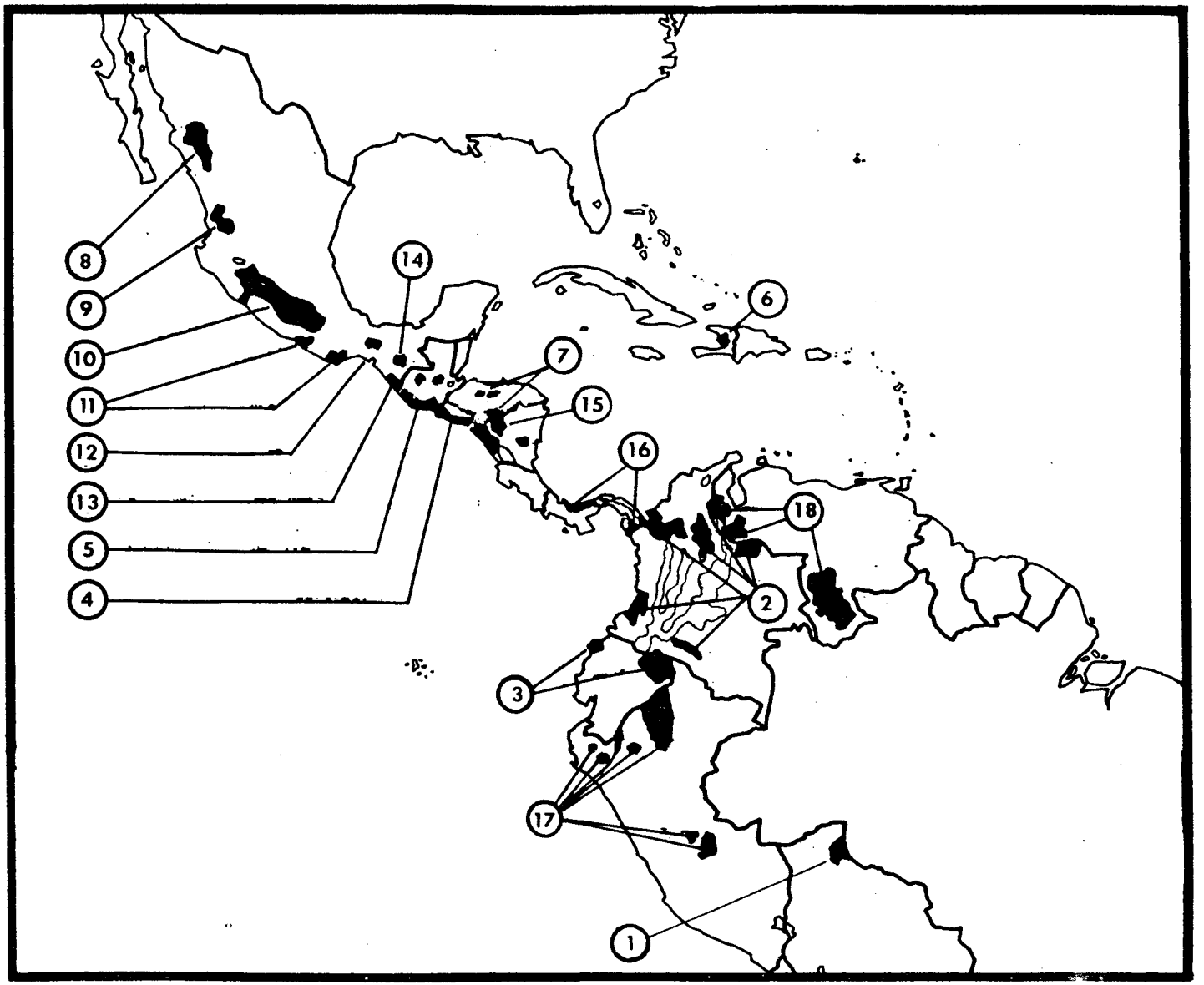
GEOGRAPHICAL DISTRIBUTION OF AREAS WITH TECHNICAL PROBLEMS, 1978

Countries and Areas	Population of Affected Areas	Area Involved (Km^2)	Insecticides Used		No. of cases in this Area	Principal Vectors	Causes of the Problem
			Type Used	Years of coverage			
Mexico							
8. Basins of Rivers Fuerte Sinaloa, Humaya and Tamazula; 9. Huicot 10. Basin of Balsas River 11. Costa Chica of Guerrero and Oaxaca Coastal Zone 12. "El Istmo" Northeastern Slope of the Golf of Mexico, Oaxaca State 13. Tapachula-Suchiate 14. Central part of Chiapas	3 476 415	162 547	DDT	21	...	A. pseudopun. A. albimanus	Internal migration; poor housing; temporary shelters; modification of houses; vector resistance to DDT; actions that remove insecticides from surfaces.
Nicaragua							
15. Pacific Coast; Central Region; Atlantic Region, Zelaya	1 794 021	30 138	DDT Malathion Propoxur	16 5 7	8 184	A. albimanus	Vector resistance to DDT, Malathion and Propoxur.
Panama							
16. Jaqué Calovebora St. Catalina, Tobobe	7 190	4 871	DDT	20	117	A. albimanus	Migration; poor housing; parasite resistance, population movement
Peru							
17. Chinchipe Ene Satipo San Lorenzo Bigote Bagua Santiago, Alto Marañon	209 000	142 950	DDT	15-18	5 263	A. pseudopun A. rangeli A. albimanus A. benarrochi	High vulnerability; poor housing; migration of laborers; temporary shelters; actions that remove insecticides from surfaces.
Venezuela							
18. Western and Southern areas	582 329	139 946	DDT	30	3 258	A. nuneztovari A. darlingi	Vector exophily; population movement; colonization; refusal to permit spraying; poor public cooperation.
TOTAL	11 016 666	688 887	-	-	185 345	-	-

Note: In the Americas, also exist regions with all types of problems of special characteristics, such as the Amazon Basin which includes areas of Bolivia, Colombia, Ecuador, Peru and a large extension of Brazil; in this 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 a long term program.

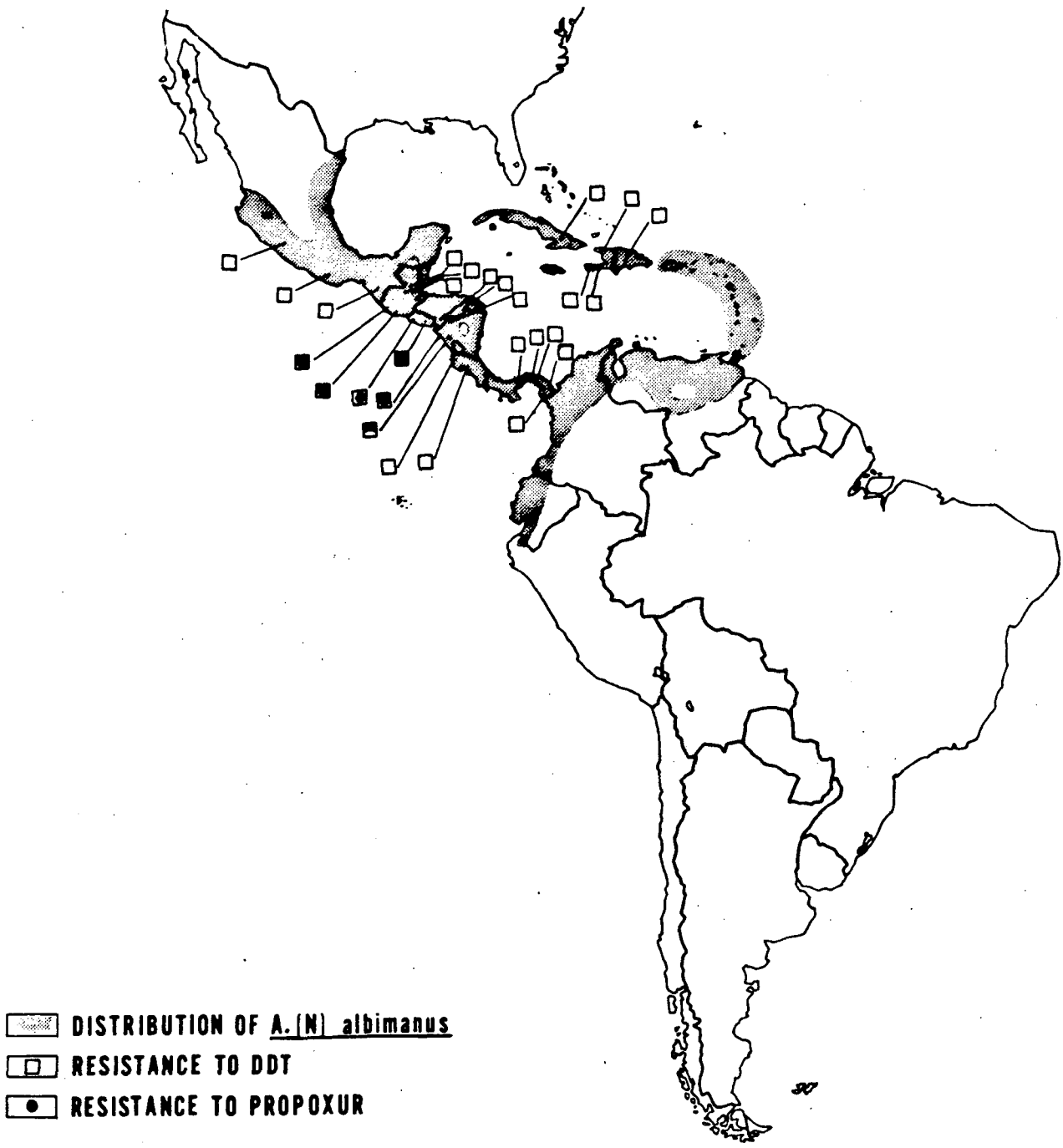
Map 3

GEOGRAPHICAL DISTRIBUTION OF AREAS OF TECHNICAL PROBLEMS, 1978



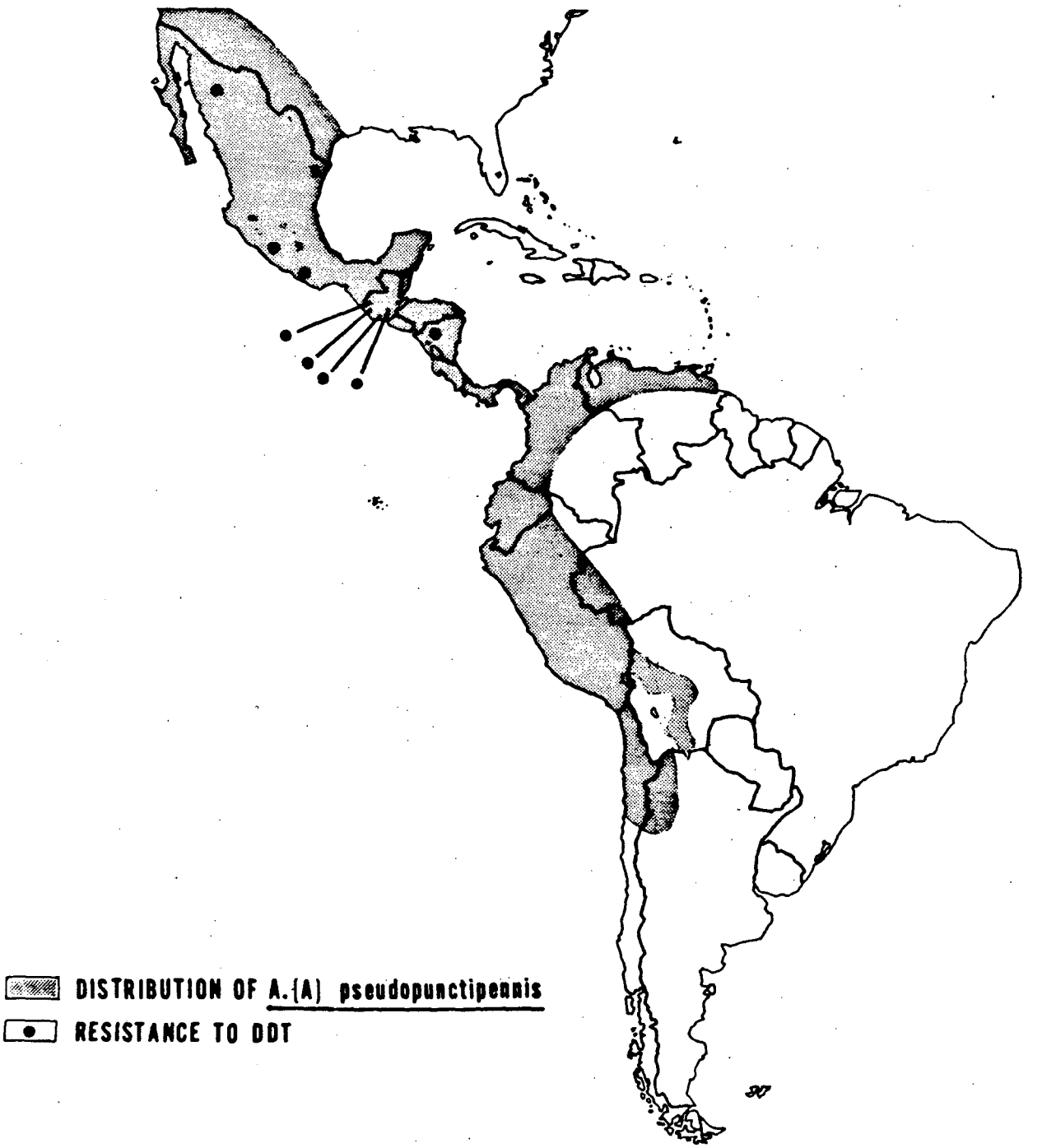
Map 4

DISTRIBUTION OF A. (N) albimanus AND RESISTANCE TO DDT AND PROPOXUR (DECEMBER 1978)



Map 5

DISTRIBUTION OF A. (A) pseudopunctipennis AND RESISTANCE TO DDT (DECEMBER 1978)



AREAS WITH CONFIRMED CASES OF P. falciparum RESISTANT TO CHLOROQUINE

No.	Country and Area
	BRAZIL
1	Barcelos (Amazonas)
2	Pto. Velho (Rondonia)
3	R. Machado (Rondonia)
4	Cuiaba (Mato Grosso)
5	Três Lagoas (Mato Grosso)
6	Conceição da Barra (Esp. Santo)
7	Alenquer (Para)
8	Santarém (Pará)
9	S. Miguel Guama (Pará)
10	Belém (Para)
11	Igarapemirim (Pará)
12	Barcarena (Pará)
13	Carretera Belém-Brasilia (Pará)
14	R. Gurupi (Pará)
15	Braz Aguiar (Roraima)
16	Mucajaí (Roraima)
17	Boa Vista (Roraima)
18	Macapá (Amapá)
	COLOMBIA
19	Curiche (Chocó)
20	Río de Oro (Cesar)
21	Caucasia (Antioquia)
22	Cimitarra y Bolívar (Santander)
23	Pto. Boyacá (Boyacá)
	ECUADOR
24	Putumayo (Napo)
	FRENCH GUIANA
25	Bellevue (Iracoubo)
	GUYANA
26	Lethem
	PANAMA
27	Las Cumbres y Chilibre Lago Gatún San Blas Garachiné-Sambú
	SURINAME
28	Alalaparoe
29	Lawa y Marowijne rivers
	VENEZUELA
30	Barinas
31	Zulia
32	T. F. Delta Amacuro
33	T. F. Amazonas

Map 6

Table 19

PAHO/WHO TECHNICAL STAFF ASSIGNED TO MALARIA PROGRAMS IN THE AMERICAS
FROM 1976 TO 1979

Country or other political or administrative unit	Medical Officers				Sanitary Engineers				Sanitary Inspectors				Entomologists				Others			
	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979
Belize	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-
Bolivia	1	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Brazil	2	2	2	2	1	1	1	1	-	-	-	-	-	-	-	1	a)	a)	a)	a)
Colombia	1	1	1	1	-	-	-	-	2	2	2	2	1	1	1	1	-	-	-	-
Costa Rica	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dominican Republic	-	-	-	-	1	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-
Ecuador	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
El Salvador	1	1	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-
Guyana	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Haiti	1	1	1	1	1	1	1	1	3	3	2	2	-	-	1	1	-	-	-	-
Mexico	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nicaragua	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Panama	-	-	-	-	1	1	1	1	1	-	-	-	1	1	1	1	-	-	-	-
Paraguay	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Peru	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suriname	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-
Headquarters and AMRO Projects	6	5	5	5	1	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-
Total	19	16	14	14	7	8	4	4	11	9	9	7	3	3	5	6	1	1	1	1

a) Parasitologist.

Table 20

DRUGS PROVIDED BY PAHO/WHO TO THE MALARIA PROGRAMS IN THE AMERICAS, 1958-1978

(In thousands of tablets)

Country or other political or administrative unit	Total 1958-1977[a]							1978						
	Chloroquine 150 mg.	Primaquine 15 mg.	Primaquine 5 gm.	Pyrimethamine 25 mg.	Combined drug (b)	Aspirin 0.50 0.20 mg.	Fanasil	Chloroquine 150 mg.	Primaquine 15 gm.	Primaquine 5 gm.	Pyrimethamine 25 mg.	Combined drug[b] Adult size	Combined drug[b] Infant size	Fanasil
Argentina	2 018	399	222	712	-	-	-	60	20	10	-	-	-	-
Belize	738	117	113	6	22	140	-	150	84	84	-	-	-	-
Bolivia	10 320	1 570	691	960	670	200	15	-	300	-	-	150	10	-
Brazil	137 835	3 514	1 479	496	3 125	-	372	4 500	420	105	54	155c)	50	104
Colombia	34 955	2 743	830	6 649	13 170	120	502	440	14	-	-	300	-	-
Costa Rica	7 794	1 253	547	223	1 385	308	-	-	300	75	-	-	-	-
Cuba	4 350	38	69	80	-	-	-	-	-	-	-	-	-	-
Dominica	90	1	1	45	-	40	-	-	-	-	-	-	-	-
Dominican Republic	14 527	91	225	847	516	20	-	300	-	-	-	100	5	-
Ecuador	15 236	1 213	271	430	1 013	-	-	1 300	350	100	20	175	25	25
El Salvador	21 455	1 104	988	128	2 070	-	-	-	-	-	-	-	-	-
French Guiana	758	543	67	126	48	-	14	-	-	-	-	200c)	50	2
Grenada	43	-	-	45	-	20	-	-	-	-	-	-	-	-
Guatemala	20 998	1 497	566	127	8 049	250	2	1 000	250	175	-	-	-	-
Guyana	1 242	307	112	403	20	30	29	120	20	10	10	-	-	5
Haiti	13 900	102	5	1 480	31 608	-	-	-	-	-	-	-	-	-
Honduras	17 786	2 314	1 346	88	1 290	-	-	400	500	100	-	-	-	-
Jamaica	879	18	-	288	50	-	-	-	-	-	-	-	-	-
Mexico	88 266	12 236	15 747	10 679	6 942	-	-	2 700	771	518	-	-	-	-
Nicaragua	14 399	2 853	2 155	156	6 933	-	-	-	-	-	-	-	-	-
Panama	6 780	1 106	645	550	1 937	-	61	-	100	50	50	-	-	-
Canal Zone	-	-	-	-	90	-	-	-	-	-	-	-	-	-
Paraguay	12 884	271	118	77	94	-	14	115	15	15	-	-	-	5
Peru	26 856	1 689	758	3 323	4 089	473	-	1 100	140	70	-	-	-	-
St. Lucia	68	1	-	70	-	36	-	-	-	-	-	-	-	-
Suriname	3 855	808	313	968	595	138	15	200	90	50	50	300c)	10	-
Trinidad & Tobago	840	961	426	127	400	132	-	-	-	-	-	-	-	-
Total	458 872	36 749	27 694	29 083	84 116	1 907	1 024	12 385	3 374	1 362	184	1 380	150	141

a) During this period, Chloroquine, Pyrimethamine and Primaquine powder and Tricalcium phosphate have been provided to different malaria proyects. b) Chloroquine/Primaquine combined. c) Includes Daraclor tablets (Chloroquine/Pyrimethamine combined).