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STATUS OF MALARIA PROGRAMS IN THE AMERICAS

XXX REPORT

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REPORT ON THE STATUS OF MALARIA ERADICATION IN THE AMERICAS

XXX REPORT

Introduction

The number of malaria cases registered in the Region of the Americas increased steadily during the last decade, with the exception of 1974. In 1972, 284,613 malaria cases were recorded in the Region, a time when the surveillance net-work was considered to be adequate. In 1981, the figure reached 633,876 cases, and the same surveillance net-work was considered less efficient. In general surveillance activities have decreased in the remote communities due to limited resources, transportation problems and difficulties related to administrative and human factors. From 1972 to 1981 the population in the originally malarious areas increased by 26%, while the number of blood slides collected in 1981 was 94% of that in 1972. Other studies have shown that although fewer blood samples were taken in 1981, a higher slide positivity rate was found (from 2.9% in 1972 to 7.0% in 1981).

The health authorities in the Region have continuously expressed concern over the current malaria situation and several resolutions have been adopted at meetings of the governing bodies of the Organization. In 1978, the XX Pan American Sanitary Conference adopted a resolution, reaffirming that eradication was the goal of the malaria program in the Americas. The following year, the III Meeting of Directors of National Malaria Eradication Services was held in Mexico to review the progress and strategy of the program and to prepare a document which was to lay the "Bases for the development of a Hemispheric Plan of Action against Malaria in the Americas." The Directing Council in its 1979 and in 1980 meetings, reviewed the malaria program and requested that the Member Governments and the Organization reformulate the national malaria plans to: (a) fit the specific situation in each country; (b) give highest priority to the financing and implementation; (c) explore all possible founding sources for the support of malaria activities at the national and hemispheric level; and (d) strengthen the training program and to intensify field research activities.

During 1981, the Member Governments and the Organization continued to make efforts to implement these resolutions, taking action on the elaboration of national malaria plans, preparing for a Planning Seminar on training of malaria personnel and expanding malaria research activities in the fields of inmunology, chemotherapy, entomology, epidemiology and vector control. All the activities are aimed at the rather long range objective of diverting the trend towards progress. Immediate improvement of the malaria situation, is constrained by the amalgamated complex of problems related to political, social, economical and human behavior factors.

The objectives of this report are to make a general appreciation of the malaria situation in the Region of the Americas, provide with a brief description of the country programs, and identify some of the problems affecting the progress of work, research and training activities and international cooperation. Efforts are made to update information on the status of the malaria programs as of June 1982 and summarize the statistical data available as of the end of 1981.

I. PRESENT STATUS OF THE MALARIA ERADICATION PROGRAM

A. General Information

Although, the number of the positive blood slides has steadily increased since 1974, the number of the slides examined has slowly decreased, with minor yearly fluctuations. The slide positivity rate riched 7.0% in 1981, the highest ever recorded since 1958. The Annual Parasite Incidence for 1981 was 2.65 per 1,000 inhabitants (malarious areas only), also the highest since the initiation of the malaria eradication program. The Annual Blood Examination Rate fell from 5.1 % in 1972 to 3.8% in 1981 due to decreased blood samples obtained from an increasing population. All these indicators point out a serious deterioration in the malaria situation in the Region as a whole (Table 1). The section of the Report labelled, "Country Information", will provide further information at the country level.

Following the practice of the previous years, all the countries of the Region continued to report the status of the malaria program by classifying malarious areas in different phases. Although the original phase definition criteria are not strictly followed, the classification still serves as a general indicator of the status of the program in relation to the goal of eradication. However, the time schedule originally set for each phase is no longer valid. In 1981, the maintenance phase area had a population of 117.0 million (49.0%), the consolidation phase area, 60.0 million (25.0%) and attack phase area 62.3 million (26.0%). There was no change in the extension of area in each phase from the previous year. (See Tables 2, 3 and 4).

At the III Meeting of Directors of National Malaria Services in Mexico in 1979, the 33 political units were classified into 4 groups according to the extent of progress, the magnitude of problems and availability of resources of the malaria programs. This classification is still valid, but requires a sub-division for Group II and a further notation for other groups, in order to give an updated picture of the malaria situation in 1981. (See Table 5). The 4 groups of countries may be presented as follows:

Group I: Includes 12 countries and territories with a population of 75,066,000 or 31.4% of the total in the originally malarious areas. There was no evidence of malaria transmission established in this group. Although 1,599 cases were registered, they were all imported or introduced.

Group II: Eight countries or territories are included in this group with a total population of 15,525,000 or 6.5% of the total in the originally malarious areas. In all these countries, malaria transmission was once interrupted or reduced to an insignificant level. However, due to importation of cases from the neighboring countries, costly surveillance activities have been carried out to prevent reestablishment of transmission. Some countries have been successful in eliminating the residual foci and/or imported sources of infection, while have been others unable to prevent reinfection and the reestablishment of transmission, thus having loosing what had been gained in previous years. The following two sub-groups are considered to be pertinent to better describe the present status:

Sub-group A: Argentina, Costa Rica, French Guiana, Panama and Paraguay have been successful in maintaining the favorable status observed in 1979. Although importation of malaria cases continued, transmission has never been reestablished. In spite of the fact that autochthonous cases were reported, the sources of infection were effectively eliminated, leaving no residual foci of transmission.

Sub-group B: Since 1979, Belize, Guyana and Dominican Republic have shown a trend of deterioration due to the fact that malaria transmission has been reestablished in many areas where it was once interrupted.

Group III. This group has 5 countries with a total population of 105,675,000 or 44.2% of the total in the originally malarious areas. Since 1979, malaria transmission increased its intensity in the attack phase areas, but no significant change has taken place in the consolidation and/or maintenance areas. In Brazil, a marked increase in the number of malaria cases was noted, but it was due to epidemic outbreaks in the Amazon Region in areas of intensive colonization. A similar situation was observed in Ecuador in the Province of Esmeraldas where the number of malaria cases increased considerably. Mexico and Venezuela maintained practically the same status in the last three years (1979-1981) and no significant progress was observed. Suriname continued to have the operational problems of the mobile teams in the interior with frequent interruption of antimalaria activities, but an agreement has been reached to transfer the responsibility of field operations to the "Medical Mission to the Interior of Suriname" (MEDIZEBS) which has a well organized network of health units established in the area, to assure the continuity of field operations.

Group IV: The eight countries included in this group have a total population of 42,977,000 or 18% of the total in the originally malarious area. This group of countries continued to have serious technical, economical, administrative and financial problems, which are difficult to solve. The number of malaria cases registered in 1981 was 355,402 or 57.7% of all cases recorded for the Americas. Only Bolivia showed a sign of

improvement in its malaria situation probably due to financial support from USAID through its PL-480 funding. Colombia is reprogramming its antimalaria activities on a priority basis, following the epidemiological stratification recently completed. The four countries in Central America (El Salvador, Guatemala, Honduras and Nicaragua) made little progress during the year. The Malaria situation in Haiti is worsening.

Table 5 shows the malaria cases registered during the past four years by the four groups of countries mentioned and Map 1 indicates their distribution. Table 6 summarizes the case detection by country and phase. Table 7 and 8 the blood slides examined and positives by plasmodia species and of malaria cases classification in the maintenance phase and consolidation phase areas respectively. Tables 9 and 10 show the number of blood samples examined, the positives and species from the attack phase area and in the non-malarious area. Table 11 gives comparative results of active and passive case detection by country.

B. Field Operations

Residual spraying with insecticides is still the principal antimalaria measure applied in all the 21 countries with areas in the attack phase and DDT continues to be the insecticide of choice when the vector is susceptible. In areas where the vector is resistant to DDT, other insecticides are used.

In 1981, less sprayings were applied with DDT as compared with the previous years, while more sprayings were conducted with other insecticides especially with fenitrothion. The increase in the use of other insecticides occurred primarily in Central American countries and Haití, where the vector is resistant to DDT. During the year, 7,362,028 sprayings were performed with DDT, 62,605 with propoxur, 471,832 with fenitrothion 65,913 with malathion, 109,301 with chlorphoxim and 12,973 with carbaryl. (See Tables 12 and 13). In Haiti, a field trial to compare effectiveness of DDT, malathion and fenitrothion was carried out. The results were evaluated by a Team composed of National and International technical staff. It was concluded that fenitrothion is the best of the three tested insecticides and could be applied effectively to interrupt malaria transmission in the Southern Peninsula of Haití.

Antilarval measures were applied in Belize, Bolivia, Ecuador, Salvador, Guatemala, Haiti, Mexico and Nicaragua through the use of larvicides or source reduction. Types of larvicides or methods of source reduction were not specified, but the inhabitants protected were reported as follows:

Countries	Anti-larval measures	Population protected	
Belize	larviciding	98,220	
Bolivia	larviciding	15,500	
Ecuador	larviciding	80,179	
Salvador	larviciding		518 breeding places
	source reduction		78 sites
Guatemala	larviciding	26,642	
Haití	source reduction	584,250	
Mexico	larviciding	488,314	
	source reduction	453,473	
Nicaragua	larviciding	470,597	

Space spraying in the form of U.L.V. was conducted in Belize, protecting 40,000 persons and in El Salvador, covering an area with 195,000 inhabitants. Type of insecticide used was not specified in the country reports.

Antimalarial drugs continued to be used as an important complementary measure to the application of insecticides and other principal control measures. In addition to the routine use of the drugs in presumptive and curative treatments, mass drug administration was carried out by the Malaria Service in some problem areas to prevent out-breaks, reduce high incidence or to test the efficiency and acceptance of the health programs being conducted and planned through mass organizations. The following countries reported mass drug distritution:

Colombia	50,292 inhabitants protected
Ecuador	As a supplement to DDT in areas with persistent malaria transmission
El Salvador	390,000 inhabitants protected
Guatemala	521,792 inhabitants protected
French Guiana	300 inhabitants protected
Haití	290,155 inhabitants protected
Mexico	38,646 inhabitants protected
Nicaragua	1 892,746 inhabitants protected

Results on the assessment related to the number of treatment cycles, dosage frecuency of treatment, the tolerance and efficacy are not available. In Nicaragua (October 1981), an antimalarial "Jornada de Salud" took place. It has been reported that a high level of coverage of the entire population was achieved for a three-day series of chloroquine-primaquine antimalarial drugs. Higher coverage rates were reported for areas with the highest incidence of malaria. In Guyana, chloroquine was distributed in the form of medicated salt to 37,000 inhabitants in the interior districts. The amount of antimalaria drugs consumed in 1981 and estimated for 1982 are provided in table 14.

Table 15 provides with a summary of the malaria personnel by category for 1980 and 1981.

C. Budget

The expenditures for the malaria programs in 1980 and 1981 and the estimated budget for 1982 are summarized in table 16 by source of funds and country.

In regards to national expenditures, 1981 showed increased expenditures when compare with 1980 for the majority of programs, although the opposite was true in a few. There was an increase of US$ 21,739,759 or 19.0% of 1980 expenditures in the Region as a whole.

With regards to the PAHO/WHO contribution, the 1980 and 1981 figures show the actual expenditures for each year, while that of 1982 is an estimate equivalent to one half of the 1982-1983 biennial budget.

The total investments made in the malaria programs of the Americas amount to US$ 140,169,113 for 1981 and the accumulated total reaches US$ 1,544,908,953, of which 89.0% were provided by national governments and 11.0% by international and bilateral cooperation. Graph 1 shows the funds invested in the malaria programs from 1957 to 1981 with a breakdown by funding sources.

D. Country Information

ARGENTINA

Malaria transmission is still observed in the North of the Province of Salta, bordering with Bolivia. This area continued to be in the attack phase with a total population of 83,000, of which 79,000 inhabitants were to be protected with DDT residual house spraying at semi-annual cycle. During 1981, 10,125 houses were included in the spraying program, but only 5,159 houses were covered in the first spraying cycle and 3,846 in the second cycle. In the epidemiological evaluation, only 49.8% of the house visits planned were accomplished during the year. Despite of the low coverage in spraying protection and the deficiency in case detection, the malaria situation seemed to remain under control without epidemic outbreaks. The principal problem continued to be the constant movement of population along the border with Bolivia where malaria transmission persists. The fluctuation of malaria incidence on the Bolivian side of the border (Río Bermejo) has had a direct influence in the malaria situation in Argentina, especially in the Province of Salta.

BELIZE

The number of malaria cases registered in the country has increased progressively since 1971 with marked increases during the past five years. Malaria transmission appears to have intensified and extended over the entire area in the attack phase, particularly in the Orange Walk, Corozal and Cayo Districts. In the last two districts, the spraying program had to be extended to include more localities than originally planned. Malaria cases were registered in Belmopan and in Belize City, located in the consolidation phase area. Although no evidence of malaria transmission was found, both cities have areas of receptivity and high vulnerability due to immigrantion from the attack phase areas and neighboring malariaous countries. During January-May, there was a large backlog of slides pending examination, but it was eventually solved by extra efforts of the malaria personnel, the assistance obtained from some private microscopists. The shortage of field personnel, insufficient number of motor vehicles and poor working conditions were the main factores affecting the effectiveness of the malaria program.

BOLIVIA

Bolivia's malaria program made considerable progress in 1981, by reducing the number of positive cases from 16,619 in 1980 to 9,774 in 1981 while increasing the number of blood slides examined from 143,648 to 176,235. This progress has been possible due to the financial support provided by PL-480 funding, and by the improved strategy adopted by the Malaria Service following recommendations made by National and International Evaluation Team which reviewed the program in May, 1980. The four principal foci (Los Yungas, Rio Bermejo, El Chaco and Guayaramerín) responsible for the majority of malaria cases, were brought under control through the intensification of antimalarial activities, such as a better coverage in house spraying with DDT, a more extensive search for malaria cases and a better organized radical cure treatment of the patients with antimalarial drugs. Entomological and operational research activities have also been intensified, aiming at finding a possible method of eliminating these foci. Under a bilateral agreement signed by the Governments of Bolivia and the Republic of China (Taiwan) in June 1981, the latter government assigned three entomologists to the Malaria Service in order to collaborate in the research and training activities in entomology. A Malaria Workshop was held in Cochabamba from 19-23 October 1981, review the progress and plan for future antimalarial activities. The Workshop was attended by 20 participants from the Malaria Service and PAHO.

BRAZIL

In 1981, no change took place in the malarious area in relation to the classification by phase of the program. Due to a shortage in field personnel, transport and insecticides, spraying coverage in the attack phase area was reduced to 70% in the first semester and 60% in the second semester of what had been initially planned. Excluding blood slides taken for follow-up of positive cases, the total number of malaria cases found in the country increased from 176,237 in 1980 to 205,544 in 1981. Of the 205,544 cases, 189,241 or 92.1% were from the Amazon Region (long-term eradication area), which has a population of 10.8 million or 20.9% of the total in the malarious area. Furthermore, 152,191 or 74.0% of the total cases in the Amazon Region were registered in 47 municipalities with a total population of 2.56 million or 5.0% of the total in the malarious areas in the country. In other words, malaria transmission is very much focalized to the Amazon Region and especially to 47 municipalities. In the short-term eradication area (with a total of 40.8 million inhabitants), 7,908 cases were registered in 1981, in comparison with 8,714 cases recorded in 1980. Of the 7.548 cases investigated, only 1.267 were classified as autochthonous. It is apparent that the major malaria problems in Brazil are in the Amazon Region where difficulties exist and are associated with constant movements of the population, poor housing and living conditions among the new settlers, hard accessibility and high operating costs. In addition, it has been confirmed the existance of P. falciparum strains resistant to 4 - amonoquinolines. The Government maintains its efforts and priorities to improve the field operations and to continue field research activities in order to find some effective and practical methods to control malaria in the Amazon Region. For the alternative treatment of P. falciparum resistant to 4-aminoquinolines, a clinical trial is being undertaken with the support of TDR/WHO.

COLOMBIA

Despite continued efforts in anti-malaria activities, the number of registered cases has increased since the initiation of the program in 1958. In spite of this, the antimalaria measures applied did produce the expected results. In general, the localities where most cases were registered during the last 15 years, are those in the newly developed areas with new settlers. The extension of the malarious areas where antimalaria measures were applied in 1966 was 563,000 Km^2, while in 1981 it increased to 971,000 Km^2. The population in the malarious areas also increased from 10 million to 17 million during the same period. Therefore, malaria transmission follows the new settlers into the formerly uninhabited land, and antimalaria activities never arrive on time, because the movement of population is not always known and because, the Malaria Service has not been provided with sufficient

administrative flexibility and resources to take immediate actions in the prevention or control of transmission. Furthermore, in some new settlement areas, social problems prevent the Malaria Service from applying antimalaria measures. However, in the originally malarious areas, most of which are in the consolidation phase, a good surveillance program has been maintained. The Malaria Service, with the cooperation of PAHO, has stratified the malarious areas according to the endemicity of the disease and other epidemiological considerations. This stratification serves as a base for planning and better utilization of available resources.

COSTA RICA

In 1981, malaria surveillance activities were continued in order to prevent the re-establishment of malaria transmission. A total of 162,861 blood slides were examined with 168 positive for malaria parasites. The majority of these positives were from the Provinces of Guanacaste, Alajuela and San Jose where many immigrants arrived from Nicaragua and El Salvador. The number of imported cases totaled 123 or 73% of all the cases registered during the year. In August 24-28 1981, an Evaluation Team composed of National and International (PAHO) staff reviewed the Malaria Program. The Team recommended the transfer of an area of 2,918 Km^2 in the Province of Limon from the attack to the consolidation phase. This area has 456 localities, 27,332 houses and 103,182 inhabitants. The program continues to receive the necessary financial supports from the Government, maintaining a priority within the National Health Plan.

DOMINICAN REPUBLIC

The malaria surveillance activities were continued in 1981 with less financial resources and therefore, it was not possible to take all of the necessary measures to eliminate the imported sources of infection, in time to prevent reestablishment of local transmission. Deterioration of the malaria situation is evident by the presence of many autochthonous and introduced cases. Of the 2,514 cases investigated during the year, 620 were classified as autochthonous, 1,585 introduced and 309 imported. The number of confirmed malaria cases in 1981 was 3,596, being 1.184 cases less than in 1980. However, the number of blood slides examined was also much smaller in 1981, resulting in an increase in slide positivity rate from 1,22% in 1980 to 1.31% in 1981. Case detection activities were reduced because evaluation field personnel were engaged in population census activities for 3 months. The principal problems which have caused the deterioration of the malaria situation observed since 1978 were the increase of imported cases from Haiti and the shortage of financial resources to provide the necessary manpower,

transportation, vehicles and even antimalarial drugs, in time to apply the remedial measures. A. albimanus in the northern frontier region (Province of Dajabón) has progressively become resistant to DDT during recent years. This could become a serious obstacle to the effectiveness of surveillance programs in this area. A research project was initiated on socio-economic aspects of malaria incidence in the country in order to analyze the relationship between modes of production and incidence of malaria in a representative sample of the rural population. The specific results of the study will provide the needed information to develop new strategies which may serve to reformulate and restructure the activities of the program.

ECUADOR

The malaria situation showed a considerable deterioration in 1981, having recorded an increase of 46% in cases and 25% in P. falciparum infections, with respect to 1980. The Esmeraldas Province continued to be the principal focus of transmission, as well as the center of dispersion of malaria to other parts of the country. Although, this province has 288,000 inhabitants or 6% of the total population in the malarious area, it registered 61% of all malaria cases in the country, excluding possible exported cases. In addition, there is a problem of P. falciparum resistance to 4-aminoquinolines, as confirmed by in vitro tests carried out in 1980. Because of its epidemiological importance, a separate new zone was created to handle all the field operations for this province. This zone has a priority over others to receive operating expenses, supplies and equipment. In addition, it has an entomological team to support epidemiological investigations. In the rest of the malarious areas in the country, with the exception of those areas epidemiologically linked with Esmeraldas, no significant change has been observed. The principal problems continued to be those related to administrative matters and the labor unions.

EL SALVADOR

The malaria situation in El Salvador has shown a considerable deterioration during the past five years, with progressive increase in the number of cases registered. In 1977, a total of 32,243 positive slides was identified among 471,109 blood slides examined (slide positivity rate = 6.8%), while in 1981, 93,187 positives were recorded among 367,447 blood slides examined (SPR. = 25.4%). During 1978-1979, the malarious area was stratified according to the endemicity (hyperendemic, endemic, hypoendemic and urban zones) and antimalaria activities were planned on the basis of the epidemiological conditions in each stratum. Because of its epidemiological importance, the hyperendemic stratum has been given priority, with 75% of the

total malaria resources. The major antimalaria activities carried out in 1981 were passive and active case detection, administration of a single dose of Chloroquine and Primaquine to selective groups of persons, massive drug administration at two-week intervals to the population in selected villages, radical cure treatments to all positives, residual house spraying with propoxur, larviciding with Abate and Baytex, application of ULV and some source reduction activities (drainage). These activities were thoroughly reviewed by a National-PAHO Team during 24-28, May 1982. The program has suffered from a series of set-backs, first with the appearance of physiological resistance of the principal vector, A. albimanus to all the common insecticides in use and secondly with those associated to social, political and cultural problems. The former has limited the scope of the most effective and practical attack measures and the latter has interferred with normal field activities.

FRENCH GUIANA

The malaria situation in French Guiana remained practically the same in 1981 as in the previous years. However, there were more cases imported from Brazil, as many Brazilians came to look for work in this country. Efforts are being made to organize a system of notification through voluntary collaborators selected among the team leaders of the workers. The population on the Suriname border (Maroni River) move back and forth constantly between the two countries and this interferes with application of effective control measures. No progress has been observed in this area. The vector, A. darlingi, is still susceptible to DDT, but P. falciparum has been found to be resistant to 4-aminoquinolines (R1 and R2) in a series of tests performed in September, 1981.

GUATEMALA

In the Northern and Centro-oriental ecological zones, the vector is resistant to DDT, but it is susceptible to fenitrothion. Fenitrothion was applied during the first spray cycle in these two zones,, but it had to be suspended in May due to a shortage in supplies. The number of malaria cases dropped during the first semester, but it rose again towards the end of the year, partly due to the major transmission season and partly due to the suspension of the insecticide. In the Pacific zone, where the vector is resistant to practically all the common insecticides, deltamethrin was used experimentally. No significant results were been observed. During the year, a total of 475,777 blood slides was examined with 67,994 positives. The Malaria Service continued to undertake field trials with new insecticides and biological control measures in order to find more effective and practical methods.

An applied research has been initiated in Guatemala to study the effectiveness of the voluntary collaborators in the surveillance and drug distribution system. The importance of this investigation is the combination of two simultaneous methods of focusing: the obtention of blood samples and the practical implementation of social surveys. The results could be relevant to the role of the community participation and the understanding of acceptability and utilization of the malaria services.

GUYANA

Malaria was eradicated from the populated, narrow coastal zone early in the 1950's, but transmission continued in the vast territory of the hinterland where the population is extremely sparse. Early in the 1960's, medicated salt was distributed among the inhabitants, in addition to DDT residual house spraying. By 1970, malaria transmission was interrupted in the entire hinterland except in the Rupununi District where a small focus remained, due to importation of malaria cases from the neighboring country. Eighteen positive slides were diagnosed in 1970 from 63,623 blood slides examined in the entire country. The originally malarious areas were either in the maintenance phase or in the consolidation phase during the same year. The principal attack measures, i.e. DDT house spraying and medicated salt distribution, were suspended, but they were not replaced by an organized malaria surveillance system. Resurgence of malaria occurred in 1975 and since then transmission has been reestablished over the entire hinterland. Attack measures were reinitiated in 1977 and have been continued since then. The Rupununi District with a total population of 21.115 inhabitants, has remained as the area where malaria transmission has been most persistant. In 1980, this district recorded 2,690 malaria cases or 85% of the total registered in the country and in 1981, 1,621 cases or 78%. Attack measures did not have the coverage desired and they did not appear to impact on continued transmission. The program was reviewed by a PAHO-AID Malaria Team in February 1981 following a Government request. The Team recommended restructuring of the Vectors Control Service and development of a long-term plan of operations which included re-inforcement of technical direction, training and retraining of all categories of personnel, preparation of clear job descriptions and assurance of adequate resources. Subsequently, a PAHO consultant visited the program from September to December of 1981 to collaborate in the development of the plan and the training of field personnel.

HAITI

The field trial of 3 residual insecticides (fenitrothion, malathion and DDT) initiated in January 1980, concluded in July 1981, after 6 spraying cycles were completed in the malathion and fenitrothion areas and 3 cycles in the DDT area. The results of the trial were evaluated in 1-23 October 1981, by a Team composed of technical staff from the Government of Haiti, PAHO/WHO and USAID. It was concluded that fenitrothion was the most efficient of the three tested insecticides in the interruption of malaria transmission in the Southern Península of Haití. A dosage of 2 gm/per square meter was applied every 3 to 4 months. The Team recommended that a detailed Plan of Operations be prepared for a five year period, including an estimate of financial and personnel requirements, needs for insecticides, equipment and transport and a realistic time schedule and goals. The Team, suggested trial and evaluation of other control measures, such as larviciding, source reduction, biological control (larvivorous fish) and fogging. Based on its recommendations, a plan of operations was prepared, aiming at the eradication of the disease by stages and areas of priority according to the results of stratification of the malarious areas. The governments of the United States of América and Japan were approached for provision of financial support and a favorable response has been obtained. The total number of malaria cases registered in the country in 1981 was 46,703 which was 87.3% of the cases registered in 1980. This decrease was due to the interruption of transmission in the Southern Peninsula where fenitrothion was applied. In the rest of the country, the malaria situation remained practically the same as in the previous year.

HONDURAS

The Government decided to employ hired labor for spraying operations and for the maintenance of the network of voluntary collaborators after a two-year trial of using community support exclusively to carry out antimalarial activities. The first semester of 1981 was devoted to training the newly recruited personnel at various levels and field operations were initiated during the second semester. Many problems were encountered, due to the lack of experience on the part of field personnel. However, the major problems found in the execution of the program were of an administrative nature, especially, the delay in payment of salaries and wages. Physiological resistance of A. albimanus to DDT and Propoxur continued to be the major problem in the South where the greater majority of the malaria cases has been recorded every year. In the city of Choluteca which is located in the Center of this area, an outbreak was observed with 7,300 cases in 1981. To control this situation, mass drug distribution, source reduction and larviciding are being conducted. Testing of other insecticides is also contemplated.

MEXICO

During the second semester of 1980, exhaustive epidemiological analyses were made in each locality and the malarious areas were stratified. It became clearer that malaria transmission was well focalized in certain localities in the attack phase area. In these localities, the insecticides did not have the expected effect and radical cure treatments were not properly administrated due to deficiencies in the case detection system. This motivated a change in the tactics used, shifting the resources from the areas with little malaria to reinforce antimalaria activities in localities with high incidence. Active case detection was introduced and radical cure treatments were rigidly administered. The Malaria Service in coordination with the PAHO Research Project, AMRO-0901, initiated field research activities, such as trial of new insecticides, studies of biological control methods with larvivorous fishes and bacteria and testing of different treatment schemes. In comparison with 1980, an increase of the number of positive cases was noted with less number of blood slides examined.

NICARAGUA

The Malaria Program in Nicaragua continued to apply diversified antimalaria measures according to local epidemiological conditions. During 4-6 November 1981, however, a nation-wide mass drug administration was carried out within "Las Jornadas Populares de Salud", which provided a 3-day treatment with chloroquine and primaquine to everyone above 12 months of age. A total of 1,892,746 individuals were treated among 2,357.857 persons censused. The objective of this large scale operation was to reduce the number of malaria cases in a short period of time, thus reducing the intensity of transmission. The results of this treatment were impressive, as November and December registered the lowest number of malaria cases in the year, when they usually were the months with the highest number of cases. However, the malaria service realized that this measure merely gave a temporary relief of the epidemiological situation and it must be accompanied by other methods of control in order to maintain the favorable epidemiological situation. The 1982 anti-malaria activities and their results would be of extreme interest and importance to evaluate the usefulness of this method.

PANAMA

No major change was observed in the malaria situation in 1981, in comparison with that in the previous year. Spraying operations were continued in the areas indicated and the surveillance activities were continued. However, case detection activities were intensified in "Tapón de Darien" where the Pan American Highway was recently opened for transit. This Region has also become available for agricultural colonization. During the year, a small outbreak was observed among the immigrants in the area of Canclon with 46 cases registered. The program was reviewed by a National and International (PAHO) Evaluation Team during May 18-22, 1981.

PARAGUAY

Paraguay maintained its malaria surveillance activities effectively without any major change in strategy and methodology. Although the importation of malaria cases from the neighboring country continued, sources of infection were eliminated efficiently and promptly. The Government maintains a high priority for the program with adequate financial supports. Of the 73 malaria cases registered in the country in 1981, only 24 were classified as autochthonous.

PERU

Between 1957 and 1968, a dynamic malaria eradication campaign was carried out wich yielded excellent results, interrupting transmission among 3,3 million inhabitants or 74% of the total population in the originally malarious areas. The number of cases registered in 1968 was 2,010 and the transmission was very much focalized. From 1969 onwards, the malaria situation has been progressively deteriorated due to the discontinuation of regular attack measures due to a series of administrative and financial difficulties resulting from a shift in health priorities. In 1977, the malaria program was integrated into the general health services and antimalaria activities were further reduced to control epidemics and to collect epidemiological information in the populated areas where health services are located. The present notification system does not seem to provide a true picture of the epidemiological situation in the country. Nevertheless, there were 10,711 cases registered from January to September 1981, 45% from areas where malaria transmission was once interrupted. The Government was concerned about this situation and requested PAHO to collaborate in the assessment of the malaria situation with the object of resuming an effective antimalaria program. A PAHO consultant visited the program during 18 October-7 November 1981 and presented his recommendations for further consideration of the health authorities.

SURINAME

In 1981, 2,479 malaria cases were recorded among 61,880 blood slides examined, while in 1980, 4,445 cases were registered among 91,141 examined. These cases were all registered in the attack phase area, no deterioration was observed in the consolidation and maintenance areas. During January-April and July-October, mass blood surveys and mass drug administration were carried out in Areas 17 and 22, which accounted for 70% of all cases recorded in 1980. These operations accounted for the general improvement of the epidemiological situation in the country. However, two outbreaks were observed in 1981, the first Area 13 (Saramacca River with 89 cases and the second in Area 25 (Deep Interior) with 647 cases. In December 1980, the program was reviewed by a PAHO Team upon the request of the Government. The Team recommended that the execution of field antimalaria activities in the interior be transferred to the Medical Mission to the Interior of Suriname (MEDIZEBS) which has a well-organized network of health units in the attack phase area of the Malaria Program. During 1981, preparatory activities were undertaken for its implementation. A decision has finally been reached to effect the transfer as of 1 January 1982.

VENEZUELA

No major change in the malaria situation took place in 1981. Malaria transmission continued to be limited to the Western and Suthern parts of the country, with a population of 634,000 or 6% of the total in the originally malarious area.

II PROBLEMS AFFECTING THE PROGRESS OF THE PROGRAM

As mentioned previously, the number of malaria cases registered has been on a steady increase in the last ten years (1972-1981) and reaching 633,876 cases in 1981, the highest ever recorded. This increase, however, is limited to certain countries or even certain areas within a country. The magnitude and nature of the problems causing this increase differ from one country to another, but in general, there are some common aspects among the countries in the Groups classiffied in Table 5.

Group. I: No evidence of reestablishment of transmission has been reported and the malaria free status has been maintained. No serious problems have been reported as of this date.

Group II: This group shares the common problem of importation of malaria cases from neighboring countries. The countries in subgroup A have been able to eliminate sources of infection and prevent the reestablishment of transmission. The Government has continued to give high priority to the malaria surveillance program with adequate financial support. No serious problems have been observed as of this date. However, for those countries in subgroup B, a deterioration has been observed in the attack phase area or a resurgency of malaria has been seen in the consolidation and/or maintenance phase areas. Problems include insufficient technical staff and inadequate financial supports.

Group III: All the five countries in this group have sections of their malarious areas in the consolidation and/or maintenance phase. The favorable status of malaria in these areas has been maintained without any serious problems. The areas where malaria transmission has increased are in the attack phase.

With the exception of Suriname, all the countries have a problem of population moving to and from areas with socio-economic development projects, such as agricultural colonization, mining, construction of highways, hydroelectric plants, irrigation systems etc. These projects bring laborers and new settlers into newly opened lands creating conditions favorable for transmission and often unfavorable for effective control activities. Suriname is different in that, it has administrative and operational problems associated with field personnel of the Malaria Service. The personnel problems together with superstition and lack of cooperation on the part of the bush negro population, have resulted in poor coverage.

Three countries in this group have serious labor problems (labor Union) within the Malaria Service. Very frequently the work plans can not be fully implemented because of labor interference.

Group IV: In the decade of 1960's, all 8 countries in this group have achieved considerable progress in their malaria programs. With the exception of Haiti, all had areas in the consolidation and/or maintenance phase sometime in the 1960's. This favorable situation, however, deteriorated because of the appearance of serious technical, administrative and financial problems late in the 1960's and early in the 1970's. In the present decade, the 8 countries have practically lost what was gained. The principal problems are summarized as follows:

a) Technical problems: physiological resistance of A. albimanus to common insecticides has been the major obstacle to progress in El Salvador, Guatemala, Honduras, Nicaragua and Haiti. The vector is multiresistant to practically all insecticides recommended for the malaria program, on the Pacific Coat of four countries in Central America . Without this most effective and economical measure, these countries have had to find more costly and less efficient control measures, such as larviciding, source reduction operations and mass drug administration. The results obtained were either of limited protection to certain population groups or of temporary relief from epidemic situations, without significant changes in the overall malaria situation. In Haití, the vector is resistant to DDT.

Physiological resistance of A. albimanus to DDT was also reported from Panama in the Canal Zone and La Comarca de San Blas and from Costa Rica along the Pacific Coast, but it did not constitute a major problem, as malaria transmission was already interrupted by propoxur and antimalarial drugs. In the Dominican Republic, A. albimanus in the northwestern frontier region (Dajabon) has increased its resistance to DDT. This was not a significant problem before, since the area was practically malaria-free. However, in recent years, malaria transmission has become wide-spread and it therefore, poses a serious treat for the future. In Mexico, A. pseudopunctipennis was found to be resistant to DDT in the Southern States along Rio Balsas. Susceptibility tests made in Southern Mexico showed that the average mortality much higher with chorphoxim and propoxur than that of malathion and fenitrothion.

The behavioristic resistance (evasive behavior) of A. nuñeztovari to DDT in western Venezuela and eastern Colombia continued to be a problem resulting in persistent transmission. In an area in Arauca, Colombia, fenitrothion was tested with better results than DDT. However, the trial was not adequately designed and it was not possible to draw conclusion from it. Propoxur was experimented in Venezuela some years ago, but in the case of the Arauca trial, no definitive conclusion was reached. It is recommended that new trials be carried out with insecticides which have some fumigant effects, under a well designed research project. (Maps 2 and 3).

P. falciparum resistance to 4-aminoquinolines is a serious problem in some areas of countries in South-america, especially Colombia and Brazil. However, some alternative drugs are still effective, and this may not be a major problem to a malaria eradication program, if the vector remains susceptible to insecticides in use and responsive to residual house spraying. (See Map 4).

b) Problems related to economic development areas: Throughout the American continent, economic development projects are being actively promoted. Many of these projects fall in the same geographical extension of highly receptive areas. With the arrival of migrants and laborers to newly opened sites who live under precarious conditions, serious malaria outbreaks usually take place. In fact, many areas or localities where malaria is highly endemic today were not even in existence some 10 or 15 years ago. This phenomenon is very common in Brazil and Colombia. Prevention of disastrous outbreaks is not always possible, because the development sites are not necessarily known to the Malaria Service and the allocation of funds, if any, is usually made with much delay.

c) Problems related to financing: Graph 1 indicates the funds invested for the malaria programs in the Americas since 1957. It is clear that the funds allocated to the program have increased progressively in the last 25 years. However, in reality, this increase has been offset, on one hand, by increasing personnel, supplies, equipment and transportation costs and on the other by the additional requirements in the newly added malarious areas such as those seen in agricultural colonization. Furthermore, in some countries, the appearance of technical problems, such as vector resistance to DDT and parasite resistance to antimalarial drugs make it necessary to apply more expensive complementary or alternative measures

d) Problems related to socio-political aspects and human behavior:

These problems have played an increasingly important role in the execution of the program in recent years. They are very difficult to quantify, but in many countries, they are

the principal factors in the reduction of operational and supervisory capacities and have resulted in inadequate coverage and poor quality of field work. Inadequate remuneration distracts trained professionals, particularly those well qualified, and labor problems frequently paralyze the field operations. The factors related to socio-political and human behavior are sometimes far outweigh other problems mentioned.

Table 17 and Map 5 summarize the geographical distribution of areas with the major technical problems.

III RESEARCH

PAHO continued to promote and support national field research in immunology, chemotherapy, entomology, epidemiology, and vector control using physical, chemical, and biologic methods. It also collaborated with the countries in epidemiologic stratification and designing control measures geared to local conditions. Acting on the recommendation of its Advisory Committee on Medical Research, it promoted the inclusion of social studies in malaria research.

A. Insecticide trials

Research on Deltametrin (OMS-1998) was continued in Guatemala in 1981. A comparative study was made with the doses of 0.025 grams and 0.05 grams per square meter and it was concluded that the two doses gave the same mortality on the test mosquitoes (bio-assay) throughout the observation period of 246 days. On the basis of this observation, an area on the Pacific Coast, with 307 localities and 43,000 houses was selected for field trial with this insecticide at 0.025 grams per square meter in semi-annual house spraying in 1981 and 1982. Preliminary reports indicated encouraging results.

In Haiti, where the efficacy of $2g/m^2$ of fenitrothion was demonstrated, a project proposal was made to extend the assessment of the efficacy of different dosages in other areas of the country.

A fenitrothion trial was carried out in 41 localities comprising 3,200 dwellings in Esmeraldas Province, Ecuador, where transmission persisted. The insecticide was applied in a four-month cycles at 2 g/m^2. Though no cases of intoxication were seen among the operators or residents, conclusions about fenitrothion's effectiveness cannot be drawn because entomologic and epidemiologic studies have not been completed.

B. Malaria Immunology:

The National Health Institute in Bogotá began investigating the immune response of monkeys to plasmodia. Appropriate Aotus monkey models were developed for comparing immunologic protection mechanisms and conducting pathology and toxicology studies of the immunizing agents. The effectiveness of malaria immunization using purified preparations of P. falciparum merozoites cultivated in vitro with or without adjuvants is being studied . Plasmodial strains have been standardized according to their response to antimalarial drugs, and preliminary studies have been initiated to characterize plasmodia biochemically and antigenically. Studies were initiated on gametogenesis and cryopreservation of plasmodial strains, and efforts are being made to breed Aotus monkeys in captivity. The biochemical characterization of Plasmodia is being studied at the Evandro Chagas Institute in Belem, Para, Brazil.

Sporozoite monoclonal antibodies have been purified with very promising results at the University of New York, using the hybridoma techniques for immunization of experimental animals.

The AMRO-0901 project in Tapachula, México is implementing the gradient separation of sporozoites to study the infective rate of different population of A. albimanus.

C. Malaria Chemotherapy:

The Government of Brazil, with cooperation of PAHO/WHO and financial support of the WHO/WB/UNDP Special Program (TDR) completed the phase II Study of mefloquine and entered its phase III as planned. Phase III will study the efficacy, tolerance and pharmacodynamics of mefloquine in the treatment of acute case of malaria. Analysis of the clinical and pharmacological data is in process.

In Nicaragua, a 3-day treatment with chloroquine and primaquine was administered to 1.892,746 individuals during 4-6 November 1981. Follow-up observations are being conducted in order to evaluate results and study the feasibility, indication or tolerance of the treatment.

The susceptibility of P.falciparum to chloroquine was studied in Nicaragua through 14 in vitro tests. Results indicated that susceptibility seemed to be less than previously known, although it was not considered to be resistant. A similar phenomenon was also noted in Haiti through in vitro and in vivo studies.

In antimalaria chemotherapy, in vitro evaluation showed that 80 percent of P. falciparum specimens studied in Brazil, Colombia, Ecuador, and Panama resist choloroquine. In El Salvador and Honduras there was no indication of resistance as of 1981. Observations in Nicaragua and Haiti in 1981 suggested lower P. falciparum susceptibility to chloroquine there than in previous years.

In collaboration with the University of New Mexico a Workshop on the epidemiology and control of P. falciparum infections has been planned for October 1982 in order to review the current situation of drug resistance falciparum malaria organize a Regional Monitoring System of P. falciparum response to drugs and coordinate efforts to control the disease.

D. Social Science and Malaria.

The working group on Social Science and Health of the PAHO Advisory Committee on Medical Research completed the Latin-american bibliography on Applied Social Sciences to Health. The group also prepared a study about the social variables which affect transmission and control of malaria. The importance of analyzing to analyze the determining factors for strengthening the surveillance systems and for better planning, organization and execution of the antimalaria programs was strased.

IV. TRAINING

Training is an important component of PAHO's plan for promoting and supporting malaria programs in the Americas.

With WHO collaboration and USAID financial support, a plan has been prepared to strengthen training activities in order to prepare sufficient technical personnel to carry out the programs.

Current strategies for controlling or eradicating malaria require broader epidemiologic knowledge on the part of malariologists in order to better identify specific problems and their magnitude and to choose the most suitable methods according to local epidemiologic circumstances and available resources. They must also be able to design evaluation systems that make it possible to gauge the effectiveness of interventions, and improve the technology applied according to results obtained, changes in the epidemiologic situation, and available resources.

During late 1980, a group of experts from PAHO, WHO, and CDC travelled to six American countries to review the curricula of existing courses, to

study national and international training needs, and define requirements for external cooperation and financial support. The group visited teaching institutions in Brazil, Colombia, Cuba, Mexico, Peru, and Venezuela. They interviewed malaria program personnel and training personnel in specific fields, especially in malariology, environmental health, tropical diseases, parasitology, entomology, public administration, and research on malaria and other parasitic diseases. Schools of agriculture with parasitology and entomology programs were also visited. On the basis of the material gathered by the group and information obtained from the countries the group did not visit, a comprehensive document has been prepared which discusses the needs and resources available to train malaria personnel in the Americas. This document will serve as a working paper for a Seminar on Training of Malaria Personnel to be held in September 1982 at PAHO/Washington. This seminar will be attended by directors of training institutions, several selected Directors of National Eradication Services, invited experts from potential collaborating agencies, short-term consultants and regular PAHO and WHO staff members who are responsible for training activities.

The Second International Training course in Malariology was held in Colombia, from September 7 to November 27, 1981. The course participants included medical officers working for general health or malaria services. Of the 13 participants, two were chiefs of zones of the Colombia Malaria Service and 11 were medical officers in the health services of rural areas. (Brazil-1, Guatemala-1 and Colombia-9). An International Course on Human Toxicology was also held in Colombia during 26-31 October, 1981. This course was intended to give the necessary orientation to the professionals in public health on pesticides and their adverse effects on the environment, toxicity of each group of pesticide, prevention of intoxication and the related laboratory practices. The course was attended by 13 professionals (Colombia-9, Guatemala-1, Honduras-1, Mexico-1 and Peru-1).

Also in Colombia a 3 weeks course on Biology, Ecology and Control of Aedes aegypti was attended by 22 participants (Bolivia-2, Brazil-1, Colombia-11, Costa Rica-1, Guatemala-1, Haiti-1, Honduras-2, Mexico-1, Nicaragua-1 and Peru-1)

In Guatemala, a course of Applied Epidemiology was given to malariologists and general epidemiologists using the PAHO moduls on Principles of Epidemiology for the Control of Diseases.

The XXXVII International Training Course in Malariology was held in Venezuela from January 19 to October 30, 1981. The course was attended by 12 participants (Bolivia-1, Ecuador-1, Haiti-2, Nicaragua-2, Peru-2 and Venezuela-4).

The National Malaria Eradication Service of Mexico (CNEP) held the II International Training Course for malaria field superfisors from April 20 to July 31, 1981. In addition to 21 Mexican trainees, 5 PAHO fellows attended this course (Costa Rica-1, Panama-2, Peru-2). The CNEP also held its X International Malaria course for Medical officers and Engineers from August 10 to November 19, 1981. This course was attended by 12 professionals from Mexico and 1 medical officer from Panama.

The School of Public Health of the Department of Health and Welfare of Mexico held its sixth "Master's Degree course in Public Health with emphasis on Malaria and Other Parasitic Diseases" from February to December 1981. This course was attended by 11 students (Costa Rica-2, Panama-1, Honduras-1, Guatemala-1, Dominican Republic-3 and Mexico-3).

V INTERNATIONAL COOPERATION AND COORDINATION

The United States of America, through its Agency for International Development (AID) continued to provide financial support to the Malaria Programs in Haiti and in Bolivia (PL-480 Funding Program). This Agency is also considering to increased financial assistance to the Malaria Program in Honduras and a preliminary study is being undertaken.

The Government of Japan donated 240 tons of fenitrothion to the Haiti Malaria Program in 1980. In view of the favorable results obtained with this insecticide, as assessed by the WHO/PAHO/AID Evaluation Team in October 1981, a further contribution of this insecticide is expected.

The Special Program for Research and Training in Tropical Diseases of WHO/UNDP/World Bank (TDR) continued its support to a research project for Clinical Trials of Mefloquine in Belem, Brazil. The Second Phase of the study was concluded and the Third Phase is under way. The TDR sponsored a "Seminar on Transmission and Control of Tropical Diseases in the Process of Human Migration" held in Brasilia, Brazil from 2 to 5 June 1981. Malaria was one of the most important topics under discussion.

With WHO collaboration and financial support of AID/USA, a plan was made to strengthen training activities in order to prepare sufficient number of malaria personnel. Under this plan, a group of experts was sent to six American countries in order to study the needs and available resources for training. A working paper was prepared to be presented to a Seminar on Training of Malaria Personnel to be held in September 1982 at PAHO/Washington, D.C.

The WHO/AID/USPHS Malaria Coordination Meeting was held in Washington, D.C. on March 30-31, 1981 to discuss coordination activities for the implementation of the malaria control/eradication strategy, primary health care and malaria control, training and research activities.

During the year, the following border meetings were held between the neighboring countries in order to exchange information and coordinate antimalaria activities.

Countries	Meeting places	Dates
Argentina-Bolivia	Salta, Argentina	April 3
Costa Rica-Panamá	Paso Canoas	monthly
	Sixaola	monthly
Costa Rica-Nicaragua	Los Chiles	December 8
Guyana-Brazil	Boa vista	November

Table 1

MALARIA MORBIDITY IN THE AMERICAS
1958 - 1981

Year	Population		Blood Slides			Morbidity per 100,000 inhabitants	
	Total Countries	Total malarious areas	Examined	Positive	%	Total Countries	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	11 797 983	333 280	2.8	71.88	200.21
1967	474 868	169 901	11 609 228	369 388	3.2	77.79	217.41
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	9 352 775	379 364	4.1	67.11	179.72
1977	576 942	215 550	9 274 480	398 925	4.3	69.14	185.07
1978	587 704	220 153	9 493 751	468 923	4.9	79.84	213.00
1979	600 263	226 361	8 630 653	515 271	6.0	85.84	227.63
1980	610 021	231 366	8 943 369	602 836	6.7	98.82	260.56
1981	627 375	239 260	9 086 093	633 876	7.0	101.04	264.93

Table 2

POPULATION IN THE MALARIOUS AREAS
IN THE AMERICAS, 1958 - 1981
(Population in thousands)

Year	Originally malarious areas					Total Population
	Maint. phase	Consolid. phase	Attack Fase	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
1979	113 092	57 280	55 989	-	226 361	600 263
1980	114 620	58 087	58 659	-	231 366	610 021
1981	117 042	59 962	62 256	-	239 260	627 375

Table 3

STATUS OF THE MALARIA PROGRAMS IN THE AMERICAS, BY POPULATION, 1981
(Population in thousands)

Country or other political or administrative unit	Total population	Population of originally malarious areas							
		Total malarious areas		Maintenance phase		Consolidation phase		Attack phase	
		Total	%	Total	%	Total	%	Total	%
Antigua	76a)	-	-	-	-	-	-	-	-
Argentina	28 392	3 427	12.1	3 271	95.5	73	2.1	83	2.4
Bahamas	240b)	-	-	-	-	-	-	-	-
Barbados	255b)	-	-	-	-	-	-	-	-
Belize	167a)	167	100.0	-	-	88	52.7	79	47.3
Bermuda	50	-	-	-	-	-	-	-	-
Bolivia	5 177	2 044	39.5	-	-	-	-	2 044	100.0
Brazil	126 858a)	51 617	41.0	13 935	27.0	16 947	33.0	20 735	40.0
British Virgin Islands	13a)	-	-	-	-	-	-	-	-
Canada	24 210	-	-	-	-	-	-	-	-
Cayman Islands	17b)	-	-	-	-	-	-	-	-
Chile	11 104	240c)	2.2	240	100.0	-	-	-	-
Colombia	28 771	17 118	59.5	-	-	12 461	72.8	4 657	27.2
Costa Rica	2 306	659	29.0	-	-	465	70.6	194	29.4
Cuba	9 914a)	3 341c)	33.7	3 341d)	100.0	-	-	-	-
Dominica	81b)	17c)	21.0	17d)	100.0	-	-	-	-
Dominican Republic	5 662	5 626	99.4	5 488	97.5	49	1.0	89	1.5
Ecuador	8 643	5 122	59.3	-	-	2 143	41.8	2 979	58.2
El Salvador	4 946	4 360	88.2	-	-	-	-	4 360	100.0
Falkland Islands	2a)	-	-	-	-	-	-	-	-
French Guiana	70a)	70	100.0	38	54.3	21	30.0	11	15.7
Grenada	101	39	38.6	39d)	100.0	-	-	-	-
Guadeloupe	330	293	89.0	293d)	100.0	-	-	-	-
Guatemala	7 483a)	2 820	37.7	-	-	-	-	2 820	100.0
Guyana	900e)	900	100.0	837	93.0	-	-	63	7.0
Haiti	5 107	4 333	85.0	-	-	-	-	4 333	100.0
Honduras	3 821	3 492	91.4	-	-	-	-	3 492	100.0
Jamaica	2 224a)	1 657	74.5	1 657d)	100.0	-	-	-	-
Martinique	330b)	206c)	62.4	206d)	100.0	-	-	-	-
Mexico	74 457	37 996	51.0	5 585	15.0	21 806	57.0	10 605	28.0
Monserrat	12b)	-	-	-	-	-	-	-	-
Netherland Ant.	270b)	-	-	-	-	-	-	-	-
Nicaragua	2 699	2 699	100.0	-	-	-	-	2 699	100.0
Panama	1 920f)	1 851	96.4	-	-	1 703	92.0	148	8.0
Paraguay	3 268	2 739	84.0	682	25.0	1 334	48.7	723	26.4
Peru	18 279	6 032	33.0	1 687	28.0	2 869	47.5	1 476	24.5
Puerto Rico	3 478a)	3 478	100.0	3 478d)	100.0	-	-	-	-
St. Kitts, Nevis, Anguilla	67	-	-	-	-	-	-	-	-
Saint Lucia	128e)	108c)	84.4	108d)	-	-	-	-	-
St. Pierre & Miquelon	6a)	-	-	-	-	-	-	-	-
St. Vincent	128b)	-	-	-	-	-	-	-	
Suriname	352	284	80.7	249	87.7	3	1.1	32	11.3
Trinidad & Tobago	1 153b)	1 095c)	95.0	1 095d)	100.0	-	-	-	-
Turks and Caicos	7b)	-	-	-	-	-	-	-	-
United States of America	226 575	64 678	28.5	64 678	100.0	-	-	-	-
Uruguay	2 917a)	-	-	-	-	-	-	-	-
Venezuela	14 313	10 656	74.5	10 022g)	94.0	-	-	634	6.0
Virgin Islands (USA)	96	96	100.0	96d)	100.0	-	-	-	-
TOTAL	627 375	239 260	38.0	117 042	49.0	59 962	25.0	62 256	26.0

a) PAHO midyear population estimates. b) Provisional data. c) Estimated. d) Population living in areas where malaria eradication has been registered by PAHO/WHO. e) 1980 midyear population figure provided by Country. f) Includes population of the Canal Zone. g) Includes an area with 7,696,938 inhabitants where malaria eradication has been registered by PAHO/WHO.

Table 4

STATUS OF THE MALARIA PROGRAMS IN THE AMERICAS, BY AREA, 1981
(Area in Km^2)

Country or other political or administrative unit	Total Area	Originally malarious areas							
		Total Malarious Area		Maintenance phase		Consolidation phase		Attack phase	
		Total	%	Total	%	Total	%	Total	%
Antigua	280	-	-	-	-	-	-	-	-
Argentina	4 024 458	349 051	8.7	334 527	95.8	3 249	1.0	11 275	3.2
Bahamas	11 396	-	-	-	-	-	-	-	-
Barbados	430	-	-	-	-	-	-	-	-
Belize	22 965	22 965	100.0	-	-	7 161	31.2	15 804	68.8
Bermuda	53	-	-	-	-	-	-	-	-
Bolivia	1 098 581	821 346	75.0	-	-	-	-	821 346	100.0
Brazil	8 511 965	6 898 045	81.0	190 469	2.8	814 874	11.8	5 892 702	85.4
British Virgin Islands	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	813 966	83.8
Costa Rica	50 900	35 446	69.6	-	-	22 653	64.0	12 793	36.0
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	21 041	19 153	91.0	-	-	-	-	19 153	100.0
Falkland Islands	11 961	-	-	-	-	-	-	-	-
French Guiana	90 000	90 000	100.0	50	0.1	82 300	91.4	7 650	8.5
Grenada	344	103	30.0	103a)	100.0	-	-	-	-
Guadeloupe	1 950	1 244	63.8	1 244a)	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	69.0	-	-	-	-	19 100	100.0
Honduras	112 088	101 351	90.4	-	-	-	-	101 351	100.0
Jamaica	11 428	10 028	87.7	10 028a)	100.0	-	-	-	-
Martinica	1 080	300	27.8	300	100.0	-	-	-	-
Mexico	1 967 183	1 150 000	58.5	190 952	16.6	546 433	47.5	412 615	36.0
Monserrat	84	-	-	-	-	-	-	-	-
Netherland Antilles	961	-	-	-	-	-	-	-	-
Nicaragua	127 358	118 358	93.0	-	-	-	-	118 358	100.0
Panama	77 082	71 272	92.5	-	-	34 838	48.9	36 434	51.1
Paraguay	406 752	406 552	100.0	271 010	66.6	80 749	19.9	54 793	13.5
Perú	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	-	-	-	-	-	-	-	-
Saint Lucia	620	510	82.3	510a)	100.0	-	-	-	-
St. Pierre & Miquelon	240	-	-	-	-	-	-	-	-
St. Vicent	389	-	-	-	-	-	-	-	-
Suriname	163 820	163 750	100.0	64 255	39.2	45	0.1	99 450	60.7
Trinidad & Tobago	5 630	5 449	97.0	5 449a)	100.0	-	-	-	-
Turks and Caicos	522	-	-	-	-	-	-	-	-
United States of America	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
Virgin Islands (USA)	345	345	100.0	345a)	100.0	-	-	-	-
TOTAL	40 405 285	15 749 289	39.0	4 222 934	26.8	2 084 502	13.2	9 441 853	60.0

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

Table 5

MALARIA CASES REGISTERED, 1978 - 1981

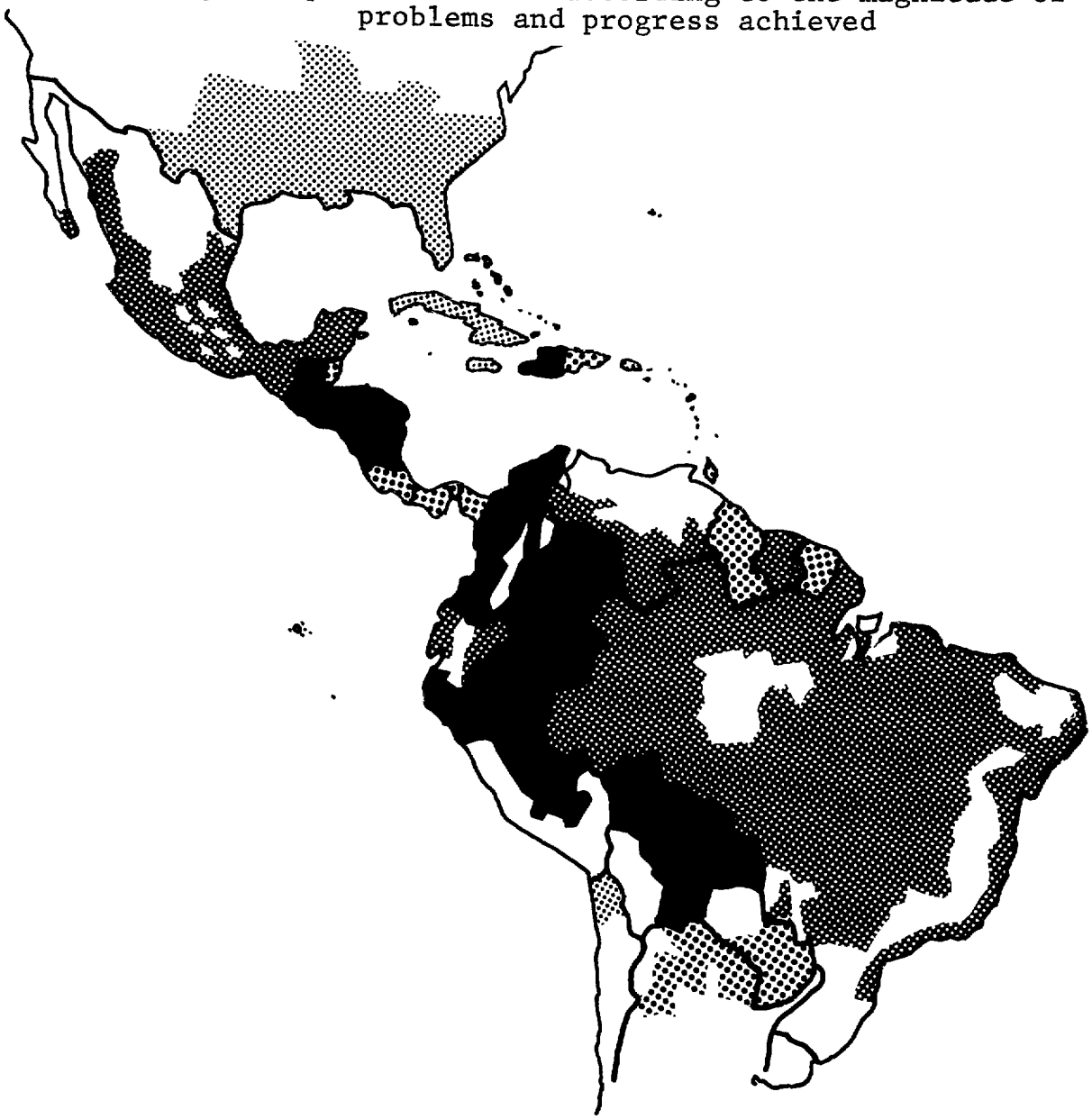
GROUP		Population 1981 in originally malarious areas (in thousands)	Cases registered			
			1978	1979	1980	1981
GROUP I	12 countries or territories in which malaria eradication has been certified	75 066	718	1 162	2 249	1 599
GROUP II	SUB-GROUP A:					
	Argentina	3 427	325	936	341	323
	Costa Rica	659	313	307	376	168
	French Guiana	65	266	604	831	769
	Panamá	1 927	268	316	310	340
	Paraguay	2 739	156	116	140	73
	Sub-total-A	8 817	1 328	2 279	1 998	1 673
	SUB-GROUP B:					
	Belize	182	1 218	1 391	1 529	2 041
	Dominican Republic	5 626	1 531	3 080	4 780	3 596
	Guyana	900	927	2 294	3 202	2 065
	Sub-total-B	6 708	3 676	6 765	9 511	7 702
	Sub-Total	15 525	5 004	9 044	11 509	9 375
GROUP III	Brazil	51 617	121 577	147 630	176 237	205 544
	Ecuador	5 122	9 815	8 207	8 748	12 745
	Mexico	37 996	19 080	20 983	25 734	42 104
	Suriname	284	876	903	4 445	2 479
	Venezuela	10 656	5 065	4 705	3 901	3 330
	Sub-Total	105 675	156 413	182 428	219 065	266 202
GROUP IV	Bolivia	2 044	10 897	14 712	16 619	9 774
	Colombia	17 118	53 412	60 957	57 346	60 972
	El Salvador	4 360	52 521	75 657	95 835	93 187
	Guatemala	2 820	59 755	69 039	62 657	67 994
	Haiti	4 378	60 472	41 252	53 478	46 703
	Honduras	3 492	34 554	25 297	43 009	49 377
	Nicaragua	2 733	10 633	18 418	25 465	17 434
	Peru	6 032	20 376	17 127	14 982	10 711 a)
	Sub-Total	42 977	302 620	322 459	369 391	356 152
	TOTAL	239 243	464 755	515 093	602 214	633 328

a) Information up to september.

MAP 1

STATUS OF THE MALARIA PROGRAM IN THE AMERICAS, 1981

By Group of countries according to the magnitude of problems and progress achieved



Group:

I - Chile, Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Martinique, Saint Lucia, Trinidad and Tobago, United States of America (Puerto Rico and the Virgin Islands)

II - Argentina, Belize, Costa Rica, Dominican Republic, French Guiana Guyana, Panama and Paraguay

III - Brazil, Ecuador, Mexico, Suriname, Venezuela

IV - Bolivia, Colombia, El Salvador, Guatemala, Haiti, Honduras

Table 6

CASE DETECTION BY COUNTRY AND PHASE OF PROGRAM, 1981

Country or other political or administrative unit	TOTAL		Maintenance phase		Consolidation phase		Attack phase		Non-malarious Area	
	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive	Slides examined	Positive
Argentina	31 431	323	20 491	56	3 397	8	7 543	259	-	-
Bahamas	3	3	-	-	-	-	-	-	3	3
Belize	46 460	2 041	4 677	63	13 510	155	28 273	1 823	-	-
Bolivia	176 235	9 774	-	-	-	-	175 737	9 593	498	181
Brazil	2 839 488	205 544	152 095	1 038	628 911	2 813	2 007 538	198 292	50 944	3 401
Cayman Islands	7	7	-	-	-	-	-	-	7	7
Canada	538	538	-	-	-	-	-	-	538	538
Colombia	463 864	60 972	-	-	182 876	7 754	279 549	52 998	1 439	220
Costa Rica	162 861	168	-	-	61 699	50	98 751	69	2 411	49
Cuba	520 668	573	520 668	573	-	-	-	-	-	-
Dominica	0	0	-	-	-	-	-	-	-	-
Dominican Republic	273 498	3 596	241 539	2 574	5 500	80	26 447	942	12	0
Ecuador	357 855	12 745	-	-	101 610	360	225 158	12 359	1 087	26
El Salvador	367 447	93 187	-	-	-	-	367 447	93 187	-	-
French Guiana	14 249	769	4 623	216	3 785	214	5 841	339	-	-
Grenada	2 220	0	332	0	-	-	-	-	1 888	0
Guadaloupe	0	0	-	-	-	-	-	-	-	-
Guatemala	475 777	67 994	-	-	-	-	461 685	66 000	14 092	1 994
Guyana	110 993	2 065	13 119	124	-	-	97 874	1 941	-	-
Haiti	283 978	46 703	-	-	-	-	283 978	46 703	-	-
Honduras	221 822	49 377	-	-	-	-	221 250	49 229	572	148
Jamaica	1	1	1	1	-	-	-	-	-	-
Martinica	1	1	1	1	-	-	-	-	-	-
Mexico	1 593 697	42 104	32 889	13	520 289	3 701	1 020 111	38 253	20 408	137
Nicaragua	223 473	17 434	-	-	-	-	223 473	17 434	-	-
Panama	387 360	340	-	-	211 727	34	175 633	306	-	-
Paraguay	101 979	73	8 539	7	45 826	4	47 056	62	558	0
Peru a)	123 819	10 711	24 954	808	69 120	3 959	29 745	5 944	-	-
Puerto Rico	11	11	11	11	-	-	-	-	-	-
Saint Lucia	0	0	0	0	-	-	-	-	-	-
Suriname	61 880	2 479	15 167	122	1 171	44	38 103	2 078	7 439	235
Trinidad & Tobago	5 574	3	5 574	3	-	-	-	-	-	-
United States	1 010	1 010	1 010	1 010	-	-	-	-	-	-
Venezuela	237 894	3 330	132 664	471	-	-	104 394	2 655	836	204
TOTAL	9 086 093	633 876	1 178 354	7 091	1 849 421	19 176	5 925 586	600 466	102 732	7 143

a) Information up to September.

Table 7

SLIDES EXAMINED AND POSITIVES, BY SPECIES AND CLASSIFICATION

MAINTENANCE PHASE, 1981

Country or other political or administrative unit	Blood slides examined	Total positive	Specie of Parasite				Classification of cases							
									Imported					
			P.falciparum	P. vivax	P.malariae	Mixed Infections	Autochthonous	Relapsing	from abroad	from areas within country	Induced	Introduced	Criptic and unclassified	No investigated
Argentina	20 491	56	-	56	-	-	32	1	2	4	1	14	-	2
Brazil	152 095	1 038	375	627	-	36	40	3	6	722	3	3	-	261
Belize	4 677	63	-	63	-	-	1	-	5	21	-	1	15	20
Cuba	520 668	573a)	86	465	6	-	-	-	553	-	-	20	-	-
Dominica	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Dominican Republic	241 539	2 574	2 574	-	-	-	251	-	231	-	-	1 238	-	854
French Guiana	4 623	216	203	13	-	-	164	-	25	20	-	-	2	5
Grenada	332	0	-	-	-	-	-	-	-	-	-	-	-	-
Guadaluope	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Guyana	13 119	124	2	120	2	-	-	1	4	67	1	-	-	51
Jamaica	1	1	...	...	...	...	-	-	1	-	-	-	-	-
Martinica	1	1	1	-	-	-	-	-	1	-	-	-	-	-
Mexico	32 889	13	1	12	-	-	-	-	3	6	-	-	1	3
Paraguay	8 539	7	-	7	-	-	1	-	2	-	-	1	1	2
Perú c)	24 954	808	-	808	-	-	641	-	3	164d)	-	-	-	-
Puerto Rico	11	11e)	-	3	-	-	-	-	11	-	-	-	-	-
Saint Lucía	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Suriname	15 167	122	120	2	-	-	95	-	-	9	-	4	-	14
Trinidad & Tobago	5 574	3	-	-	3	-	-	-	3	-	-	-	-	-
United States	1 010	1 010	42	95	3	1	-	-	-	996	3	1	-	-
Venezuela	132 664	471	17	453	1	-	94	3	81	124	-	169	-	-
T O T A L	1 178 354	7 091	3 421	2 724	15	37	1 319	8	931	2 133	8	1 451	19	1 212

a) Seven cases P. ovale and 9 without diagnosed specie.
b) Eight cases P. ovale, 7 without diagnosed specie and from 854 cases the specie of parasite was not reported. Ten congenital cases.
c) Information up to September.
d) 155 cases imported from attack phases and 9 from consolidation phases.
e) From eight cases unknown specie of parasite.

Table 8

SLIDES EXAMINED AND POSITIVES, BY SPECIES AND CLASSIFICATION, CONSOLIDATION PHASE, 1981

Country or other political or administrative unit	Population (thousands)	Blood slides examined	Total Cases	IPA*	Specie of Parasite				Origin of Infections							
					P. falciparum	P. vivax	P. malariae	Mixed Infections	Autochthonous	Relapsing	Imported from abroad	Imported from areas within country	Induced	Introduced	cryptic	Unclassified or not investigated
Argentina	73	3 397	8	0.1	-	8	-	-	2	-	4	2	-	-	-	-
Belize	88	13 510	155	2.0	12	143	-	-	23	1	10	19	-	-	12	90
Brazil	16 947	628 911	2 813	0.2	1 082	1 688	-	43	388	27	10	1 366	6	99	9	908
Colombia	12 461	182 876	7 754	1.0	2 749	4 969	1	35	2 328	20	21	4 535	10	39	420	381
Costa Rica	465	61 699	50	0.1	-	50	-	-	25	-	22	1	-	-	-	2
Dominican Republic	49	5 500	80	1.6	80	-	-	-	20	-	-	-	-	38	-	22
Ecuador	2 143	101 610	360	0.2	84	275	-	1	84	6	-	157	-	4	-	109
French Guiana	21	3 785	214	10.2	206	8	-	-	182	-	24	5	-	-	-	3
Mexico	21 806	520 289	3 701	0.2	33	3 667	-	1	1 601	72	42	975	15	73	182	741
Panama	1 703	211 727	34	0.02	15	19	-	-	7	-	13	13	-	-	1	-
Paraguay	1 334	45 826	4	0.00	-	4	-	-	2	-	1	-	-	-	-	1
Peru	2 869	69 120	3 959	1.4	-	3 959	-	-	180	-	-	47	-	-	-	3 732
Suriname	3	1 171	44	14.7	41	3	-	-	-	-	1	31	-	-	-	12
TOTAL	59 962	1 849 421	19 176	0.3	4 302	14 793	1	80	4 842	126	148	7 151	31	253	624	6 001

* Annual parasite Incidence.

Table 9

SLIDES EXAMINED AND POSITIVES BY SPECIES
ATTACK PHASE, 1981

Country or other political or administrative unit	Slides examined			Species found			
	Total	Positive		P. falciparum	P. vivax	P. malariae	Mixed Infections
		Number	Porcentage				
Argentina	7 543	259	3.4	-	259	-	-
Belize	28 273	1 823	6.4	29	1 794	-	-
Bolivia	175 737	9 593	5.5	493	9 080	-	20
Brazil	2 007 538	198 292	10.0	79 864	116 373	1	2 054
Colombia	279 549	52 998	4.2	24 725	27 948	15	310
Costa Rica	98 751	69	0.1	7	61	-	1
Dominican Republic	26 447	942	3.5	942	-	-	-
Ecuador	255 158	12 359	5.0	3 334	9 018	-	7
El Salvador	367 447	93 187	25.4	10 413	82 309	-	465
French Guiana	5 841	339	6.8	213	121	-	5
Guatemala	461 685	66 000	14.3	5 510	60 299	-	191
Guyana	97 874	1 941	2.0	588	1 323	-	30
Haití	283 978	46 703	16.5	46 703	-	-	-
Honduras	221 250	49 229	22.2	6 738	42 189	-	302
México	1 020 111	38 253	3.7	717	37 524	2	10
Nicaragua	223 473	17 434	8.0	1 355	16 038	-	41
Panama	175 633	306	0.2	173	132	-	1
Paraguay	47 056	62	0.1	4	58	-	-
Perú a)	29 745	5 944	20.0	43	5 888	13	-
Suriname	38 103	2 078	5.4	1 835	234	-	9
Venezuela	104 394	2 655	2.5	510	2 115	12	18
Total	5 955 586	600 466	10.1	184 196	412 763	43	3 464

a) Information up to september.

Table 10

SLIDES EXAMINED AND POSITIVES BY SPECIES,
NON-MALARIOUS AREAS, 1981

Country or other political or administrative unit	Slides examined			Species found			
	Total	Positive		P. faciparum	P. vivax	P. malariae	Mixed Infections
		Number	Porcentage				
Bahamas	3	3	100.0	...	...	...	...
Bolivia	498	181	36.3	3	178	-	-
Brazil	50 944	3 401	6.7	1 447	1 888	1	65
Canada	538	538	100.0	...	...	...	...
Cayman Island	7	7	100.0	...	...	...	...
Colombia	1 439	220	15.3	88	130	-	2
Costa Rica	2 411	49	2.0	1	48	-	-
Dominican Republic	12	0	-	-	-	-	-
Ecuador	1 087	26	2.4	1	25	-	-
Guatemala	14 092	1 994	14.1	113	1 877	-	4
Grenada	1 888	0	-	-	-	-	-
Honduras	572	148	25.8	8	140	-	-
Mexico	20 408	137	0.7	-	133	4	-
Paraguay	558	0	-	-	-	-	-
Suriname	7 439	235	3.2	223	12	-	-
Venezuela	836	204	24.4	9	194	-	1
Total	102 732	7 143	7.0	1 893	4 625	5	72

Table 11

COMPARATIVE RESULTS OF ACTIVE AND PASSIVE CASE DETECTION IN MALARIA PROGRAMS IN THE AMERICAS, 1981

Country or other political or administrative unit	Active case detection					Passive case detection					Total	
	Average number of evaluation	Blood Slides			Average number of notification posts	Average of notification posts prod. slides per months	Blood Slides			Average of slides per month per productive notification posts	Blood Slides	
		examined	Positive	Percent			Examined	Positive	Percent		Examined	Positive
Argentina	71	20 551	243	1.2	607	75	10 880	80	1.0	12.1	31 431	323
Bahamas	-	-	-	-	-	-	3	3	100.0	-	3	3
Belize	11	36 189	215	0.01	159	159	10 271	1 826	18.0	5.4	46 460	2 041
Bolivia	94	149 976	3 636	2.4	3 244	1 298	26 259	6 138	23.4	2.0	176 235	9 774
Brazil	...	1 726 238	32 063	2.0	42 214	16 109	1 113 250	173 481	16.0	6.0	2 839 488	205 544
Canada	-	-	-	-	-	-	538	538	100.0	-	538	538
Cayman Islands	-	-	-	-	-	-	7	7	100.0	-	7	7
Colombia	220	182 246	14 490	8.0	7 802	3 834	281 618	46 482	16.5	6.1	463 864	60 972
Costa Rica	94	161 172	107	0.1	749	421	1 689	61	4.0	0.3	162 861	168
Cuba	...	23 695	0	-	-	-	496 973	573	0.1	-	520 668	573
Dominica	-	-	-	-	-	-	-	-	-	-	0	0
Dominican Republic	171	211 084	2 237	1.1	5 271	3 393	62 414	1 359	2.2	1.5	273 498	3 596
Ecuador	125	130 270	1 935	1.5	6 453	3 544	227 585	10 810	5.0	5.3	357 855	12 745
El Salvador	...	50 668	8 795	17.4	2 788	2 350	316 779	84 392	27.0	11.2	367 447	93 187
French Guiana	...	9 710	69	1.0	15	14	4 539	700	15.4	27.0	14 249	769
Guadaloupe	-	-	-	-	-	-	-	-	-	-	0	0
Guatemala	68	59 660	5 469	9.2	12 975	1 116	386 117	62 525	16.2	29.0	475 777	67 994
Guyana	88	86 814	1 422	1.6	32	32	24 179	643	2.7	63.0	110 993	2 065
Grenada	-	-	-	-	-	-	2 220	0	-	-	2 220	0
Haiti	166	82 924	3 019	3.6	6 700	3 383	201 054	43 684	22.0	2.5	283 978	46 703
Honduras	89	9 205	733	8.0	3 727	2 212	212 617	48 644	23.0	8.0	221 822	49 377
Jamaica	-	-	-	-	-	-	1	1	100.0	-	1	1
Martinica	-	-	-	-	-	-	1	1	100.0	-	1	1
Mexico	2 007	996 537	18 425	2.0	84 523	35 834	627 160	23 679	3.8	1.5	1 593 697	42 104
Nicaragua	147	12 842	318	2.5	5 319	2 897	210 631	17 116	8.1	6.1	223 473	17 434
Panama	284	357 423	258	0.1	706	239	29 937	82	0.3	10.4	387 360	340
Paraguay	157	49 892	34	0.1	4 327	855	52 087	39	0.1	5.1	101 979	73
Peru a)	...	82 255	4 975	6.0	5 737	773	41 564	5 736	13.8	4.5	123 819	10 711
Puerto Rico	-	-	-	-	-	-	11	11	100.0	-	11	11
Saint Lucia	-	-	-	-	-	-	0	0	-	-	0	0
Suriname	42	45 353	1 054	2.3	99	50	16 527	1 425	8.6	27.5	61 880	2 479
Trinidad	-	2 270	0	-	-	-	3 304	3	0.1	-	5 574	3
United States	-	-	-	-	-	-	1 010	1 010	100.0	-	1 010	1 010
Venezuela	447	168 324	1 307	0.8	2 815	381	69 570	2 023	3.3	15.2	237 894	3 330
TOTAL	-	4 625 298	100 804	2.2	-	-	4 430 795	533 072	12.0	-	9 086 093	633 876

a) Information up to September.

Table 12

SPRAYINGS WITH RESIDUAL INSECTICIDES APPLIED IN 1980 AND 1981 IN THE MALARIA PROGRAMS OF THE AMERICAS

Country or other political or administrative unit	Sprayings applied in 1980				Sprayings applied in 1981			
	DDT	Propoxur	Fenitrothion	Others	DDT	Propoxur	Fenitrothion	Others
Argentina	11 960	-	-	-	9 005	-	-	-
Belize	16 835	-	-	-	13 353	-	-	-
Bolivia	135 640	-	-	-	154 572	-	-	-
Brazil	4 016 014	-	-	-	4 382 444	-	-	-
Colombia	729 903a)	-	-	8 633b)	835 667	4 268	-	32 153c)
Costa Rica	43 527	9 678	-	-	19 491	-	-	-
Dominican Republic	84 501	-	-	-	5 973	-	-	5 895b)
Ecuador	222 997	-	-	-	189 742	-	-	-
El Salvador	...	...	...	...	-	21 600	-	-
French Guiana	3 315	-	-	-	4 074	-	-	-
Guatemala	840 518d)	...	...	...	131 280	-	276 436	-
Guyana	8 602	-	-	-	7 025	-	-	-
Haiti	-	-	80 244	-	14 821	-	163 853	40 838b)
Honduras	146 092	8 270	-	-	128 993	-	31 543	-
Mexico	2 298 366	-	-	-	887 174e)	-	-	-
Nicaragua	10 591	-	-	68 971f)	32 478	28 583	-	109 301g)
Panama	48 279	21 675	-	-	52 176	8 154	-	-
Paraguay	78 576	-	-		91 664	-	-	-
Peru	117 684f)	-	-	-	156 963f)	-	-	-
Suriname	3 611	-	-	-	3 384	-	-	-
Venezuela	349 566	-	-	27 514h)	241 749	-	-	-
TOTAL.....	9 166 577	39 623	80 244	105 118	7 362 028	62 605	471 832	188 187

a) Sprayings with DDT, Propoxur, Malathion and Carbaryl. b) Malathion. c) 19,180 spraying with malathion and 12,973 with Carbaryl. d) Fenitrothion and DDT. e) Information up to October. f) Incomplete information. g) Sprayings with Chlorphoxim. h) Sprayings with NCH.

Table 13

INSECTICIDES USED IN THE MALARIA PROGRAMS
1981 AND ESTIMATED 1982

Country or other political or administrative unit	DDT (Kg.)				DDT (Liters)		Propoxur 50% (Kg.)		Malathion 50% (Kg.)		O t h e r	
	1981		1982 (Est.)									
	100%	75%	100%	75%	1981	1982 (Est.)	1981	1982 (Est.)	1981	1982 (Est.)	1981	1982 (Est.)
Argentina	-	3 339	-	10 000	-	-	-	-	-	-	-	-
Belize	2 134	4 480	5 000	15 000	-	-	-	-	-	-	-	-
Bolivia	-	98 519*	-	128 000	-	-	-	-	-	-	-	-
Brazil	181 746a)	1 708 575	200 000a)	2 000 000	53 386	65 000	-	-	6 000b)	...	-	-
Colombia	4 097	311 328	5 550	650 000	-	-	6 042	9 000	7 228	55 000	8 956c)	-
Costa Rica	1 580	18 468	1 800	20 000	-	-	1 420	2 500	-	-	-	-
Dominican Republic	771	21 760	2 000	75 000	-	-	-	-	8 010	15 000	-	-
Ecuador	362	140 008	500	150 000	-	-	-	-	-	-	7 000d)	18 000e)
El Salvador	-	-	-	-	-	-	32 736f)	75 000f)	-	-	(g)	(g)
French Guiana	790	-	800	-	-	-	-	-	-	-	-	-
Guatemala	2 000	6 925	3 000	7 000	-	-	-	-	-	-	(h)	(h)
Guyana	640	1 500	2 100	8 500	1 900	3 000	-	-	-	-	-	-
Haití	58	5 062	-	-	-	-	-	-	17 310i)	-	104 408d)	-
Honduras	1 800	92 500	3 000	140 000	-	-	-	-	-	-	34 000d)	10 000d)
México	13 416	539 006	20 740	631 045	-	-	-	-	-	-	-	-
Nicaragua	-	17 147	-	16 050	-	-	17 152	48 000	-	-	76 510	82 852
Panamá	2 497	29 562	1 500	38 000	493 380	500 000	7 849j)	10 000j)	-	-	-	-
Paraguay	-	50 000	200	50 000	-	-	200	-	-	-	200d)	-
Perú	-	254 590	-	436 400	-	-	-	-	-	-	2 175k)	7 000l)
Suriname	708	347	1 200	1 000	-	-	-	-	-	-	-	-
Venezuela	-	162 226	-	209 575	59 035	97 263	-	-	142	21 210	(m)	(n)
TOTAL.....	212 599	3 465 342	247 390	4 585 570	607 701	665 263	65 399	144 500	38 690	91 210	233 249	207 852

* Information up to November.
a) DDT 80%. b) Liters Malathion 100%. c) Kg. Carbaryl 85%. d) Liters Fenitrothion 40%. e) 8,000 Kg. and 10,000 Lt. Fenitrothion 40%. f) Propoxur 5%. g) 220 Gal. Propoxur emulsion 20%, 11,000 Lb. Abate 1% and 2,500 Lt. Fenthion. h) 37,224 Kg. Fenitrothion 40% in 1981 and 40,000 Kg. in 1982, plus 8,692 Kg. Deltametrin 5% in 1981 and 9,000 Kg. in 1982. i) Malathion 95%. j) Also, in 1981 78,496 Lt. Propoxur were used and 80,000 Lt. in 1982. k) Kg. HCH 30%. l) 2,000 Lt. Fenitrothion 50% and 5,000 Kg. BHC 30%. m) In 1981 were used 5,827 Kg. HCH 25%, 5,755 Lt. Fenthion 95% and 11,380 Lt. Pencothion 94%. n) In 1982 these will be used: 5,050 Kg. HCH 25%; 4,600 Lt. Fenthion 95% and 21,310 Lt. Pencothion 94%.

Table 14

ANTIMALARIAL DRUGS USED IN THE MALARIA PROGRAMS IN 1981

AND ESTIMATED FOR 1982

(In thousands of Tablets)

Country or other political or administrative unit	Chloroquine 150 mg.		Primaquine 15 mg.		Primaquine 0.5 mg.		Chloroquine/Primaquine Combined Tablets				Pyrimethamine 25 mg.		O t h e r	
							Adult dose		Infant dose					
	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982
Argentina	9.7	10.0	4.4	5.0	3.6	5.0	-	-	-	-	-	-	-	-
Belize	113.0	172.0	40.0	40.0	33.0	-	-	-	-	-	-	-	-	-
Bolivia	783.0	800.0	145.0	150.0	45.0	50.0	32.0	40.0	1.8	2.0	24.0	25.0	1.6a)	3.0a)
Brazil	10 493.7	11 000.0b)	505.0	1 050.0	152.0	300.0	30.0	500.0	65.0	200.0	144.0	250.0	156.0c)	250.0c)
Colombia	2 000.0	2 500.0d)	350.0	350.0	40.0	50.0	1 200.0	2 500.0	-	-	600.0	750.0	95.0c)	100.0c)
Costa Rica	540.4	600.0	52.7	60.0	10.5	11.0	-	100.0	-	5.0	-	-	-	-
Dominican Republic	-	1.300.0	-	100.0	-	-	-	300.0	-	-	-	-	-	-
Ecuador	931.0	1.510.0	152.0	300.0	51.0	160.0	338.0	600.0	55.0	60.0	5.0	-	5.0c)	6.0e)
El Salvador	2 188.8	627.9	569.2	546.0	684.2	299.0	3 530.9	5 824.4	637.8	1 092.0	-	-	-	-
French Guiana	60.0	60.0	29.0	30.0	-	-	12.0	15.0	2.0	2.0	-	-	11.0f)	10.0f)
Guatemala	1 860.7	2.000.0	301.0	500.0	283.3	300.0	5.6	100.0	1.4	50.0	-	-	-	-
Guyana	108.0	40.0	29.0	30.0	29.3	20.0	9.3	30.0	13.0	5.0	4.0	60.0	35.8g)	46.0g)
Haiti	4 575.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	526.0	1 500.0	32.1	228.0	23.0	220.0	74.5	1 400.0	59.6	60.0	-	-	-	-
Mexico	4 960.0	6 400.0	798.0	560.0	1 300.0	1 400.0	623.0	200.0	163.0	4 100.0	-	-	-	-
Nicaragua	16 425.8	8 000.0	4 309.4	2 150.0	3 515.9	1 800.0	-	-	-	-	-	-	-	-
Panamá	194.0	212.6	21.0	23.0	19.0	20.9	13.0	14.3	286.0	314.0	43.0	47.3	9.7h)	10.7h)
Paraguay	264.5	300.0	0.9	1.0	-	-	-	-	-	-	-	-	-	-
Peru	731.1	1 500.0	10.9	350.0	20.0	120.0	100.0	-	-	-	-	80.0	7.0i)	7.0i)
Suriname	200.0	200.0	75.0	100.0	25.0	25.0	100.0	-	25.0	-	50.0	60.0	162.0j)	-
Venezuela	3 000.0	3 150.0	273.0	275.0	61.0	60.0	1 674.0	1 600.0	276.0	250.0	100.0	105.0	-	-
T O T A L	49 965.2	41 882.5	7 697.6	6 848.0	6 295.8	4 840.9	7 742.3	13 223.7	1 585.6	6 140.0	970.0	1 377.3	483.1	432.7

a) In 1981: 1,000 Tabs. Fansidar (Sulfadoxine/Pyrimetamine), and 600 Tabs. Fanasil 500 mg., and in 1982 2,000.
b) Including 6,000,000 Amodiaquine 150 mg.
c) Fanasil 500 mg.
d) Amodiaquine 150 mg.
e) Fansidar.
f) Darachlor (Chloroquine/Pyrimethamine.
g) In 1981: 20,950 Fanasil Tabs., 10,000 Darachlor & 4,850 Tabs. Fansidar, and in 1982: 8,000 Tabs. Fanasil, 8,000 Daraclor and 30,000 Fansidar.
h) In 1981: 8,720 Tabs. Fanasil & 1,000 Tabs. Fansidar and in 1982: 9,600 Tabs. Fanasil & 1,100 Tabs. Fansidar.
i) 5,000 Tabs. Fanasil and 2,000 Fansidar.
j) 10,000 Tabs. Fanasil, 100,000 Darachlor and 52,000 Fansidar.

Table 15

PERSONNEL EMPLOYED IN THE MALARIA PROGRAMS IN THE AMERICAS
31 DECEMBER 1980 AND 1981 a)

(Part - Time Personnel in Parenthesis)

Title	1980	1981
Engineers	102	72
Spraying Chiefs	384	432
Sector Chief	630	823
Squad Chiefs	2 142	1 806
Sprayment	8 485	7 469
Draftsmen	120	82
Medical Officers	186 (5)	164 (4)
Entomólogists	63	56
Assistant Entomologists	270	268
Statisticians and Statiscians Assistants	365 (19)	383 (7)
Evaluation Inspectors	1 648 (b)	2 563 (b)
Evaluators	7 783	7 800
Microscopists	938 (62)	940 (62)
Administrators	61	56
Administrative Assistants	647	731
Accountants	42	45
Disbursing Officers	41	44
Storekeepers	59	68
Storekeepers Assistants	122	79
Secretaries	276	275
Others	959	630
Transport Chiefs, Mechanics and Assistant Mechanics	453	431
Drivers	1 015	925
Motorboat Operators	333	320
Boatmen	94	110
TOTAL	27 218 (86)	26 572 (73)

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

b) In some programs this personnel performs spraying operations' and larvicide activities.

Table 16

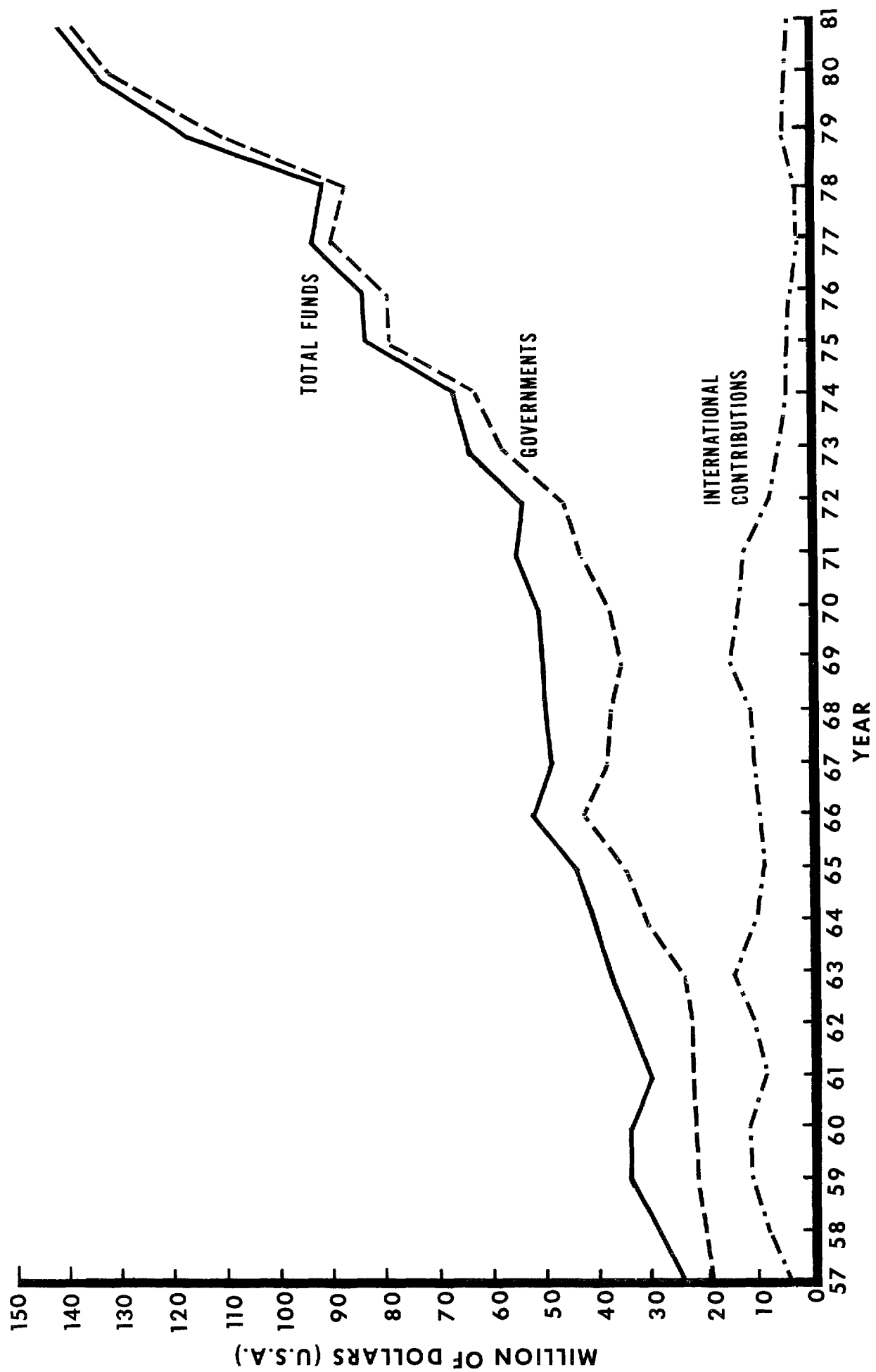
NATIONAL AND INTERNATIONAL CONTRIBUTIONS TO THE MALARIA PROGRAMS OF THE AMERICAS, EXPENDITURES 1980-1981 AND BUDGET 1982
(U.S.A. dollars)

Country or other political or administrative unit	National Expenditures			PAHO/WHO Contributions			Grants & Loans			Total		
	1980	1981	1982 a)	1980	1981	1982 b)	1980	1981	1982 a)	1980	1981	1982
Argentina	291 706	538 759	538 759	10 527	17 323	16 800	-	-	-	302 233	556 082	555 559
Belize	178 981	178 981	208 635	25 317	17 866	18 000	-	-	-	204 298	196 847	226 635
Bolivia	282 471	432 465	...	108 653	245 608	86 400	815 933c)	775 193c)	-	1 207 057	1 453 266	86 400
Brazil	12 328 029	20 561 740	24 598 734	322 487	469 611	366 150	-	-	-	12 650 516	21 031 351	24 964 884
Colombia	10 673 354	10 316 302	15 606 557	186 329	221 923	252 150	919 867	1 179 536	4 409 803	11 779 550	11 717 761	20 268 510
Costa Rica	1 669 137	904 371	302 105	13 307	10 793	4 150	-	-	-	1 712 444	915 164	306 255
Dom. Rep.	1 082 612	1 090 319	...	46 077	12 605	80 400	-	-	-	1 128 689	1 102 924	80 400
Ecuador	5 355 333	8 150 943	5 744 431	77 949	80 000a)	88 300a)	-	-	-	5 433 282	8 230 943	5 832 731
El Salvador	2 346 480	1 861 810	1 928 012	50 602	51 163	70 200	-	-	-	2 397 082	1 912 973	1 998 212
French G.	2 175 332	1 456 313	1 560 800	-	-	-	-	-	-	2 175 332	1 456 313	1 560 800
Guatemala	3 640 460	4 262 262	4 203 792	52 089	55 000a)	42 500	-	-	-	3 692 549	4 317 262	4 246 292
Guyana	344 371	413 907	...	21 985	23 826	66 350	-	-	-	366 356	437 733	66 350
Haiti	1 471 671	1 252 000	1 320 000	211 929	308 280	294 950	1 351 000c)	933 000c)	900 000c)	3 034 600	2 493 280	2 514 950
Honduras	1 900 000	3 552 577	4 000 000	37 000	40 000a)	44 250a)	16 896d)	-	-	1 953 896	3 592 577	4 044 250
Mexico	46 869 123	60 126 695	...	122 366	139 619	101 800	-	-	-	46 991 489	60 266 314	101 800
Nicaragua	4 675 600	...	...	118 493	63 552	45 400	156 230d)	23 770d)	-	4 950 323	87 322	45 400
Panamá	2 117 855	2 196 666	2 736 568	40 957	11 666	16 900	-	-	-	2 158 812	2 208 332	2 753 468
Paraguay	2 090 341	3 524 478	3 349 067	77 790	58 963	43 600	-	-	-	2 168 131	3 583 441	3 392 667
Peru	...	...	...	26 340	23 638	41 700	-	-	-	26 340	23 638	41 700
Suriname	791 668	860 000	860 000	66 166	64 466	59 700	-	-	-	857 834	924 466	919 700
Venezuela	13 048 764	13 162 790	...	-	-	-	-	-	-	13 048 764	13 162 790	...
Proyecto A M R O	-	-	-	610 865	482 564	562 796	14 230c)	15 770c)	40 100c)	625 095	498 334	602 896
TOTAL	113 363 288	134 843 378	66 957 460	2 227 228	2 398 466	2 302 496	3 274 156	2 927 269	5 349 903	118 864 672	140 169 113	74 609 859

a) Estimated. b) Estimated based on Operating Budget, 1982-1983, Doc. ABU-1600-81. c) AID Grant. d) UNEO Grant.

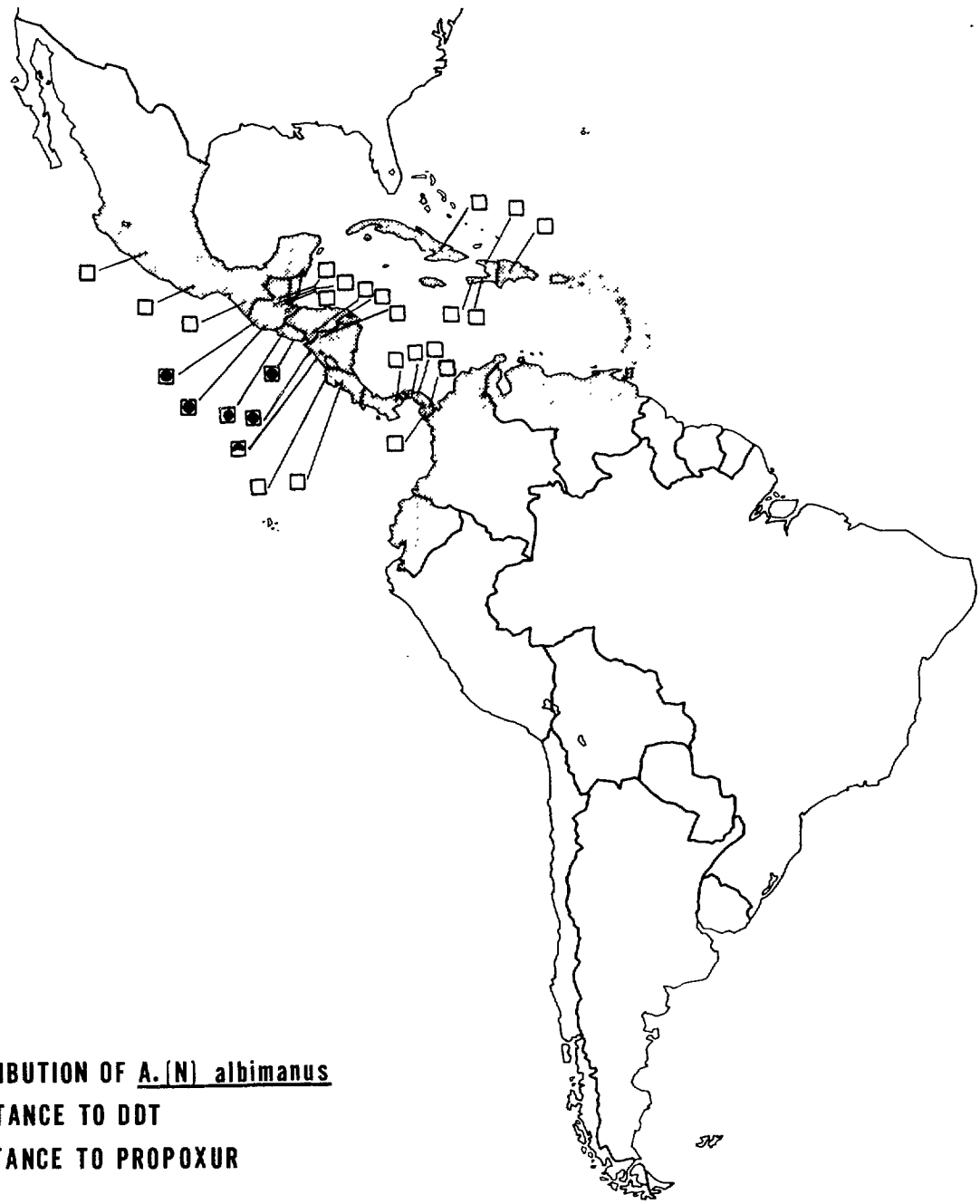
GRAPH 1

FUNDS INVESTED IN THE MALARIA PROGRAMS IN THE AMERICAS, 1957-1981



Map 2

DISTRIBUTION OF A. (N) albimanus AND RESISTANCE TO DDT AND PROPOXUR (DECEMBER 1981)

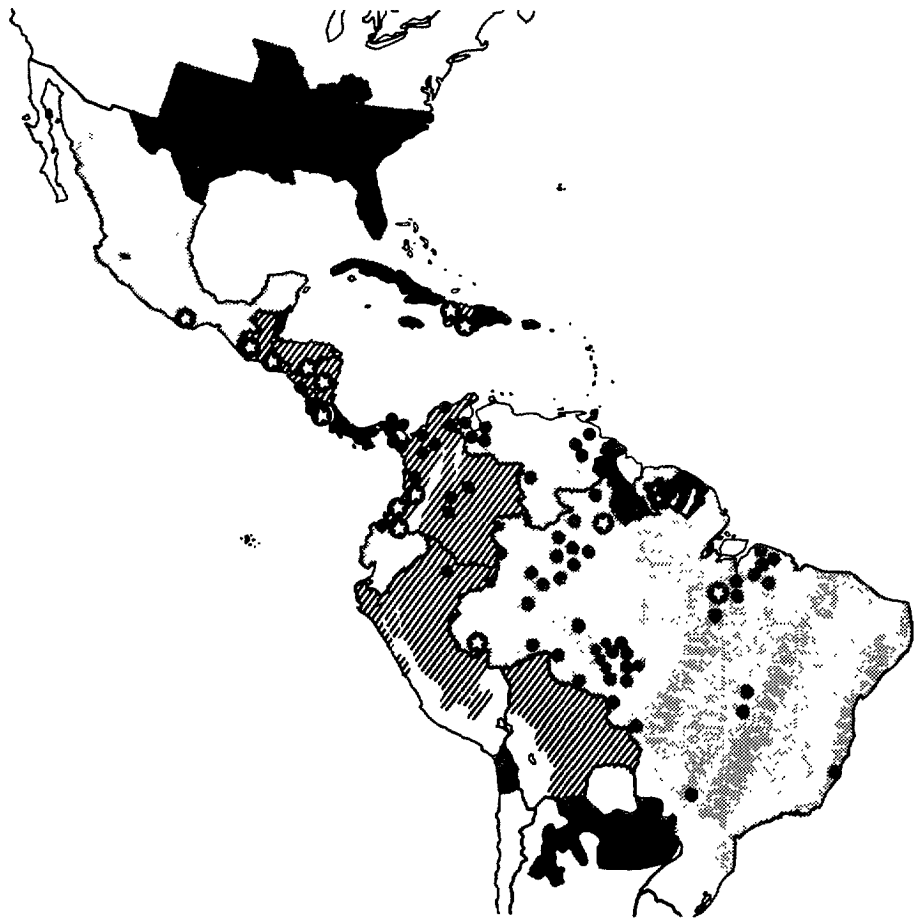


Map 3

DISTRIBUTION OF A. (A) pseudopunctipennis AND RESISTANCE TO DDT (DECEMBER 1981)

MAP 4

CLASSIFICATION OF MALARIOUS AREAS IN THE AMERICAN REGION
AND RESPONSE OF P. falciparum TO CHLOROQUINE



Group:

I - Chile, Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Martinique, Saint Lucia, Trinidad and Tobago, United States of America (Puerto Rico and Virgin Islands)

II - Argentina, Belize, Costa Rica, Dominican Republic, French Guiana, Panama and Paraguay

III - Brazil, Ecuador, Mexico, Suriname and Venezuela

IV - Bolivia, Colombia, El Salvador, Guatemala, Haiti, Honduras, Nicaragua and Peru

P. falciparum response to chloroquine:

- Sensitive
- Resistant

Table 17

GEOGRAPHICAL DISTRIBUTION OF AREAS WITH TECHNICAL PROBLEMS, 1980

Country and Area	population of affected Areas	Areas Involved Km 2	Insecticides used		No. of cases in this area	Principal Vectors	Causes of the Problem
			Type Used	Years of coberage			
Bolivia							
1. Department Beni	53 726	22 434	DDT	23	1 058	A. darlingi	Migration, activities of darlingi.
Brazil							
2. Acre 3. Amapá 4. Amazonas 5. Goais 6. Maranhao 7. Mato Grosso 8. Pará 9. Rondonia 10. Roraima	2 564 519	1 780 849	DDT	14	152 191	A. darlingi	Intensive population movements, poor housing, P. falciparum resistance.
Colombia							
11. Bajo Cauca (Nechi) Urabá, Litoral Pacífico, Medio Sur, Magdalena Medio, Catatumbo, Sarare, Ariari-Guejar, Alto Vaupes, Caquetá, Putumayo	1 553 946	235 164	DDT Propoxur	8-32	32 116	A. darlingi A. punctimac. A. nuñeztovari A. albimanus A. pseudopun. A. neivae A. albitarsis	Vector behavior; poor housing; colonization; social problems; parasite resistance to chloroquine; refusal to spraying; population movements.
Ecuador							
12. Esmeraldas	287 619	17 806	DDT Fenitrothion	14 1	7 761	A. punctimac. A. albimanus A. pseudopun.	Operational and administrative problems; colonization; poor housing; parasite resistance to chloroquine.
El Salvador							
13. Pacific Coastal	1 051 262	4 819	DDT Propoxur	10 7	40 000	A. albimanus	Vector resistance to all insecticides.

Table 17 (Cont.)

GEOGRAPHICAL DISTRIBUTION OF AREAS WITH TECHNICAL PROBLEMS, 1980

Country and Area	population of affected Areas	Areas Involved Km^2	Insecticides used		No. of cases in this area	Principal Vectors	Causes of the Problem
			Type Used	Years of coberage			
Guatemala							
14. Pacífic Coastal Zone	892 634	11 456	Deltametrine (Piretroide)	1	31 568	A. albimanus	Vector resistance to insecticides.
Guayana Francesa							
15. Oyapock and Maroni Regions, Matoury, Remiere-Montjoly, La Comte, Nancibo	10 925	282	DDT	2	536	A. darlingi	External migration; population movement.
Guyana							
16. Rupununi, Northwest Zone	43 410	...	DDT	17	1 879	...	Lack or transportation and personnel.
Haití a)							
17. Cité Simone O. Duvalier Jacmel; Valle de la Coma; Gross-Morne, Sur este del país; Petit-Goave; Bois Neuf.	1 332 863	...	DDT	De 4 a 17	26 717	A. albimanus	Vector resistance to DDT; population movements.
Honduras a)							
18. South Area; Jamastran Valley; Talanga and Cedros Valleys	237 635 b)	5 436 a)	Malathion DDT Prop.	9	...	A. albimanus A. pseudopun.	Vector resistance to chlorinated, organophosphorus & Carbamate insecticides.
México							
19. Basins of Rivers Fuerte Sinaloa, Humaya and Tamazula; 20. Huicot 21. Basin of Balsas River 22. Costa Chica of Guerrero & Oaxaca Coastal Zone 23. South Border of Mexico 24. Central part of Chiapas	3 615 288	222 807	DDT Dieldrin	24	21 127	A. pseudopun. A. albimanus	Internal migration; poor housing; temporary shelters; modification of houses vector resistance to DDT; action that remove insecticides from surfaces.

... No information available
a) Information up to 1980
b) Information up to 1979

Table 17 (Cont.)

GEOGRAPHICAL DISTRIBUTION OF AREAS WITH TECHNICAL PROBLEMS, 1980

Country and Area	population of affected Areas	Areas Involved Km ^{2}	Insecticides used		No. of cases in this area	Principal Vectors	Causes of the Problem
			Type Used	Years of coberage			
Nicaragua a)							
25. Dpto. Chinandega, Leon & Managua Dpto. Granada Rivas	1 195 573	16 644	DDT Mal. Propoxur	16 5 7	19 144	A. albimanus	Vector resistance to DDT, Malathion and Propoxur.
Panamá							
26. Jaqué, Brujas Canclón, Tawala, Pto. Obadía, Calovedora, Tobebe.	11 837	4 895	DDT	3-23	166	A. albimanus	Migration; poor housing; parasite resistance; population movements.
Perú							
27. Col. San Lorenzo; Bigote, Chinchipe, Bagua Santiago, Ene-Satipo Bajo Marañon	212 533	142 950	DDT	18-22	2 170	A. albimanus, A. pseudopun, A. rangeli A. benarrochi	High vulnerability; poor housing; migration of laborers; temporary shelters; actions that remove insecticides from surfaces.
Venezuela							
28. Western and Southern Areas	633 904	139 946	DDT	34	238	A. nuñeztovari A. darlingi	Vector exophily; population movement; anthropological problems.
TOTAL	13 697 674	2 605 488	-	-	336 671	-	-

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, Perú and large extension of Brazil in the latter country, for example, a large scale plan for socio-economic development which contemplates construction of unlimited number of highways and projects of de colonización determina que la lucha antimalárica se ejecute con un programa a largo plazo. colonization makes it necessary that anti-malarial campaign be carried out as a long term program.

a) Information up to 1980.

Map 5

GEOGRAPHICAL DISTRIBUTION OF AREAS OF TECHNICAL PROBLEMS, 1981

(see table 17)