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STATUS OF MALARIA PROGRAMS IN THE AMERICAS

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SITUATION OF MALARIA PROGRAMS IN THE AMERICAS

XXXIV REPORT

INTRODUCTION

In 1985 the Malaria Program in the Americas maintained the general purpose of preventing and controlling the disease and reducing endemic disease in the most affected areas by treating epidemic foci and interrupting transmission in areas with low levels of endemicity. The current socioeconomic crisis in the Latin American countries does not permit an effort compatible with the high degree of priority that both governments and the Organization have assigned to combating this disease.

Nine countries recorded advances in achieving their specific objectives; in seven, the malaria situation worsened and in five the situation was maintained stationary with respect to the previous year.

During 1985 the countries continued the effort initiated in previous years to strengthen systems of epidemiological surveillance and to seek mechanisms for greater intrasectoral participation. The antimalarial program followed, developed through the control of vectors with residual household insecticides, antilarval measures, chemical products, larvivorous fish and/or reduction of breeding places, personal protection (use of repellent substances and mosquito nets), and treatment of cases.

The treatment of confirmed cases was basically oriented to avoid mortality, to reduce morbidity, and to diminish the suffering of the persons affected. The process of epidemiological and operational stratification of malarious areas was initiated in most of the countries for the purpose of redefining strategies in accordance with the local situation and available resources.

The training of human resources was increased in 1985, especially in the countries of Central America, as well as basic and operational research oriented to the development of new control technologies and better and more effective systems of diagnosis, evaluation and epidemiological surveillance.

Efforts are being continued to improve information subsystems, and several countries have initiated the use of computers for the tabulation and analysis of data. However, it would be desirable to unify standards and to incorporate information into the National Health System.

The use of insecticides continued to be the basic measure for vector control. Low consumption of DDT was maintained as in the previous year. Alternative organ-phosphorated insecticides or carbamates were applied in very limited areas in several countries, owing to their high cost and the difficulties in acquiring them. Their utilization is not always based on epidemiological conditions or on resistance of the vectors to DDT, which means that a more detailed study of the mechanisms of resistance and their repercussions on the dynamics of transmission is needed.

Antimalarial drugs were used profusely for the treatment of acute attacks or for radical cure of registered infections. The resistance of P. falciparum to the 4-aminoquinolines and to the inhibiting of Dihydrofolin Reductase continued to worsen in the South American, Amazon, and Caribbean countries, which were obliged to review their treatment methods and to adopt combinations of more effective drugs against multiresistant infections of that species.

The promotion of mechanisms of coordination and national and external financing advanced in the Central American subregion so as to better define the problem of malaria, establish strategic approaches, program activities, and set goals in accordance with the local reality in regard to technical and financial feasibility.

In the Andean area advances were made for the carrying out of joint programs through the development of bilateral agreements established among several countries of the Subregion with international financing agencies and the governments of industrialized countries.

Actions were initiated for the development of joint programs among Brazil, Guyana, French Guiana, Suriname, and Venezuela.

I. CURRENT SITUATION OF MALARIA CONTROL PROGRAMS

A. General Information

The countries of the Region are in a phase of transition between the doctrine and strategy of eradication and the development of a program of surveillance, prevention, and control that is based on the epidemiological approach incorporated in the activities of the General Health Services and that take into account the local social and economic conditions of the population and its resources, following the strategy of Primary Health Care.

If we take into account the number of cases confirmed parasitoscopically, the epidemiological situation has been stabilized in the last three years, with 830,460 cases registered in 1983, 928,879 in 1984, and 884,202 in 1985 (although only partial information is available in three countries).

The countries of the Region have been classified into four groups in accordance with the evolution of the malaria problem and the development of the program and its results:

Group I Includes the 12 countries or territories where evidence of transmission does not exist: Cuba, Chile, Dominica, the United States, including Puerto Rico and the Virgin Islands, Grenada, Guadalupe, Jamaica, Martinique, Saint Lucia, and Trinidad and Tobago. (Map 1).

Group II Encompasses three countries, Argentina, Costa Rica, and Panama, where the transmission of malaria was reduced considerably and the favorable situation has been maintained (Map 2).

Group III Is made up of five countries where malaria has increased in endemic areas, Brazil, French Guiana, Guyana, Paraguay, and Suriname. In 1985 this group registered 47% of all the cases found in the Region.

Group IV Is composed of 13 countries, divided into three geographical subregions: Subregion A: Haiti and the Dominican Republic; Subregion B: Belize, El Salvador, Guatemala, Honduras, Mexico, and Nicaragua; and Subregion C: Bolivia, Colombia, Ecuador, Peru, and Venezuela. In this group 464,530 cases of malaria were registered in 1985 (52.5% of the total of the Americas).

In Table 2 it may be observed that the countries or territories that compose Group I registered 1,519 cases, most of which were registered in the United States (1,030) and in Cuba (457). Almost all the cases in this Group were classified as imported, 1,037 in the United States, 441 in Cuba, 13 in Martinique, and 18 in Trinidad and Tobago.

In the 21 remaining countries that have active control programs a reduction was registered in the total number of cases. In four countries reductions of 10 to 30% were registered (Bolivia, El Salvador, Guatemala, Ecuador, and Venezuela) in three countries (French Guiana, Suriname, and Belize) the cases were reduced to half, and in Haiti and the Dominican Republic the reduction in the number of registered cases was very large: from 69,863 to 12,631 in Haiti and from 2,370 to 816 in the Dominican Republic in 1984 and 1985, respectively. Colombia, Nicaragua, and Panama maintained the same number of cases in 1984-85 with 55,791, 15,130, and 126, respectively.

The eight remaining countries showed large increases, such as Paraguay, which moved from 49 cases in 1983 to 4,568 in 1985; Argentina and Guyana, which doubled the number of cases; and Costa Rica, Brazil, Honduras, Mexico, and Peru, which had increases of 10 to 30% of the registered cases.

The general result of case detection (Table 6) indicates that 9,341,893 blood samples were examined (80,934 fewer than in 1984); the majority, or 64.6%, were taken in attack-phase areas. The samples taken in areas in maintenance increased from 1,302,266 in 1984 to 1,458,988 in 1985, while the number of positive diminished from 12,118 to 10,954, and the percentage of positivity diminished by 0.93% and 0.75% respectively. In areas in the consolidation phase 1,740,228 blood samples were taken, 105,671 fewer than in 1984 and 262,519 fewer in 1983. The reduction is partly due to the fact that Argentina transferred the area of consolidation to maintenance and Peru transferred part of the area that in consolidation to the area in attack. In the attack-phase area there was no change and the percentage of positivity was maintained at the same level, or, 13,64% and 13.73% in 1985.

Classification of antimalarial programs in accordance with phases belongs to the terminology of the eradication of malaria, and the countries have continued to maintain this division, which appears in Tables 3, 4, and 5, for the purposes of comparison with the information regarding previous years.

It may be seen that there were no great changes in the population of the malarious areas classified by program phase. The quantities registered express only the natural increase of the population. The following are the figures and respective proportions of the population of the malarious areas in accordance with phases of the program:

maintenance phase:	124,086,000 -	47.76%
consolidation phase:	67,092,000 -	25.82%
attack phase:	68,659,000 -	26.42%
total population of the malarious areas:	269,838,000 -	100.00%

There was a diminution in 1985 with respect to the previous year (50,385 and 47,353, respectively). This item of data confirms the deterioration that is taking place in the programs, since it indicates the recovery of transmission: Brasil, Ecuador, and Mexico are the countries where this increase was most evident. Positivity in areas in attack also increased in 1984 (842,618 cases in comparison with 764,961 in 1983), which indicates that the control measures used in that area were insufficient or ineffective to control the endemic disease.

Table 7 presents the epidemiological information of the 21 countries that have active control programs. This group of countries is responsible for 99.8% of the positive samples detected in the Hemisphere. Among them, Brazil and Mexico, with a total of 517,920 cases, produced 58.56% of the cases of the Region. Guyana showed a deterioration in the transmission by P. falciparum, 14.02% in 1984 and 29.00% in 1985; in Colombia this indicator increased in 1985 to 38.15%, from 34.87% registered the previous year.

In accordance with the indexes of Table 7, Belize and Guatemala in 1985 showed the highest incidence of malaria (17.50% and 17.12%, respectively). The lowest continued in Panama, with an API of 0.06%, the same as in 1984.

Tables 8, 9, 10, and 11 group the examined blood samples and those positive by species, in accordance with the phase of the programs and the origin of the cases. Table 12 makes a comparison between the active and passive search for cases in each of the countries. In accordance with these figures, it may be observed that 58.79% of the total of examined samples came from the passive search, a system with which the greatest number of cases was detected, 752,907, or 85.13%.

B. Field Operations

Consumption of insecticides as a principal measure for vector control was maintained in 1985 similar to that of 1984. Table 13 presents the data on the products utilized by the programs for malaria. The figures on DDT were maintained practically equal except for liquid DDT, which diminished from 108,410 liters in 1984 to 60,394 in 1985. Consumption of propoxur and fenitrothion increased. DDT continued occupying first place among the insecticides utilized; however, it has not been used for several years in El Salvador and Haiti, and since 1984 has not been utilized in Guatemala.

Reduction of dependency on insecticides as the principal means of attack should be reflected in a diversification of control measures. Unfortunately, this trend has not been significant. In almost all the areas where there spraying has ceased, no control measures have been implemented other than the distribution of drugs in selected areas.

Table 14 evaluates a reduction of fenitrothion and an increase in the use of propoxur and other insecticides in 1985, especially in Guatemala, where 363,339 sprayings were carried out with deltametrin and 131,314 with propoxur. Table 15 shows the reduction in the number of sprayings with various insecticides during the period 1981-1985.

Five countries utilized larvicides as an antimalarial control measure in order to protect 1,423,025 inhabitants. Small sanitary engineering works for the reduction of breeding places were utilized in El Salvador and Mexico, thereby protecting 925,918 persons.

Mass distribution of drugs was carried out in five countries as a control measure to give protection to 1,199,220 persons. Selective treatment was used in four countries among 8,995,640 inhabitants, and two countries applied combined measures, protecting 1,399,189 inhabitants.

A part of the population at risk in malarious areas received no control measure. Six countries reported having left a total of 9,913,712 persons without care for lack of financial resources, and it is estimated that 989,150 inhabitants are without protection owing to social problems caused by public disturbances and 63,916 inhabitants were not protected because of difficult access to some areas. Another 5,315,823 inhabitants were not protected for various reasons, such as socioeconomic problems.

Below are presented the figures on spraying done with DDT in the last 12 years.

Year	Sprayings with DDT
1974	14,270,027
1975	13,532,982
1976	11,347,781
1977	9,751,636
1978	9,098,629
1979	9,401,860
1980	9,166,577
1981	7,525,467
1982	4,541,133
1983	3,629,088
1984	3,786,946
1985	3,683,885

Antimalarial drugs for the treatment of acute attack cases were used in all the countries with programs. Table 16 provides data on the consumption of drugs during 1985 and an estimate of what is expected to be consumed in 1986. Table 17 specifies the total quantities of drugs consumed from 1982 to 1985.

Table 18 contains information on the personnel employed in antimalarial programs during 1984 and 1985.

C. Budget

Table 19 summarizes the data on the funds utilized in the programs for malaria in the Americas. They are broken down by financial resources from the governments, those contributed by PAHO/WHO, and those from loans and/or grants of international origin. The figures are expressed in absolute values for each year, basing the conversion to United States dollars at the official exchange rates established in each country. It should be clarified that in several countries the value of the dollar on the black foreign exchange market greatly surpasses established official levels.

D. Information by Countries

ARGENTINA

Antimalarial activities were developed with very low operational performances, which negatively affected the efficiency and effectiveness of the program.

Epidemiological surveillance was fulfilled in 45% of the program, and household spraying was carried out in 44.8%; 638 sprayings were made in the area considered in maintenance.

The previous problems, together with those of a socioeconomic nature facing the Argentine malarious region, were reflected in the deterioration of the malaria situation, whose 774 cases registered in 1985 represented 177% of those observed the previous year.

The importation of cases from neighboring countries continued high (23.4% of the total number of cases registered). Most of the infections corresponded to P. vivax (99.5%).

BELIZE

The impact of antimalarial actions in 1985 was positive, although the process of evaluation of the recently reorganized program is still not complete.

Although the incidence registered during the year appeared to be lower than that of 1984, the activities programmed were not carried out in full. House spraying was 88% fulfilled during the first cycle and only 31% during the second. This noncompliance was due to the lack of funds for acquiring the solvents necessary for spraying of painted houses.

Epidemiological evaluation reached only 13% of what was programmed, although it is noteworthy that the personnel assigned for this activity was also charged with providing treatment, which was considered priority. In view of this, 95% of the cases detected were really treated. Those who remained without treatment were those who migrated to other parts of the country.

The reduction of cases in 1985 was 29.6% with respect to the previous year. Only 3.6% of the total number of cases was due to P. falciparum, which was favorable if compared with that observed in 1984, during which the percentage of cases by this parasitic species was 17%.

BOLIVIA

During 1985 malaria control activities continued to be very diminished with a resulting deterioration of the national epidemiological situation and an increase in the absolute number of cases and dispersion of the disease.

The principal measure of vector control continued to be household spraying with DDT, an activity that was developed with multiple interruptions owing to work stoppages and strikes by the field staff, which brought about serious deficiencies in spatial (nonsprayed localities) and time coverage (inopportune spraying).

Budgetary allocation was very late and insufficient, with the aggravant of inflation. Budgetary execution was restricted by sharp variations in the price of inputs and their frequent absence on the local market. Work was performed on barely 42% of the working days. Owing to serious economic restrictions, the supervision indispensable to correct deficiencies at each level was practically not carried out.

BRAZIL

The greatest malaria problem of this country is concentrated in the Amazon region, where it is associated with migratory movements in areas of recent occupation. New human settlements, many of them disordered and massive, not only facilitate transmission of the disease but also make it difficult to carry out control activities on a timely basis.

In view of the foregoing, the program oriented its action prioritarily toward this region for the purpose of reducing the incidence to levels that would facilitate development of the agro-industrial and mining projects in the Brazilian Amazon region.

In other areas of the country with interrupted transmission surveillance activities were significantly stepped up for the purpose of protecting them from reintroduction of the disease.

In 1985 the general epidemiological situation continued its trend toward deterioration, although it was proportionately less than in previous years. The increase in positivity was 5.8% in relation to 1984. The states of Rondonia and Pará contributed 73% of the blood samples with plasmodia from the Amazon region, although a trend was noted toward stabilization in Rondonia and reduction in Pará.

In other Amazon states the situation is frankly unfavorable, for example, in Roraima, Maranhao, and Amazonas.

The intense transmission in this area of the country, together with intense internal migratory movements, increases vulnerability in the areas where malaria was interrupted. Positivity in these areas increased from 13,000 positive hematic samples discovered in 1984 to 14,000 in 1985, although the number of autochthonous cases continued to decrease.

The residual foci of Mato Grosso do Sul and Goias did not exceed 100 cases in the year; those of Santa Catarina and Paraná remained inactive and possibly extinct. New foci were discovered in Piauí, Minas Gerais, Bahia, Ceará, and Rio de Janeiro. The majority were discovered in Piauí.

Relative improvements may be attributed to improvement of operations and to timely strategic modifications based on the following:

- Improvements in epidemiological stratification and selection of priority areas.

- Additional cycles of spraying with insecticides in settlement projects.

- Increase of health information and education in the affected communities.

- Strengthening of personnel both in quality and in quantity.

COLOMBIA

Malaria in Colombia is considered as one of the ten principal health problems of the country. However, current social and economic conditions have contributed directly to maintaining this endemic disease at unfavorable levels. Inefficiency of the actions is reflected in the low coverage, for example, of spraying, which in 1985 only amounted to 33% of that programmed. The limited allocation of resources and working problems contributed to aggravating this situation.

Colombia has initiated an interesting strategic opening in search of greater intra- and inter-institutional cooperation. Work is currently being carried out jointly with the Sectional Health Service of Antioquia to resolve the malaria problem in that Department; the results attained so far are considered highly promising. With the cooperation of other Sectional Services a research project on malaria oriented to better understanding of the factors that affect transmission is also being carried out. In this activity the Bureaus of Epidemiology and of Direct Campaigns of the Ministry of Health are collaborating.

COSTA RICA

This country maintains 70% of the national malarious area in the consolidation phase. Positivity in 1985 reached 734 cases, the greatest number in the last five years. This increase of cases is attributed to the increase in migratory movements, especially of refugees and displaced persons from neighboring countries.

Epidemic outbreaks were detected in border cantons with Nicaragua in the provinces of Alajuela and Limón, with 302 and 147 cases, respectively.

Classified as imported were 356 cases from Nicaragua, two from El Salvador, three from Guatemala, and one from Ecuador. The imported cases represented approximately half of the total.

Financing of the program in Costa Rica was adequate since the Government assigns it high priority.

ECUADOR

There was a reduction of 12.2% in the number of cases with respect to 1984, although the number of positive localities increased slightly.

The provinces where transmission remains most active are those of Esmeraldas, Manabí, Guayas, and Los Rios. These four provinces totaled 80% of all registered cases. Most of them from P. falciparum (71.6%) came from the province of Esmeraldas.

Control measures were based on the use of household insecticides (fenitrothion in Esmeraldas and DDT in the other provinces), although the operations were not complete owing to the lack of means of transport and to work stoppages.

At the beginning of the year a loan agreement was signed with AID of the United States for the acquisition of inputs, training of personnel, research, and institutional development.

With this financial effort the program was reorganized and the training of personnel was initiated at all levels. Worthy of mention is the training of personnel of the general health services for the development of antimalarial activities coordinated with the NMES.

EL SALVADOR

The epidemiological situation in this country showed an appreciable improvement in 1985. The 66,874 cases discovered in 1984 were reduced to 44,473 in 1985. P. falciparum decreased 98% compared with 16.7% the previous year.

The country is making efforts to improve its antimalarial strategy based on the application of combined measures of control. Recently, in addition to household and spatial spraying, the collective distribution of drugs, the application of larvicides in selected areas, and the construction of small antimalarial engineering works with community participation are being employed. The community itself participates significantly in the distribution of drugs through its voluntary collaborators.

The acute social, political, and economic crisis being faced by the country since 1979 constitutes the principal obstacle for the implementation of a complete program, which at present only covers 24% of the population affected by the malaria problem, although it receives priority within the limitations mentioned.

Arrangements are currently being carried out for the obtaining of financial resources to increase the development of engineering works for vector control in the aquatic phase. The Agency for International Development of the United States (AID) has already assigned resources for the execution of one of these projects.

GUATEMALA

Although budgetary resources for fiscal year 1985 were reduced with a view to coping with the country's present economic crisis and cuts in certain basic budgetary lines were considerable, the adaptation of work plans so as to cover priority problems exclusively made it possible to obtain the control of the situation and even improve it in relation to 1984. These favorable results were due in part to the support provided by the health authorities, which contributed to solving the frequent and various problems and, especially, to achieving flexible and adequate budgetary execution that had in the previous year been the principal cause for deterioration of the program situation.

The principal activities developed during 1985 consisted primarily of the application of residual household insecticides and the distribution of antimalarial drugs under different systems.

The annual parasite incidence in 1985 was 17.12% for the 3,210,101 inhabitants of the malarious area, while in 1984 it reached the figure of 23.88%.

FRENCH GUIANA

The malaria situation appears to have improved. Although data for the month of November are not available, the number of cases was reduced from 1,021 in 1984 to only 512 in 1985.

GUYANA

Although the coastal area was able to be maintained free of transmission, other areas of the country showed an increase of 150% in relation to 1984. The situation has been aggravated by the increase in the cases of P. falciparum, which, in relation to the total in 1984, rose from 14% to 29% in 1985.

All the incriminated foci have not been able to be investigated in depth but it is considered that the two greatest are found in the region of the Mazaruni and Cuyuni rivers, where the increase in cases reached 400% in relation to those detected the previous year. There is strong suspicion that a strain of chloroquine-resistant P. falciparum has been introduced into this area.

The traditional measures of vector control have resulted inoperative in these foci, since a highly migratory population of diamond and gold seekers resides in them; in addition, accessibility is not good.

The possibility of a change of control measures is being investigated, such as the intensive use of mosquito nets and the impregnation of hammocks with repellent substances and/or insecticides.

Emergency financial resources were requested of UNDP for the purchase of vehicles, equipment, and supplies. These elements, valued at $100,000, began to arrive at the end of the year, as well as drugs acquired with a financial subsidy granted by the Federal Republic of Germany.

The service of malaria control in Guyana is part of the Regional Health Service for the purpose of following the policy of horizontalizing the program within the guidelines of Primary Health Care.

HAITI

The epidemiological situation was maintained stable with own fluctuations corresponding to climatological changes characteristic of the country.

During the year certain recommendations made by a commission to review the program that visited the country in 1984 were implemented.*

In view of the changes introduced into the program the passive search of cases was reduced to that carried out in selected indicator areas. The personnel that previously was devoted to visiting voluntary collaborators is now occupied in the distribution of drugs. Epidemiological surveillance is now the responsibility of the general

health institutions. In the indicator areas mentioned, monthly parasitological surveys and some entomologic activities are carried out. Monitoring of the sensitivity of parasites to drugs has also been continued.

From January to September 12,631 cases were detected. During 1985, considered a period of transition, only a single spraying cycle was carried out with fenitrothion in 2,185 localities with 179,230 houses and with a population of 617,778 inhabitants.

The commission mentioned concluded that transformation of the current planning of the antimalarial program should give special attention to the approaches proposed by stages (emergencies, control, elimination) in terms of feasibility. Emphasis was given to development, adaptation, and strengthening of the sanitary infrastructures at the local level in order to ensure the access of all the population to timely diagnosis (clinical and parasitological) and to specific treatment. This effort should be supported by an appropriate referral system capable of treating serious cases and of dealing with evaluation of susceptibility to chloroquine. The need was stressed to analyze epidemiological data and to generate and utilize information at the most peripheral level possible.

HONDURAS

An increase in the cases of malaria detected continued to be registered in comparison with previous years. During the first half practically no control measures were taken owing to the lack of inputs (insecticides and drugs).

In the Gracias a Diós Department most of cases discovered were from P. falciparum, which caused an increase in cases from this species at the national level. However, in Choluteca only eight cases were diagnosed. In this last area, of high incidence in previous years, the endemic disease has been maintained at a low level the last three years, with an average of 370 cases a year (in 1982, 2,686 cases were registered).

There are areas where malaria has increased owing to the greater intensity of migratory movements. Some municipalities in Region 6 are in this situation. Resistance of A. albimanus to fenitrothion was discovered in Health Region 4.

MEXICO

Since 1981, a strategy has been implemented in Mexico of giving priority to the most positive localities discovered and grouped in accordance with a process of stratification.

The epidemiological situation has continued to deteriorate in this country. In 1985, 36.8% more cases were discovered than in 1984. Among the principal causes may be mentioned the timely allocation of the financial resources necessary for development of the program. Also incriminated are the impediments constituted by the process of decentralization, initiated in 1984, and the labor problems that arose during the year.

All of the above led to meager fulfillment of the actions programmed during the first half of the year. During the second, things improved a little with the provision of vehicles, vector control equipment, insecticides, and drugs.

The basic control activities continue to be household spraying with insecticides, the treatment of patients, and, in some localities, antilarval control with insecticides and physical sanitation works.

NICARAGUA

In 1985 Nicaragua initiated a process of integration of the malaria program within the General Health Services. Regionalization of the program was increased starting in 1983.

In 1985 control activities were based on household sprayingwith insecticides, radical treatment of positive cases and of cohabitants, and the antimalarial campaign. Epidemiological evaluation was based on the active search of cases.

Although regionalization of the activities has been a progressive process, it is considered that programming and standardization still need to be strengthened for the purpose of obtaining more favorable results with regard to administrative support and the effective and real integration of antimalarial actions within the General Health Services.

Nicaragua's malaria program is increasing epidemiological stratification and operations research in order to improve the planning of control activities in accordance with the epidemiological reality and local resources.

PANAMA

This is the only country that has avoided the deterioration that is observed in all the others. The total of 126 cases registered was the lowest in the Region and for the most part came (99) from border areas still in attack. More than half of the detected cases were imported from other countries. The autochthonous cases are attributed to the nomadism

of the affected communities. The antimalarial program of Panama continues to depend to a large degree on the protection provided by insecticides. During the year 30,980 sprayings with DDT were carried out, 5,700 with propoxur and 4,122 with fenitrothion.

Antimalarial drug use is also supported strongly. During the year 123,000 tablets of 4-aminoquinalines of 150 mg were consumed, in addition to 133,000 adult doses and 26,000 child doses of chloroquine/primaquine.

PARAGUAY

This program, which evolved so favorably from 1970 to 1983, began to deteriorate in 1984. The 554 cases registered in 1984 increased to 4,568 in 1985, almost all from P. vivax.

This situation is attributed to the ecological changes originated by the multiplication of bodies of water, since damming has increased the number of mosquito breeding places and with them, anopheline density. On the other hand, the exposed susceptible population has also increased owing to the opening up of new settlement areas for the implementation of agricultural projects by companies that hire temporary personnel from different places in the country and from the exterior (Brazil).

To the foregoing has been added the persistent difficulty in obtaining locally the insecticides utilized by the program and the high cost of such products.

Most of cases comes from the border areas with Brazil.

Some emergency measures have been taken with which the growing incidence of cases has been diminished during the last months of 1985.

PERU

The deterioration of the malaria situation in Peru has been notable in recent years. Today it is considered that the at risk population is 6.5 million inhabitants, after having been reduced to only 140,000 persons in 1968.

Although in 1985 the number of sprayings increased in order to contain the expansion of transmission, coverage still resulted insufficient. It is estimated that 450,000 dwellings had to be sprayed during the year, that is, 900,000 sprayings; but the number carried out barely reached 193,808.

In 1985 35,026 cases were detected among 213,487 examined samples.

The principal problems faced by the program were derived from an insufficient budget assigned for the execution of the activities programmed. The health services in which malaria control is integrated did not program activities and the funds allotted to peripheral services covered only a part of the needs for equipment and insecticides.

It is considered that there was not sufficient support from regional and local services; in addition, criticism was made of the shortage of personnel trained for the execution of control measures.

DOMINICAN REPUBLIC

The trend continues toward the improvement initiated in 1983. In 1984 2,370 cases were registered, and in 1985, only 816.

However, in the border areas with Haiti the malaria problem has not evidenced reduction.

SURINAME

Malaria prevails in Suriname in the border region with French Guiana. In other parts of the country the situation is highly satisfactory.

Special emphasis has been given to research of cases and to sero-epidemiological evaluation. In addition to the activities of active and passive search of cases radical antimalarial treatment is provided.

Vector control through spraying with residual insecticides continues being a basic activity of the program.

During 1985 two border meetings were carried out, the first with French Guiana, in Albina, and the second with French Guiana, Guyana, Brazil, Trinidad and Tobago, and Venezuela, in Georgetown, Guyana.

VENEZUELA

The epidemiological situation continued to deteriorate owing to the adverse economic conditions prevalent in the country, by virtue of which sufficient budgeting was not available for the payment of field staff or for the travel expenses of supervisors, inspectors, and rural visitors. The deterioration observed was greatest in the States of Barinas, Bolívar, Táchira, and T. F. Amazonas, Monagas and Sucre; these last two States were certified as having eradicated malaria more than 20 years ago.

Taking into consideration future prospects from the technical, administrative, and operational standpoint, the current situation is not favorable, especially when compared with the successes attained by the antimalarial program several five-year periods ago, which it has not been possible to maintain.

II. SPECIAL PROBLEMS FOR THE DEVELOPMENT OF MALARIA CONTROL PROGRAMS

A. Resistance of parasites

The problem of the resistance of infections of P. falciparum to antimalarial drugs is limited to the countries of South America, and the greatest prevalence has been registered in Brazil, Colombia, Ecuador, and Venezuela. In foci of resistant P. falciparum the phenomenon occurs frequently at lower levels of resistance (R-1), which makes possible the effective utilization of 4-aminoquinolines for treatment of acute attacks of malaria, especially at the level of primary care.

The resistance of infections of P. falciparum to pyrimethamine-sulfadoxine (PYR-SO) association has increased. There do not appear to be high levels of resistance to quinine when it is associated with PYR-SO or with antibiotics. These are alternative treatments increasingly in use at the secondary care level in infections resistant to 4-aminoquinolines and to the PYR-SO association.

B. Vector resistance

The problem of the resistance of anopheline vectors to insecticides should be dealt with in relation to the utilization of pesticides in agriculture and other interventions in the environment in order to better understand their relation, to study genetics and the mechanisms of production of the resistance, to make forecasts of the case, and to evaluate the repercussions that the resistance may have on the dynamics of transmission.

General consensus exists specialized teams should be maintained that are capable of detecting and monitoring the response of malarious infections to drugs and the resistance of anopheline vectors to insecticides and larvicides, as well as characterization of the mechanisms of resistance and the impact of resistance on transmission.

Although resistance to insecticides could have serious effects on the strategy of malaria control in some situations, particularly in areas of intense farming of certain products (cotton, sugar cane, rice), a great deal appears to depend on the eco-epidemiological and socioeconomic conditions prevailing in the area.

C. Critical analysis of deficiencies in the current approach to malaria control

On the one hand, it is admitted that malaria has disappeared from the most developed areas or countries as a result of social and economic improvement; but on the other, control activities have rarely been designed on the basis of serious consideration of different patterns of social and economic development. As is mentioned in the XVIII Report of the CEM/WHO, the process involved in reaching and maintaining control has depended not only on the previous intensity of transmission, but also on new trends in agriculture or mining activities and on the current distribution of rural populations. The traditional malarious locality is being replaced increasingly by a mobile rural population seeking work. The workers are concentrated temporally in inadequate camps or shacks under favorable conditions for the transmission of malaria. In some areas a population density develops that completely outstrips the total capacity of specialized and general health services. In others, the services are not employed opportunely. The slow transformation of the strategy of eradication to one of control frequently permits epidemics. In some areas of the Pacific coast in Central America the conditions of meso-endemic disease are replaced by epidemics as a result of difficulties in maintaining effective control. The same has occurred in Ecuador and Paraguay in Souuth America.

In most of the malarious areas of the rural environment in the Region of the Americas antimalarial services preceded development of the infrastructure of the general health services. Malaria services in many areas are still the only health services that continually reach the periphery. Although there have been efforts to slowly integrate these antimalarial services into the basic health services, these efforts not only have not contributed to the development of the latter but have rather caused a serious deterioration at the level of malaria control. In many circumstances, the resurgence of malaria originated decisions opposed to integration. This occurred because the general services were not provided with the necessary resources to carry out their tasks.

House spraying with insecticides and mass administration of drugs are usually effective interventions, since their use can modify drastically both the transmission and the prevalence of malaria, and if they are maintained for a sufficiently prolonged period can even eliminate the reservoir. However, when the level of effectiveness of these interventions declines or is discontinued, the same levels of endemicity are reestablished unless maintenance of the achievements obtained is ensured by other means. In contrast, more lasting effects are obtained with the elimination of breeding places of anophelines and improvement of dwellings and living conditions.

D. Possibilities of incorporating malaria control into the general health services

In some countries of the Region vertical activities or health campaigns have been combined under a common administration that is extended from the center to the periphery. This has improved the efficiency of control activities in Brazil, Colombia, Guatemala, and Venezuela. Campaigns remained centralized in all aspects of characterization and control of problems. Medical care of health problems without relation to direct campaigns continued under the responsibility of the basic health services.

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

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

E. Problems in applying technological advances to malaria control

It was emphasized that clinical diagnosis of malaria should be redefined in such a way that nonmalarious fevers can be ruled out with a resulting saving of drugs. On the other hand, the need was emphasized to develop simple diagnostic tests that can be utilized under field conditions.

Concern exists for taking the necessary precautions to prevent the inadequate use of recently registered drugs (as in the case of mefloquine) and regarding the need to evaluate the therapeutic schemes in use retrospectively and prospectively.

Vector control is an integral part of the prevention and the control of malaria and so far has been organized at the central and regional level with a vertical approach. The gradual change toward a more flexible approach that eventually involves the most peripheral levels of the health regions, private enterprise, and the community itself will take some time and a great deal of effort. Health education and community participation can reduce many breeding places of anophelines and several types of modification of the environment can be

carried out . In this sense, vector control is integrated into social and economic development. Available measures of personal protection and of reduction of man/mosquito contact, such as mosquito nets, whether or not impregnated with insecticides or repellents, has proven to be useful.

The effect of control measures on transmission will be influenced by extension of coverage of the population. This will in turn be related to the acceptance and perception of its value by the community, the customs of the persons at risk, the movement of individuals within the communities, and the extent to which the health system is aware of such movements. Special attention should be given to the application of methods to appraise rapid economic and social rapid changes in such a way that relevant information is utilized effectively.

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

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

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

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

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

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

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

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

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

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

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

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

III. RESEARCH*

Research on malaria continued in several countries of the Region. Support for these activities is provided by ministries of health, universities, or specialized national or international agencies through multilateral or bilateral programs (see table next page).

Significant advances toward the development of a malaria vaccine have been achieved in the USA. Other areas were also explored through laboratory, clinical, entomological and socioeconomic research, in th USA and other countries of the Region. In spite of these publications o malaria from the developing countries of the Americas were outnumbered b publications on Chagas' disease and Schistosomiasis, suggesting that mor attention should be given to malaria research in Latin America and th Caribbean.

A. Seroepidemiology

Malaria serology is being used in several countries of Central ar South America. Combined with other parameters, it is expected that th will contribute to a better knowledge of the malaria situation in a give area.

From 1361 samples tested in different age groups, in the distri of Danli, Department of El Paraiso in the eastern part of Honduras, 24. and 4.9% had antibodies against P. vivax and P. falciparum respectivel When the positive samples were correlated with the age of the populatic it was noted that of the 245 samples from the 1 - 4 year old age grou 22% were sero-positive for P. vivax while none of them reacted with falciparum. In contrast, in the group aged $\geq$ 44 years, of the 1 samples tested 30% and 15% reacted with P. vivax and P. falcipar respectively. This suggested that malaria caused by P. vivax was fi times more prevalent than that produced by P. falciparum and that contr measures have reduced considerably the transmission of P. falcipar malaria but not P. vivax malaria[1].

With the objective of establishing the prevalence of antibodies different populations and their potential to contribute to mala transmission, serological studies were also made in Costa Rica. Se samples were collected from 483 undocumented aliens; 1049 refugees livi

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*/ Review of activities made or published by researchers in Region during 1985.

FUNDS FOR MALARIA RESEARCH FROM NATIONAL AND INTERNATIONAL AGENCIES IN THE AMERICAN REGION, 1985*

AGENCY	AMOUNT US$
International Development Research Center, Canadá [a]	38,433[a]
Board of Science and Technology for International Development. National Academy of Science, Institute of Medicine. (USA) [b]	244,176
National Institutes of Health. National Institute of allergy and Infectious diseases, (USA)[c]	5,708,000
United States Agency for International Development[d]	12,500,000
United States Army[e]	5,220,000
United States Navy[f]	1,150,000
Pan American Health Organization/World Health Organization (PAHO/WHO)[g]	334,500
Special Program for Research and Training in Tropical Diseases, UNDP/WORLD BANK/WHO[h]	1,756,432

a) Project in Brazil;

b) Mosquito field studies carried out in the Region outside the USA;

c) Funds awarded to USA Institutions;

d) Most of the funds were awarded to USA Institutions. Funds for projects outside the USA included projects in Peru and Colombia;

e) Most of the funds were awarded to USA Institutions. Funds for projects outside the USA included projects in Brazil and Panama;

f) Most of the funds were awarded to USA Institutions. Funds for projects outside the USA included a project in Mexico.

* Estimates for calendar year 1985. (All data in US$, except for (a)).

in refugee camps, and 1274 residents from 15 localities in the department of Sarapiqui and Chiles, on the Nicaraguan border. Most autocthonous cases detected in 1985 were from this area. Sera were tested for antibodies against P. vivax only [2].

From the group of undocumented aliens, 88 (8.2%) sera were positive for malaria antibodies; 14 (3%) of them with titers of 64. However, only 2 (0.4%) demonstrated parasitemia by thick blood smear. This discrepancy may be related with the automedication. As they are not identified as being overtly infected with malaria because the parasitological diagnosis was negative and because of their nomadic life style, the potential risk of these individuals as a source of transmission is obvious. The refugee group was consistently treated with antimalarial drugs at the camps and thus had a lower number of sera positive samples (4.7%). Most of them with low titers[2].

In the six localities from the Department of Sarapiqui, 4% (19) of the 494 sera tested had titers of $\geq$ 16. In four of these localities the percentage of positive sera was 17.0%, 9, 7.5 and 1.3. In the two others, no reactive sera were found. On the other hand in the Department of Los Chiles, 3 out of the 6 localities sampled had seropositivity rates that varied from 0.8 to 2.4% while the three other areas were negative. These results indicate that some of the localities in the Department of Sacapiqui merits an amplification of the epidemiological surveillance and also the success of the control measures implemented in the Department of Chiles. Moreover, the fact that 69% of the individuals with positive serology from both departments were from Nicaragua and had lived in the area for six months or less, stress the importance of migration and the need for early detection and treatment in order to eliminate the potential risk of this population to become a source of infection[2].

In order to pinpoint possible cases of malaria that were not detected by observation of a thick blood smear, a serological survey was made in the locality of Senhorinho, Sao Paulo, Brazil. Forty six of the 514 samples collected had antibodies against P. vivax in titers $\geq$ 16 as shown by the indirect immunofluorescence test. All of them belonged to individuals over 13 years of age[3].

In Colombia, the high titers of antimalaria antibodies among workers of the forest area in the Pacific lowland, indicated the higher risk to malaria among timber workers.

B. Health Services

An evaluation of four health programs from the Ministry of Health and Social Assistance was reported from Venezuela: malaria eradication, infant paralysis, high risk pregnancy and child birth and community participation. For each of the programs the study (a) identified key

management features relating to structure and strategy; b) examined program performance to assess its consistency with the declared objective of promoting social development; and c) evaluated what structure and strategy features may have contributed to the social development of the target community. In addition, there was a review of the information mechanisms which link planners, executors and the 'clients', as well as the extent to which target populations are involved in the decisions made with respect to each program. It was concluded that the initial success of the malaria program was related with the personal involvement of the highest hierarchy within the ministry. This enabled the program to obtain the necessary resources to address a problem considered a national priority. The program also has a great degree of autonomy and because of the employment of grass-root personnel drawn from the community there is a special relationship with the clients. In addition, the emphasis on a dominant goal allowed for the simplification of the organizational structure and reduced to a minumum the need for interdepartamental coordination[4].

A study on the degree of knowledge and utilization of the services provided by the control programme, promotional activities for health education and measures implemented by the community to prevent infection was made in the Uraba region of Colombia[5]. A survey of 12% of the households, which comprised 14% (1122 individuals) of the population was made in two urban communities of the municipalities of Arboletes and Mutata. In the former, it was established that 50% of individuals with a febrile episode attend the health unit for treatment and 53% make use of the diagnostic service (thick blood smears). Seventy five percent of the houses used nets; 80% used insecticide; 55% drained small ponds near the houses; and only 35% of the households had received educational information in relation to the program. On the other hand in mutata, 86% of the individuals made use of the health services either for treatment or to certify the diagnosis. Nets, insecticide, or source reduction activities near the houses were employed by 27, 53, and 18% of the households respectively while 26% of the households received promotional information. From the above, it is obvious that automedication still exists. Promotional activities concerning the services provided by the program, an important feature for their adequate utilization, are lacking and that more attention should be paid to health education. This work also indicated the usefulness of this type of survey to pinpoint areas of intervention for improving antimalarial control activities[5].

In view of the several problems encountered by the Anti-Malaria Campaign Service (AMCS) of Suriname for implementing their activities in the interior, an attempt was made in order that the anti-malaria activities were carried out by Medical Mission program (MM) (primary health care services). It was concluded that the latter was able to efficiently execute the existing anti-malaria program at a reduced

operational costs. However, still there was the need to maintain a core of expertise at the central level in order to guide the overall policy of the program as well to supervise the activities implemented at the primary health care level.[6]

In Guatemala there was an evaluation of the Network of volunteers collaborators (VC) to determine if the information collected through passive case finding reflects the true incidence of malaria. This is important since the VC is not only an effective and economic way to provide treatment in the rural ares but also provides the control program with epidemiological information to facilitate planning and evaluation of control activities. It was estimated that around 25% of the autodiagnosed cases of malaria were identified by the net of passive case finding. It was concluded that data provided by the VC should be interpreted with caution. Better training of the VC with increased supervision, combined with health education to change attitudes and practices of the population, could improve the VC performance, making them more usefull to the community as well as in the gathering of data needed by the control program[7].

C. Socioeconomic research*/

The recognition that social and economic factors play a fundamental role in the transmission and control of malaria has lead to the development of several research projects directed towards a better understanding of the social epidemiology of malaria in the Region.

In Colombia, it was considered important to analyze the social, economic and epidemiological determinants of malaria and its impact on labour productivity at the individual and household level in order to develop an improved methodology for evaluation of anti-malaria campaigns. For this purpose three analytical models were applied. A single questionnaire with different sections was used for the individual, household and community level and three cross-sectional surveys were conducted. In each survey, around 400 households of socially homogenous groups were studied.**/

The precarious socio-economic condition of the respondents, rather than variables such as family income, education and nutrition, explained to a large extent the high incidence of malaria. The housing conditions are poor throughout the area, hence there was no variance. Outdoor work, irrespective of the type of work, means high exposure to mosquito bites and is one of the fundamental causes of the infection. The absence of sanitary facilities increases malaria incidence while the presence

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/*/ Information provided by the Special Programme for Research and Training in Tropical Diseases, UNDP/WB/WHO

**/ Dr. Elssy Bonilla Ramos, University of Los Andes, Bogotá, Colombia.

of a volunteer worker of the National Malaria Eradication Service (NMES) diminishes malaria incidence and provides a link between the community and control strategies. Insecticide spraying has less effect than expected due to the poor state of the dwellings. However, the NMES still plays a decisive role in controlling the problem.

Due to the difficulty of separating economic functions, changes in production and income can hardly be ascertained. Few persons were absent from work due to a mild form of malaria and if absent they were replaced by other family members. It was postulated that anti-malaria campaigns may have failed because conventional methods such as spraying and blood sampling were not combined with the treatment of the social causes of malaria in order to eradicate the disease. A methodology for the cost-benefit evaluation of a program of disease control or eradication was developed. Preliminary application of the evaluation methodology leads one to believe that anti-malaria campaigns need to be integrated into other health projects; they should be based on improvements of socio-economic conditions; and they should take social, labour, economic, entomological and epidemiological factors of the affected region into consideration. It was also suggested that policy regarding anti-malaria control programs should consider that implementation may be more effective at the community rather than the national level. In addition, educational material should focus on hygiene, garbage disposal and preventive measures in general at the individual and household level.

Another multidisciplinary project focus on quantitative and qualitative aspects of social, economic and cultural factors and their relation with the development of malaria in a highly endemic area of Colombia */.

In the project several data-gathering methods are being used: an initial survey, interviews, participant observations, blood samples for parasitology, capture and analysis of vectors and a review of documents. A 10% sample of the population, was stratified according to production processes; occupational categories will be obtained from census data, official registration of properties, industry, commerce, etc.

In order to identify the economic, social and cultural factors which determine to a certain extent the presence of malaria, variations in the structural processes are being examined. The study area selected

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*/ Dr. Saul Franco Agudelo, University of Antioquia, Medellín, Colombia.

is characterized by an accelerated capital growth and it is hypothesized that patterns of social production are related to the incidence of malaria.

The risk to acquire malaria, which depends on various physical contexts, different activities of household members within the macro-economic and macro-ecological constraints imposed upon the local host and vector communities, is also being investigated in Colombia*/. For this purpose, contrasting local communities representing the river basin had been selected by means of random or intentional sampling. Within each community, a stratified random-cluster sample of households will be taken to study community-relevant and household activities. A random sample will be chosen for entomological studies of the area.

This is a project of controlled comparisons. A costal area, was chosen because of the microclimatic variation. An operational-analytical model containing new ecological and epidemiological concepts has been developed. This includes time and space communities, spacial and time mobility, etc. Activity patterns of local communities are the focal point in relation to risk exposure of the population. Since there is a great range of variation in human conditions and activities, cross-sectional and longitudinal comparisons can be made. The household level and the role distribution within the household is thought to determine the degree of malaria risk. The micro-environmental context is the basic unit of analysis for the study of vectors. The basin will be stratified into floristic associations and topographic landscapes. It is expected that this study may provide some insight into different exposure risk of mosquito bites among different population groups. The information obtained from the vector study may be useful to understand some basic epidemiological factors of malaria transmission in this river basin area. Furthermore, data regarding prevalence of malaria, distribution of anopheles species, time of biting and man biting rates may provide ground work for the development of new control strategies.

The interrelationships among modes of production, migration flows and socio-ecological conditions and their effects on the rise in malaria, are being studied in the Dominican Republic **/. An administrative section of the Malaria Control Programme (SNEM) that includes about 25,000 inhabitants has been selected as the study area. It has 150 operative units and 24 of them constitute the basis for sampling. A stratified sample by social-economic conditions will be used, and it is estimated that 450 households per operative unit will be chosen. A large number of variables will be included in the study.

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*/ Dr. Elías Sevilla Casas, Del Valle University, Cali, Colombia.

**/ Dr. Delmín Cury, National Service for Malaria Erradication.

Modes of production, work relations, land distribution, origin and destiny of capital, proportion of large and small farms, types of energy used, forms of migration, and ecological conditions. The action of the agency in charge of control activities will be studied on two levels, by direct observation and through SNEM records. Case detection and treatment, review of tests for microscopic diagnosis, insecticide application, vector susceptibility, etc. To date, 360,000 questionnaires from the national agrarian census of 1981 have been processed; more than 50,000 households have been relabelled for sample selection, and field data from a sample of 2,285 households (and a monthly follow-up with a questionnaire and visit) have been obtained.

The main objective of the study is to show the relationship between modes of production and the incidence of malaria. It is postulated that the different modes of production, e.g. capitalistic, mercantile and subsistence would explain the incidence of malaria over the last ten years and in the future. Seasonal migration, for sugar cane cutting and coffee harvesting, especially from Haiti, has brought about changes in the economic structure, micro and macro ecological changes and the malaria control activities of SNEM all are intervening variables in the causal model. During the first part of the analysis, the concept of modes of production was replaced by "levels of development" which are related to technological variables, and appeared to be a predictor of malaria incidence. Therefore, it is expected that the results would have a certain predictive value, e.g. to outline definite agricultural areas with high incidence of malaria as foci of control activities.

A retrospective analysis utilizing official reports from the Ministry of Health, Malaria Programme (SNEM), hospital medical records, social security and labour registration forms as well as quantitative data regarding epidemiological information and qualitative data of socio-economic, political and cultural information in three historical periods is being made in Costa Rica. These periods were: a) 1900-1920, b) 1921-1940 and c) 1941-1982. The analysis is directed to determine the economic, social and political factors, institutional principles and organization responsible for effective control programmes in order to assess their present validity. */

Factors are analyzed relating to malaria occurrence and its fluctuation over time. Taking into consideration that data collection in 1925 was deficient, it was shown that malaria occupied the fifth place as the principal cause of death. Applying the hospital rate to the entire population, there were 19,000 cases at that time, e.g. an annual morbidity rate of 40/1000. It was shown that economic, social and

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*/ Dr. Francisco Escobar Abarca, Social Research Center, San José, Costa Rica.

technical aspects determined the differential vulnerability to death and diseases. There was a correlation between rural agricultural settlements with elevation of less than 1000 feet and malaria. Epidemic outbreaks affected mostly children, young adults and rural male agricultural workers, while the urban upper class residing over 1000 feet were least affected. The social aspects of the banana industry revealed that the concentration of workers in the lowland areas and a concentration of mosquitoes due to standing water (connected with the prowing of banana plants) produced massive malaria infection. Migration toward the coffee plantation, exhausting work and poor diet facilitated the spred of the infection. The mortality rate was 17/1000 in 1939. Most of the costs created by the disease were borne by the worker and the production of wealth had no positive impact on individual income. When banana cultivation declined, malaria incidence declined as well. In 1947 the age group from 20-40 was the most affected by P. falciparum and P. vivax. Often malaria infection was accompanied by ancylostomiasis. The agro-economic development over time shows that artificially forced settlement patterns brought immigrant populations to live in lowland areas, despite the threat of disease. New problems of malaria resurgence are related to political and military unrest, refugee influx from neighboring countries, illegal residents, vector resistance to DDT and may reverse the trend seen between 1932-1960; malaria mortality practically disappeared and morbidity decreased to a minumum.

It is assumed that progressive socio-economic differentiation of settlers is associated with a different potential to contract malaria. In order to improve malaria control it was proposed to study the social and economic determinants influencing the propensity to contract malaria and the access to preventive and curative measures in a new settlement project of the Amazon region */.

A questionnaire will be used to obtain socio-economic data from approximately 500 households. Participant observations, secondary data and interviews are additional methods employed. Different localities were chosen to represent different socio-economic and migratory situations. The first survey had included about 1,000 families and will permit completion of a two-year panel study. The second survey will include a sample of the original cohort plus new settlers. A third survey with similar sampling, will be carried out using a multi-disciplinary stratified design with clusters. Epidemiological studies (blood smears, serological tests) will be done by the malaria control agency, using standard procedures.

In this two-year panel study the determinants of health and disease are examined in the economic and social context of a settlement in the Amazonas region. It is hypothesized that illness and its effects are conditioned by economic, political and social structures. Labour processes are studied, e.g. work relations, land tenure, use of modern

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*/ Dr. Donald Sawyer, Center for Regional Development and Planning, Belo Horizonte, Brazil.

machinery, means of financing production. The structure and functioning of health services, including "modern" versus traditional medicine in relation to the life situation of the settler is part of the analysis. Characteristics of the individual, the family and the community may explain the spread of malaria, and/or its control. Morbidity data regarding malaria, child malnutrition, hypertension and work accidents are used to throw light on the state of health of settlers in the Amazon. Different sites representing varying economic and demographic situations which serve as contextual variables, may provide an understanding of the process of settlement. A multidisciplinary research team will share its respective findings. Results will be compared at three points in time for the project population as a whole and for members of the first panel, and for two points in time for the second panel. Special attention will be paid to those who contracted malaria and those who did not before entering the project.

D. Chemotherapy

The resistance in human malaria is mainly of practical importance in relation to Plasmodium falciparum. Strains resistant not only to chloroquine but also to dihydrofolate reductase inhibitors, and even to potentiating combinations of these with sulphonamides or sulphones, are appearing in an increasing number of countries.

Despite resistance to these drugs, P. falciparum could be susceptible to new available drugs such as mefloquine and its use should be highly restricted to specific circumstances in order to maintain its usefulness.

An institution in Medellin, Colombia began to carry out a phase II/III clinical trail using a combination of mefloquine and sulfadoxine/pyrimetamina.

The sensitivity of P. falciparum to antimalarial drugs continue to be monitored in the Region. In Colombia, chloroquine resistance in vitro was detected in 97 out of 101 patients from different geographic areas. Sensitivity to amodiaquine in vitro was observed in 29 out of 30 P. falciparum isolates. In vitro sensitivity to amodiaquine was observed in 16 patients infected with chloroquine-resistant P. falciparum. In vitro sensitivity to quinine was demonstrated in 57 P. falciparum isolates. Two infections from the Amazon base (2/24) were resistant to mefloquine in vitro. Resistance to Fansidar, a sulfadoxine-pyrimethamine combination, was described in 9 patients from the Amazon region. One patient showed recrudescence of the infection 41 days after treatment.

The current distribution and degree of resistance of P. falciparum to widely used antimalarial drugs requires the evaluation of therapeutic schemes based on combinations of fast acting blood schizontocides with slow acting drugs. These associations may reduce the development of multidrug-resistant isolates and retard the spread of resistant populations of P. falciparum parasites[8]. A similar study was made in another 150 patients treated with a single dose of 1500mg, sulfadoxina and 75mg, pirimetamina (Fansidar). It was found that thirty nine of the patients had parasites that were resistant to the drug combination. Forty eight percent of them had type I resistance, 41% type II and 10% type III[9].

Multiresistance to P. falciparum has also been reported in Brazil. Tests in vitro with 40 samples from the Amazon region indicate that all of them were resistant to cloroquine; 2.5% to quinine and 27.5% to mefloquine. In addition, when fansidar was administered to 54 patients in similar doses as above, almost all patients showed a certain degree of resistance[10].

Different schemes using clindamicine for the treatment of P. falciparum malaria were tested in Brazil[11]. The three schemes used were effective in clearing the parasitemia and only a few patients had side effects such as dhiarrea, or itching[11]. In Guatemala, pruritus associated with the treatment with cloroquine is being studied.

Cloning and characterization of P. falciparum strains from Brazil were jointly made by institutions from Brazil and the U.S.A. Intra specific variation was observed among the clones when they were tested by isoenzyme analysis, drug sensitivity and monoclonal antibodies.

Centers in the USA tested a good number of potentially active new compounds against clones of P. falciparum of known drug sensitivity. In addition, the antimalarial activity of natural products are being screened in Brazil in vitro against P. falciparum and P. bergei and in vivo on the latter.

E. Entomology and vector control

Studies to determine the host selection and host preference of Anopheles albimanus was made in a malaria endemic area of Southern Chiapas in Mexico. It was concluded that from 56 to 70.5% of the mosquitoes collected in two different times of the year fed outside of the houses, thus suggesting that the A. albimanus uses the houses as a resting place rather than as a source of blood. In addition, it was shown that bovines were chosen three times more often than humans as a source of blood[12].

Since Anopheles albimanus has been described as being generally more zoophilic than anthropophilic, more exophagic than endophagic, not particularly long lived, and rarely found to be infected with malaria, an attempt was made to measure their vectorial capacity. The results indicate that An. albimanus is sufficiently anthropophilic, numerous, and long lived to transmit both P. vivax and P. falciparum. The estimates of the vectorial capacity indicate that malaria can be transmitted year round. However, the months with the highest vectorial capacity are those during the transition from one season to another. This period correlates well with the highest vector densities[13].

Evaluation of insecticides or vector behavior in the coastal areas of Mexico is difficult to achieve as traditional entry/exit traps are not practical because of the many openings in the walls. One method of solving this problem is to surround the house with a curtain creating an artificial wall. For this purpose, the "Colombian Curtain" has been used. This curtain is a cotton polyester mosquito net which encircles the exterior of a house from the ground to roof. However, in the way the curtain is usually used, it was considered that it was a more efficient exit than entrance trap, and that in some occasions it was not possible to evaluate mosquito movements as they were able to enter and exit freely.

In order to avoid these shortcomigs the technique was modified in order that the curtain remains stationary allowing for a more complete observation of mosquito migration in and out of the house, the feeding behavior, the period of time in the house and the mortality. The curtain consists of several pieces of mosquito neeting sewn together. The borders are trimmed with cotton material to protect the edges. The curtain is attached to the eaves of the roof of an occupied house and allowed to hang freely to the ground creating a small space between the house and the curtain. The ends form an overlapping flap which allows the house occupants to enter and leave without letting mosquitoes escape. This exterior curtain trap was successfully used in Mexico to evaluate insecticide resistance and mosquito behaviour in houses[14].

The evaluation of insecticides and repellents, and methods of applying them for the prevention of malaria among Amazonian migratory laborers living in huts without walls was completed in Brazil. Primary screening of five insecticides (DDT, malathion, DDVP, Propoxur, and Deltamethrin) and one repelent (MGKR-II) was made on string curtains impregnated with the appropriate chemical. It was shown that propoxur, followed by Malathion were the more promising in reducing the invasion. In addition, high mortality was shown among those that invaded. When impregnated burlap curtains were used surrounding the huts, the reduction was above 95% when there was 5% of unprotected space. The reduction rate dropped to $\pm$ 80% when the unprotected space was 17%. When the burlap curtains were employed as substrate, those impregnated with

propoxur maintained above 85% reduction of invading anophelines for 56 weeks and malathion was above 80% for 22 weeks. No difference was found between DDT impregnated and unimpregnated curtains. Results of observations on the nocturnal habit of laborers and anopheline mosquitoes indicated that surrounding the hut with burlap curtains would provide excellent protection against anopheline bites. This study also showed that the field method designed to screen effective residual antimosquito chemicals for huts without walls is simple, practical and sensitive, not only for that purpose, but also in detecting behavioral refractoriness of anophelines[15].

The infectivity of two strains of P. vivax from El Salvador and Colombia respectively was tested on An. albitarsis from Colombia colonized in the laboratory. In comparison with other species, the An. albitarsis were less susceptible than Anopheles freeborni, Anopheles culicifacies and strains of Anopheles albimanus from El Salvador, Panama and Colombia and more susceptible than a strain of An. albimanus from Haiti[16].

A laboratory assessment of a species-specific radioimmunoassay for the detection of Malaria sporozoitos in mosquitoes was carried out in the U.S.A.[17]. Results from the field use of this test were reported in Brazil by researchers from this country and the United States. More than 9000 Anopheles captured in the state of Para, were classified by their morphology. They belonged to 13 different species. By the radioimmunometric assay (RIA) using monoclonal antibodies, An. darlingi were found to be infected with P. falciparum. On the other hand, An. darlingi, An. triannulatus, An. nuneztovari and An. albitarsis were found to be infected with P. vivax. Similar results were obtained when an ELISA test instead of the RIA was used[18]. Studies conducted by the Del Valle University of Colombia, in the eastern planes, Pacific Coast, and Northern region of that country using the RIA indicated that although having a low sporozoite rate (0.6%) An. darlingi, An. albimanus and An. ollopha were implicated in malaria transmission.

It is expected that the ELISA test for identification of vectors of human malaria and for determination of the species of plasmodia that infect them will be used in field studies in Honduras, Mexico and Peru during 1986.

Studies on the biological control of malaria vectors were done in several countries. The identification of local species of larvivorous fish continue to be made in Cuba. In addition, production of B. Thuringiensis and B. sphaericus in a pilot plant, as well as determination of their formulation and effectiveness was initiated. In Mexico, the work continues in order to isolate and characterize strains of B. thuringiensis. The regulation of production of B. sphaericus; the mode of action of its toxin, and the mass production of Romanomermis

culicivorax were studied in the U.S.A. The latter was tested for biological control in an endemic area of malaria in the Pacific Coast of Colombia. Preliminary results indicate that after the initial application, the nematode continues to recycle in the natural breeding places of anopheles mosquitoes and that the prevalence of malaria in the community under study had decreased when compared with the population used as controls [19].

F. Immunology

Developments in this field had progressed at an outstanding pace since the mid seventies. A promising immunogen to be used as a malaria vaccine has been synthesized in laboratories of the U.S.A. The molecule, a string of 4 amino acids repeated 3 times, is modeled on a surface component of sporozoites which is known as circumsporozoite proteins (CS). It is expected that the immune response to the synthetic peptides of the repeating region of the CS protein conjugated to a carrier might neutralize sporozoites before they are sequestered in the host liver cells. The peptide reacted with antibodies in serum of randomly selected individuals living where malaria is endemic, with serum from a volunteer protected from infection by immunization with irradiated parasites as well as with monoclonal antibodies against the sporozoite surface. Polyclonal antibodies raised against the synthetic peptide react with the surface of the parasite and prevent the parasite from entering human cells in culture [20,22].

Monoclonal antibodies against sporozoites of P. falciparum were used to screen a genomic library of P. falciparum in an expression vector and the cloning and sequencing of the gene encoding for the CS protein was described. Proteins composed of 16, 32, or 48 tandem copies of a tetrapeptide repeating sequence found in the CS protein were efficiently expressed in the bacterium Escherichia coli. When injected into mice, these recombinant products resulted in the production of high titers of antibodies that reacted with the authentic CS protein on live P. falciparum sporozoites but not on P. knowlesi, P. cynomolgi, P. vivax and P. gallinaceum. These antibodies also posses biological activity associated with protective immunity, as was shown by their ability to block sporozoite invasion of human hepatoma cells in vitro [23,24].

In order that a vaccine could protect against P. falciparum from different geographical areas, the immunodominant epitope should be widely distributed among different strains. Two recent studies indicate that this could be the case. Sporozoites of P. falciparum obtained from a large number of endemic areas were screened with species-specific monoclonal antibodies that recognize the repeated epitopes of the respective CS proteins. It was determined that all the parasite isolates of a given species react with a single monoclonal antibody [25]. In several strains of P. falciparum it was also found that despite minor variations in the structure of the gene coding for the CS protein, all of them had the repetitive epitope [26].

The possibility has been raised, that the immune response induced by a vaccine may select antigenic variants not previously detected[27]. Although this does not seem to be the case for the CS protein of P. falciparum, there is evidence that it could occur with merozoites from red cells infected P. knowlesi[28]. A 140 kilodalton (kDa) merozoite surface antigen of P. knowlesi was shown to be the processed product of a 143 kDa schizont component, and that processing occured at the time of erythrocyte rupture. When this antigen was used in Freund's adjuvant to immunize four rhesus monkeys, two of them developed fulminating infections on challenge with schizonts, as did the three control animals. The remaining two immunized animals controlled their infections and developed chronic low-grade parasitemias. The partially protected animals were those that had developed anti-143/140 kDa antibodies capable of blocking red cells invasion in vitro. When parasites isolated from the chronic stage of infection were compared with the original parasite population used for challenge it was shown that the 143/140 kDa original surface antigen had been replaced by multiple cross-reacting alternate antigenic forms of the molecule. Thus, specific immune response directed against a purified merozoite surface antigen resulted in the replacement of this antigen by variant or mutant forms[27].

Another approach that could be useful in designing serologic agents capable of blocking the parasite development in the vertebrate host is represented by the characterization of glycophorin-binding protein of P. falciparum merozoites. A complementary DNA clone for this protein has been isolated and characterized. The protein interacts with glycophorin, the erythrocyte receptor during invasion of the host cell by the parasite. Antigenic determinants of this protein expressed in Escherichia coli have been used to produce antibodies to a glycophorin-binding protein and the antibodies show schizont-specific immunofluorescence that react with the merozoite protein[29].

Advances during the last year were not only made toward obtaining a P. falciparum vaccine but also to the synthesis of a vaccine for P. vivax. The gene encoding the circumsporozoite (CS) protein of the human malaria parasite P. vivax was cloned. The deduced sequence of the protein consists of 373 amino acids with a central region of 19 tandem repeats of the nonapeptide Asp-Arg-Ala-Asp/Ala-Gly-Glu-Pro-Ala-Gly. A synthetic 18-aminoacid peptide containing two tandem repeats binds to a monoclonal antibody directed to the CS protein of P. vivax and inhibits the interaction of this antibody with the native protein in sporozoite extracts. The portions of the CS gene that do not contain repeats are closely related to the corresponding regions of the CS genes of two simian malarias, Plasmodium cynomolgi and Plasmodium knowlesi. In contrast, the homology between the CS genes of P. vivax and P. falciparum, is very limited [30]. Another group of researchers also established the estructure of the immunodominant repeating peptide of the

CS protein of P. vivax. A fragment of the parasite DNA that encodes this tandemly repeated epitope was isolated using an oligonucleotide probe whose sequence is thought to be conserved in the CS protein genes. DNA sequence analysis of the clone indicates that the CS repeats nine aminoacids in length. The structure of the repeating region was confirmed using synthetic peptides and monoclonal antibodies directed against P. vivax sporozoites[31].

It is expected that results of the initial Phase I trials of the P. falciparum vaccine will be available late during 1986. An agreement for collaboration on vaccine development has been signed between WHO and Hoffman-La Roche which is producing the P. falciparum synthetic peptide vaccine. Another agreememt with the same objective is being made between WHO and Smith Kline which is producing the vaccine based on the P. falciparum repetitive epitope expressed in E. coli. A meeting in which recent advances in vaccine development and possible characteristics of clinical trials were discussed was held in the Americas with support from the USAID and PAHO sponsorship.

The cell mediated immune response to P. falciparum antigens was explored in patients from Colombia. T cells from patients acutely infected with malaria exhibit a disease-related stimulation of DNA synthesis in response to P. falciparum antigen in vitro. This response is weak and short-lived, suggestive of induction of suppressor mechanisms. Supernatants from 60% of the T cell cultures treated with malaria antigen and from 30% treated with RBC ghost antigen contained interferon-gamma (IFN-gamma). A high IFN-gamma activity was also seen in antigen-treated cultures from P. falciparum-immune donors living in highly endemic malaria areas. On the other hand no IFN-gamma was found in supernatants of antigen-treated T cells from patients with P. vivax malaria. It was postulated that the IFN-gamma activity may be useful and sensitive indicator of cellular immunity in P. falciparum malaria [32].

G. Diagnostic

Microscopic detection of malaria parasites in thick blood films is rapid and accurate when parasitemia is relatively high. However, problems may appear when parasitemia is low and/or great number of slides have to be examined. In addition, this technique is time consuming and requires well trained personnel. New developments made it possibly to use DNA probes for diagnostic purposes. This, allowed for rapid testing of blood samples from large population surveys. Field testing of this assay began in 1985.

An interesting development was the detection of P. falciparum using a synthetic DNA probe that could be useful in diagnosis. A labeled synthetic polynucleotide representing a repetitive sequence from P. falciparum was hybridized with genomic DNA spotted on nitrocellulose.

After an overnight exposure, P. falciparum DNA was specifically detected. The synthetic probe showed no cross-hybridization with host DNA or with DNA isolated from other species in the phylum Apicomplexa, P. vivax and Babesia species [33]. As this test uses an isotopically labeled probe, it might be undesirable for clinical laboratories or field testing. It is expected that probes containing a non radioisotopic labelled nucleotides could be made available, e.g. probes carrying biotin that could be detected by an histochemical reaction after binding an avidin-enzyme complex to the probe. This will allow for a wider use of the DNA probes as a diagnostic tool.

IV. EDUCATION AND TRAINING OF HEALTH WORKERS FOR MALARIA CONTROL

A. Development of strategies for training human resources

Training should be given both to specialized personnel and to general health system workers. It is essential that physicians be informed of the practical methods for the diagnosis and treatment of malaria and, in particular, be able to identify serious and complicated cases of the disease and to manage such patients. In addition, they should know the basic principles of epidemiology, surveillance, and control. This knowledge should be acquired in schools of medicine, nursing, and public health.

The training of instructors is considered the most important activity to improve control and research activities. The latter will provide instructors with the stimulus to better understand the causes and dynamics of transmission and advances in the design and evaluation of effective control methodology.

If the previously trained personnel in malaria is assigned to other activities in the field of health, such knowledge continues to be useful, and consequently efforts should be made to encourage them and maintain them in the service.

National resources for education should be identified, utilized, and strengthened before seeking training abroad. However, highly specialized courses can continue to be organized in foreign institutions, in which case field practices can be set up in endemic areas in the country of origin. Courses given to small groups in which the student has the opportunity to learn how to apply laboratory and field techniques and methods are more productive. It is preferable to select students among the personnel who are already working in the health services to ensure that they will have a position available after their training. In the Americas, the training of entomology personnel at the graduate level is being prepared based on general, economic, and agricultural entomology, with emphasis on medical entomology. Intermediate personnel are being given basic courses in epidemiology and vector-borne disease

control and are provided with basic knowledge on the ecology and biology of arthropods of importance in public health. A trend exists to develop graduate courses to train epidemiologists in vector-borne diseases and specialists in environmental management and vector and rodent control. On the other hand, short courses for vector and rodent control are already available, in addition to courses for management and preservation of equipment for the application of insecticides and larvicides. Modular short courses on epidemiology, surveillance, and control of malaria are also in great demand, which are being given to the professional and technical personnel of the general health services.

Training in the practice of malariology should be carried out in endemic areas, since it offers the advantage of being less expensive and more appropriate from the point of view of ecology and solution of local problems.

Training for implementation of the strategies of PHC for the control of malaria should take into account the experience obtained in the control of other diseases. Some countries have already begun to decentralize the malaria program to the provinces and health regions. Needs and resources are being identified in these areas for the development of the local program as an integral part of them.

Training constitutes an important component of PAHO's technical cooperation. In order to organize training courses and workshops, and to support the participation of national candidates, the Organization utilized regular funding and extrabudgetary resources, particularly those allocated as part of the implementation of grant No. 597-0136 awarded to PAHO for the support of a subregional program for the control of malaria in Central America and Panama (CAP).

A set of five training modules in the elements of epidemiology and control of malaria, which were originally drafted in 1983, continued to be used and updated throughout 1984-1985, and are now ready for wider distribution in Spanish. English and a Portuguese versions were in preparation for testing during 1986. This material is intended for use by general health services personnel, as well as by malaria and epidemiological services. In addition of being a teaching instrument, the way in which workshops are being carried out is intended to promote the articulation, and eventual integration of the services involved. Although the material has been designed for professional personnel with an academic degree in one of the health sciences, it can be easily adapted for use by medium level or auxiliary personnel of the health team.

In addition to the activities mentioned above, PAHO awarded individual fellowships in malaria, parasitology, vector control and related fields, supported the implementation of training activities and awarded fellowships to the following courses:

1. Academic Courses

1.1 XLI Malariology and Environmental Health

Duration:	14 January - 01 November 1985
Place:	Maracay, Aragua, Venezuela
Institution:	School of Malariology/SAS
PAHO fellowships (2):	HAI, GUY
Note:	The Government of Venezuela covers tuition and living costs. The XLII course will be given during the period 13 January - 14 November, 1986. 3 PAHO fellowships have already been processed for the 1986 course (ELS, GUT, HOND).

1.2 Master of Science Course on Medical Entomology

Duration:	20 months (started Sept. 30, 1985)
Place:	Panamá, República de Panamá
Institution:	University of Panamá
PAHO fellowships (6):	COR, GUT, HON(2), HAI, PAN
Note:	Course given with the support of PAHO/Panamá, MOH/SNEM and Consultants, mayor constraints are related to selection of qualified candidates within the career structure of National Institutions. PAHO-AID provides support to this course.

2. Short Courses

2.1 Comprehensive Vector Control (Spanish)

Duration:	August 5 - September 13, 1985
Place:	The Wedge, South Carolina
Institution:	University of South Carolina (USA)
PAHO fellowships (15):	PAN, ELS, COR, HON, GUT, COL, VEN, MEX, DOR, CUB, BOL, BRA
Note:	Students from CAP countries were supported by PAHO-AID while those from other countries were supported by PAHO, regular. Plans were prepared to held a similar course (Spanish) during the period 8 September - 17 October, 1986.

2.2 Insecticide application techniques and handling and maintenance of Spraying equipment

Duration:	4-15 November 1985
Place:	Panama, Rep. of Panama
Institution:	University of Panama
PAHO fellowships (19)	GUT, HON, COR, BLZ, ELS, NIC, HAI, PAR, ECU, BRA, COL, MEX, PAN
Notes:	Candidates from participating countries were supported by PAHO-AID Agreement. All other candidates were supported by PAHO regular funds. Due to heavy demand, a similar course of 3 weeks duration (rather than 2) is being planned for the period 04 August - 30 September 1986.

2.3 Emergency Control of Aedes aegypti

Duration:	April 14-18, 1986
Place:	Panama, República de Panama
Institution:	PAHO/Panama, MOH/SNEM
Note:	Although the course was given in 1986, it is mentioned here because it was organized and announced in 1985. It is also to be noted that due to new developments and findings, plans are under way regarding training on identification and control of Aedes albopictus.

2.4 Refresher Course on Medical Entomology

Duration:	February 3 - March 14, 1986
Place:	Panama and Guatemala
Institution:	Panama: Univ. of Panama, PAHO/MOH/SNEM Guatemala: Univ. del Valle, PAHO/MOH/SNEM
Note:	Preparatory activities were carried out in 1985 for implementation in 1986.

2.5 Course on Technical and Administrative management for middle level personnel

Duration:	29 September - 19 December 1986
Place:	Quiriguá - Guatemala
Institution:	National Training Institute for Health Personnel/MOH
Note:	Site selection, curriculum design and general administrative preparatory work was carried out in 1985, for implementation in 1986. Decision regarding future courses of this type will be dependent upon the demand.

3. Other staff development activities planned in 1985 for implementation in 1986

3.1 Educational profiles and educational technology

Duration:	31 March - 11 April, 1986
Place:	San Jose, Costa Rica
Institution:	PASCAP

3.2 Preparation of teaching materials and audiovisual aids

Duration:	19-30 May, 1986
Place:	San Jose, Costa Rica
Institution:	PASCAP

3.3 Research Methodology

Duration:	7-18 July, 1986
Place:	Tegucigalpa, Honduras
Institutions:	PASCAP, Universidad Autónoma de Honduras, PAHO

3.4 Community Participation in malaria control

Duration:	7-11 July, 1986
Place:	Tegucigalpa, Honduras
Institution:	PAHO

3.5 Serological diagnostic techniques for parasite diseases

Duration:	04 August - 30 September, 1986
Place:	Sao Paulo, S.P., Brazil
Institution:	University of Sao Paulo

4. General Comments

4.1 The information presented herewith refers mainly to training activities in the field of malaria and vector biology and control promoted and/or supported directly by PAHO.

The list does not include individual fellowships awarded to candidates attending courses organized by universities as part of their regular curriculum.

Additional information regarding development of human resources in general, can be found in official PAHO document No. 207 "Quadriennial Report 1982-1985" and "Annual Report" 1985.

4.2 There may be some statistical discrepancies between the list of fellowships awarded in the Americas, by field of study and country of origin (1985) included in the "1985 fellowship Annual Report", and the list provided in this document (XXXIV Status of malaria programs in the Americas). The reason is twofold:

(a) difference in classification of field of study - considering that the fellowship report is general while the malaria report is more specialized; and

(b) The fellowship report includes only those persons who have received an award to participate as "fellows" while the malaria status report includes fellows and also the participants who have received travel and expenses but who have not been awarded an official PAHO fellowships. A number of short course workshops and seminars (less than 21 days duration) frequently fall in this category.

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Table 1

MALARIA MORBIDITY IN THE AMERICAS
1958 - 1985

Year	Population (in thousands)		Blood slides			Morbidity per 100,000 Inhab.	
	Total country	Malarious areas	Examined	Positive	%	Total country	Total Mal. areas
1958	387,276	135,409	1,716,103	56,705	3.30	14.64	41.88
1959	394,606	145,920	2,749,117	75,612	2.75	19.16	51.82
1960	400,500	143,586	3,955,149	79,998	2.02	19.97	55.71
1961	416,008	147,292	5,341,004	99,639	1.87	23.95	67.65
1962	427,919	153,742	7,221,367	177,089	2.45	41.38	115.19
1963	434,950	152,021	7,903,156	227,026	2.87	52.20	149.34
1964	447,666	158,642	8,156,290	254,572	3.12	56.87	160.47
1965	455,527	146,389	9,069,950	241,462	2.66	53.01	164.95
1966	463,649	166,469	11,797,983	333,280	2.82	71.88	200.21
1967	474,868	169,901	11,609,228	369,388	3.18	77.79	217.41
1968	484,664	174,704	12,522,696	282,773	2.26	58.34	161.86
1969	491,483	176,325	12,179,190	323,782	2.66	65.88	183.63
1970	505,819	181,257	9,925,162	344,170	3.47	68.04	189.88
1971	513,544	185,492	10,134,212	338,416	3.34	65.90	182.44
1972	524,774	190,448	9,695,953	284,813	2.94	54.27	149.55
1973	535,109	195,528	9,400,682	280,276	2.98	52.38	143.34
1974	544,865	200,755	8,997,318	269,003	2.99	49.37	134.00
1975	555,676	205,872	9,276,878	356,692	3.84	64.19	173.26
1976	565,249	211,086	9,352,775	379,364	4.06	67.11	179.72
1977	576,942	215,550	9,274,480	398,925	4.30	69.14	185.07
1978	587,704	220,153	9,493,751	468,923	4.94	79.79	213.00
1979	600,263	226,361	8,630,653	515,271	5.97	84.47	227.63
1980	610,021	231,366	8,943,369	602,836	6.74	98.82	260.56
1981	627,375	239,260	9,100,529	629,629	6.92	100.36	263.16
1982	635,954	245,307	8,826,418	715,177	8.10	112.46	291.54
1983	639,212	249,327	9,113,611	830,700	9.11	129.96	333.18
1984	659,535	257,276	9,422,827	914,171	9.70	138.61	355.33
1985	665,777	259,838	9,341,893	884,438	9.47	132.84	340.38

Map 1

GROUP I. COUNTRIES WITH NO EVIDENCE OF TRANSMISSION

GROUP I	Population (1985) Malarious areas	Cases registered			
		1982	1983	1984	1985
Cuba	3,390	335	298	401	457
Chile	265	0	0	0	0
Dominica	16	0	0	0	2
Grenada	45	0	0	0	1
Guadalupe	311	1	1	0	0
Jamaica	1,712	1	4	5	2
Martinica	203	7	1	0	13
Saint Lucia	114	0	0	0	0
Trinidad & T	1,140	4	3	6	19
United States	68,041	622	605	792	1,037
Puerto Rico	3,186	2	2	2	1
Virgin Islan	96	0	0	0	0
T O T A L	78,519	972	914	1,206	1,532

Map 2

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

GROUP II	Population (1985) Malarious	Cases Registered 1982	1983	1984	1985
Argentina	3,833	567	535	437	774
Costa Rica	735	110	245	569	734
Panama	2,101	334	341	125	126
T O T A L	6,669	1,011	1,121	1,131	1,634

MAP 3

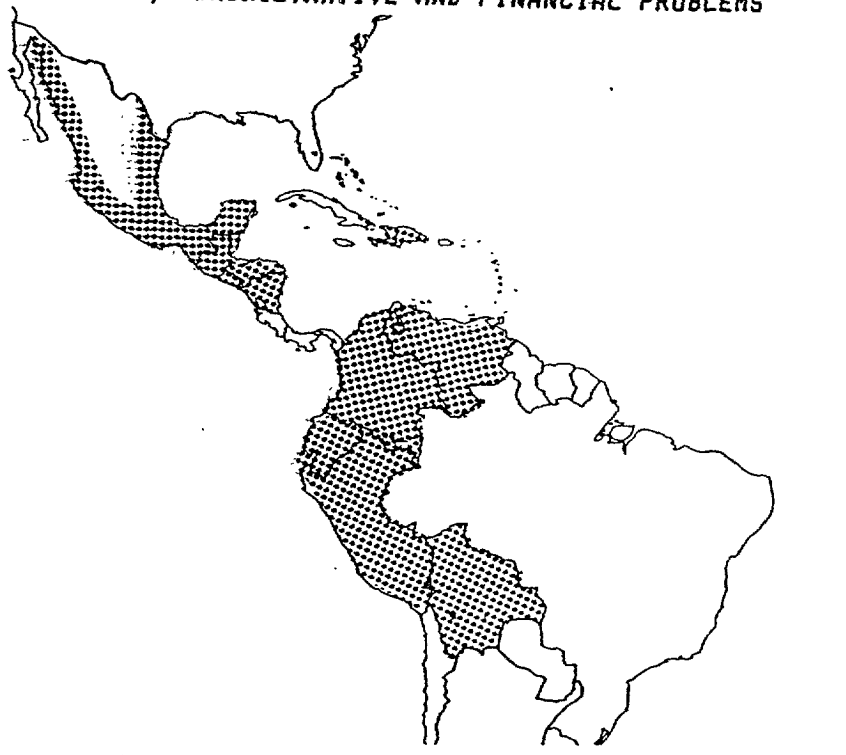
GROUP III. COUNTRIES WHRE MALARIA IS INCREASING IN ENDEMIC ARES

GRUPO III	Population (1985) Malarious areas	Cases registered 1982	1983	1984	1985
Brazil	57,633	221,939	297,687	378,257	401,904
French Guiana	80	1,143	1,051	1,021	512
Guyana	955	1,700	2,102	3,017	7,900
Paraguay	2,769	66	49	554	4,568
Suriname	296	2,805	1,943	3,849	1,635
T O T A L	61,733	227,653	302,832	386,698	416,519

a) Does not include information for Nov.

MAP 4

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



GROUP IV	Population (1985) Malarious areas	Cases Registered 1982	1983	1984	1985	
Subregion A:						
Haiti	4,818	65,354	53,954	69,863	12,631	a)
Dominican Rep.	6,200	4,654	3,801	2,370	816	
Subregion B:						
Belize	160	3,868	4,595	4,117	2,800	
El Salvador	4,249	86,202	65,377	66,874	44,473	
Guatemala	3,210	77,375	64,024	74,132	54,958	
Honduras	3,999	57,482	37,536	27,332	33,828	
Mexico	39,864	49,993	75,029	85,501	116,016	
Nicaragua	3,272	15,601	12,907	15,702	15,130	
Subregion C:						
Bolivia	2,533	6,699	14,441	16,338	14,354	
Colombia	19,112	78,601	105,360	55,268	55,791	
Ecuador	5,426	14,633	51,606	78,599	68,989	
Peru	6,536	20,483	28,563	32,621	35,026	
Venezuela	13,538	4,269	8,400	11,127	9,718	a)
T O T A L	112,917	485,214	525,593	539,844	464,530	

a) Information up to September

Table 2

MALARIA CASES REGISTERED, 1982-1985

GROUPS		Population 1985 a) Malarious areas	Registered Cases 1982	1983	1984	1985
GROUP I	Countries or territories in which malaria eradication has been certified b)	78,519	972	914	1,206	1,532
GROUP II	Argentina	3,833	567	535	437	774
	Costa Rica	735	110	245	569	734
	Panama	2,101	334	341	125	126
	Sub-total	6,669	1,011	1,121	1,131	1,634
GROUP III	Brazil	57,633	221,939	297,687	378,257	401,904
	French Guiana	80	1,143	1,051	1,021	512
	Guyana	955	1,700	2,102	3,017	7,900
	Paraguay	2,769	66	49	554	4,568
	Suriname	296	2,805	1,943	3,849	1,635
	Sub-total	61,733	227,653	302,832	386,698	416,519
GROUP IV	Subregion A:					
	Haiti	4,818	65,354	53,954	69,863	12,631 c
	Dominican Rep.	6,200	4,654	3,801	2,370	816
	Subregion B:					
	Belize	160	3,868	4,595	4,117	2,800
	El Salvador	4,249	86,202	65,377	66,874	44,473
	Guatemala	3,210	77,375	64,024	74,132	54,958
	Honduras	3,999	57,482	37,536	27,332	33,828
	Mexico	39,864	49,993	75,029	85,501	116,016
	Nicaragua	3,272	15,601	12,907	15,702	15,130
	Subregion C:					
	Bolivia	2,533	6,699	14,441	16,338	14,354
	Colombia	19,112	78,601	105,360	55,268	55,791
	Ecuador	5,426	14,633	51,606	78,599	68,989
	Peru	6,536	20,483	28,563	32,621	35,026
	Venezuela	13,538	4,269	8,400	11,127	9,718 d)
	Sub-total	112,917	485,214	525,593	539,844	464,530
	T O T A L	259,838	714,850	830,460	928,879	884,215

a) Population in thousands. b) Twelve countries or territories. c) Information up to September.

Table 3

POPULATION OF THE MALARIOUS AREAS
1958 - 1985
(In thousands)

Year	Originally malarious areas					Total population
	Maint. phase	Conso-lidation	Attack	Prep. phase or program no 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
1982	118,338	62,028	64,941	-	245,307	635,954
1983	119,175	66,970	63,182	-	249,327	639,212
1984	124,408	68,372	64,496	-	257,276	659,535
1985	124,086	67,092	68,659	-	259,837	665,777

Table 4

STATUS OF THE MALARIA PROGRAMS IN THE AMERICAS, BY POPULATION, 1985
(Population in thousands)

Country or other political or administrative unit	Total population	Population of originally malarious areas							
		Total Mal.area		Maintenance		Consolidation		Attack	
	a)	Total	%	Total	%	Total	%	Total	%
Antigua	79 b)	-	-	-	-	-	-	-	-
Netherland Antilles	258 b)	-	-	-	-	-	-	-	-
Argentina	30,833	3,833	12.43	3,741	97.60	-	-	92	2.40
Bahamas	223 b)	-	-	-	-	-	-	-	-
Barbados	252 b)	-	-	-	-	-	-	-	-
Belize	160	160	100.00	-	-	28	17.50	132	82.50
Bermuda	57 b)	-	-	-	-	-	-	-	-
Bolivia	6,471	2,533	39.14	-	-	-	-	2,533	100.00
Brazil	135,544	57,633	42.52	15,223	26.41	22,313	38.72	20,097	34.87
Canada	25,399 b)	-	-	-	-	-	-	-	-
Colombia	29,285	19,112	65.26	-	-	13,885	72.65	5,227	27.35
Costa Rica	2,600	735	28.27	-	-	632	85.99	103	14.01
Cuba	10,058	3,390	33.70	3,390 c)	100.00	-	-	-	-
Chile	12,079 b)	265	2.19	265	100.00	-	-	-	-
Dominica	80 b)	16	20.00	16 c)	100.00	-	-	-	-
Ecuador	8,877	5,426	61.12	-	-	2,335	43.03	3,091	56.97
El Salvador	4,716	4,249	90.10	-	-	-	-	4,249	100.00
United States of Amer.	238,740 b)	68,041	28.50	68,041 c)	100.00	-	-	-	-
Grenada	112 b)	45	40.18	45 c)	100.00	-	-	-	
Guadalupe	350	311	88.86	311 c)	100.00	-	-	-	-
Guatemala	7,784	3,210	41.24	-	-	-	-	3,210	100.00
French Guiana	80 b)	80	100.00	42	52.50	32	40.00	6	7.50
Guyana	955 b)	955	100.00	858	89.84	-	-	97	10.16
Haiti	5,054	4,818	95.33	-	-	-	-	4,818	100.00
Honduras	4,372	3,999	91.47	-	-	-	-	3,999	100.00
Caiman Islands	20 b)	-	-	-	-	-	-	-	-
Falkland Islands	2 b)	-	-	-	-	-	-	-	-
Turks & Caicos	6 b)	-	-	-	-	-	-	-	-
Virgin Islands (USA)	96 b)	96	100.00	96 c)	100.00	-	-	-	-
Virgin Islands (UK)	13 b)	-	-	-	-	-	-	-	-
Jamaica	2,296	1,712	74.56	1,712 c)	100.00	-	-	-	-
Martinique	326 b)	203	62.27	203 c)	100.00	-	-	-	-
Mexico	78,524	39,864	50.77	5,859	14.70	22,717	56.99	11,288	28.32
Montserrat	13	-	-	-	-	-	-	-	-
Nicaragua	3,272	3,272	100.00	-	-	-	-	3,272	100.00
Panama	2,180	2,101	96.38	-	-	1,917	91.24	184	8.76
Paraguay	3,259	2,769	84.96	756	27.30	1,335	48.21	678	24.49
Peru	19,698	6,535	33.18	-	-	1,810	27.70	4,725	72.30
Puerto Rico	3,186	3,186	100.00	3,186 c)	100.00	-	-	-	-
Dominican Rep.	6,243	6,200	99.31	6,053	97.63	52	0.84	95	1.53
St.Kitts, Nevis-Ang.	50 b)	-	-	-	-	-	-	-	-
St. Pierre & Miquelon	6 b)	-	-	-	-	-	-	-	-
St. Vincent	105 b)	-	-	-	-	-	-	-	-
Saint Lucia	135 b)	114	84.44	114 c)	100.00	-	-	-	-
Suriname	402	296	73.63	259	87.50	5	1.69	32	10.81
Trinidad & Tabago	1,200	1,140	95.00	1,140 c)	100.00	-	-	-	-
Uruguay	3,010	-	-	-	-	-	-	-	-
Venezuela	17,317	13,538	78.18	12,776 d)	94.37	31	0.23	731	5.40
T o t a l	665,777	259,837	39.03	124,086	47.76	67,092	25.82	68,659	26.42

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

Table 5

STATUS OF MALARIA PROGRAMAS IN THE AMERICAS, BY AREA, 1985
(Area in km)

Country or other political or administrative unit	Total area	Originally malarious areas							
		Total Mal. areas		Maintenance		Consolidation		Attack	
		Total	%	Total	%	Total	%	Total	%
Antigua	280	-	-	-	-	-	-	-	
Netherland Antilles	961	-	-	-	-	-	-	-	
Argentina	4,024,458	349,051	8.67	337,776	96.77	-	-	11,275	3.2
Bahamas	11,396	-	-	-	-	-	-	-	-
Barbados	430	-	-	-	-	-	-	-	-
Belize	22,965	22,965	100.00	-	-	7,150	31.13	15,815	68.87
Bermuda	53	-	-	-	-	-	-	-	-
Bolivia	1,098,581	821,346	74.76	-	-	-	-	821,346	100.00
Brazil	8,511,965	6,898,045	81.04	190,469	2.76	1,226,413	17.78	5,481,163	79.46
Canada	221,016	-	-	-	-	-	-	-	-
Colombia	1,138,914	970,849	85.24	-	-	156,863	16.16	813,986	83.84
Costa Rica	50,900	35,446	69.64	-	-	27,832	78.52	7,614	21.48
Cuba	110,860	37,502	33.83	37,502 a)	100.00	-	-	-	-
Chile	756,626	58,073	7.68	58,073	100.00	-	-	-	-
Dominica	751	152	20.24	152 a)	-	-	-	-	-
Ecuador	291,906	175,462	60.11	-	-	27,797	15.84	147,665	84.16
El Salvador	21,041	19,153	91.03	-	-	-	-	19,153	100.00
United States of Amer.	9,365,604	2,309,876	24.66	2,309,876 a)	-	-	-	-	-
Grenada	344	103	29.94	103 a)	100.00	-	-	-	-
Guadalupe	1,950	1,244	63.79	1,244 a)	-	-	-	-	-
Guatemala	108,889	80,350	-	-	-	-	-	80,350	100.00
French Guiana	90,000	90,000	100.00	50	0.06	82,350	91.50	7,600	8.44
Guyana	215,025	215,025	100.00	7,012	3.26	-	-	208,013	96.74
Haiti	27,750	23,545	84.85	-	-	-	-	23,545	100.00
Honduras	112,088	101,351	90.42	- -	-	-	-	101,351	100.00
Cayman Islands	183	-	-	-	-	-	-	-	-
Falkland Islands	11,961	-	-	-	-	-	-	-	-
Turks & Caics	522	-	-	-	-	-	-	-	-
Virgin Islands (USA)	345	345	100.00	345 a)	100.00	-	-	-	-
Virgin Islands (UK)	174	-	-	-	-	-	-	-	-
Jamaica	11,428	10,028	87.75	10,028 a)	100.00	-	-	-	-
Martinique	1,080	300	27.78	300 a)	-	-	-	-	-
Mexico	1,967,183	1,150,000	58.46	190,952	16.60	546,433	47.52	412,615	35.88
Montserrat	84	-	-	-	-	-	-	-	
Nicaragua	127,358	118,358	92.93	-	-	-	0.00	118,358	100.00
Panama	77,082	71,272	92.46	-	-	35,290	49.51	35,982	50.49
Paraguay	406,752	406,552	99.95	271,010	66.66	80,749	19.86	54,793	13.48
Peru	1,285,215	961,171	74.79	-	-	195,418	20.33	765,753	79.67
Puerto Rico	8,896	8,896	100.00	8,896	-	-	-	-	-
Dominican Repub.	48,442	47,562	98.18	44,281	93.10	1,096	2.30	2,185	4.59
St. Kitts, Nevis-Ang.	396	-	-	-	-	-	-	-	-
St. Pierre & Miquelon	240	-	-	-	-	-	-	-	-
St. Vincent	389	-	-	-	-	-	-	-	-
St. Lucia	620	510	82.26	510 a)	100.00	-	-	-	-
Suriname	163,820	163,750	99.96	43,705	26.69	45	0.03	120,000	73.28
Trinidad & Tabago	5,630	5,449	96.79	5,449	100.00	-	-	-	-
Uruguay	186,926	-	-	-	-	-	-	-	-
Venezuela	915,741	600,000	65.52	460,054 b)	76.68	343	0.06	139,603	23.27
T o t a l	31,405,220	15,753,731	50.16	3,977,787	25.25	2,387,779	15.16	9,388,165	59.59

a) Areas where malaria eradication has been registered by PAHO/WHO.
B) Includes an area of 407,945 square kilometers where malaria eradication has been registered by PAHO/WHO./

Table 6

CASE DETECTION BY COUNTRY AND PHASE OF PROGRAM, 1985

Country or Other political or Adm. unit	T o t a l		Mantenimiento		Consolidacion		Fase de ataque		Areas no Malaricas	
	Slides examined	Positive	Slides examined	Posit.	Slides examined	Posit.	Slides examined	Posit.	Slides examined	Posit.
Argentina	23,611	774	15,590	536	-	-	8,017	234	4	4
Bahamas	481	1	-	-	-	-	-	-	481	1
Barbados	1	1	-	-	-	-	-	-	1	1
Belice	20,905	2,800	1,621	71	2,055	166	17,229	2,563	-	-
Bolivia	85,378	14,354	-	-	-	-	85,378	14,354	-	-
Brazil	3,479,946	401,904	118,321	1,099	792,744	6,032	2,508,560	389,223	60,321	5,550
Canada a)	219	219	-	-	-	-	-	-	219	219
Colombia	334,062	55,791	-	-	111,535	2,581	222,527	53,210	-	-
Costa Rica	121,456	734	-	-	72,123	416	47,437	224	1,896	94
Cuba	815,919	457	815,919	457	-	-	-	-	-	-
Dominica	2	2	2	2	-	-	-	-	-	-
Ecuador	370,998	68,989	-	-	118,357	6,563	251,811	62,294	830	132
El Salvador	201,177	44,473	-	-	-	-	201,177	44,473	-	-
Estados Unidos	1,037	1,037	1,037	1,037	-	-	-	-	-	-
Grenada	3,236	1	940	0	-	-	-	-	2,296	1
Guadeloupe	0	0	-	-	-	-	-	-	-	-
Guatemala	441,757	54,958	-	-	-	-	425,309	53,531	16,448	1,427
French Guiana	5,788	512	2,028	50	1,417	103	2,343	359	-	-
Guyana	53,276	7,900	4,671	1,704	-	-	48,605	6,196	-	-
Haiti c)	157,534	12,631	-	-	-	-	157,534	12,631	-	-
Honduras	410,720	33,828	-	-	-	-	408,101	33,437	2,619	391
Caiman Islands	14	2	-	-	-	-	-	-	14	2
Jamaica	492	2	490	2	-	-	-	-	-	-
Martinica	13	13	13	13	-	-	-	-	-	
Mexico	1,014,397	116,016	22,870	190	342,865	16,937	639,068	98,264	9,594	625
Nicaragua	424,681	15,130	-	-	-	-	424,681	15,130	-	-
Panama	367,839	126	-	-	199,712	27	168,127	99	-	-
Paraguay	131,196	4,568	8,606	21	45,892	126	76,125	4,400	573	21
Peru	213,487	35,026	-	-	33,515	2,949	179,972	32,077	-	-
Puerto Rico	1	1	1	1	-	-	-	-	-	-
Dominican Repub.	404,575	816	358,896	323	14,086	76	31,593	417	-	-
Saint Lucia	0	0	0	0	-	-	-	-	-	-
Suriname	56,953	1,635	123	2	3,142	81	43,074	1,399	10,614	153
Trinidad y Tabago	5,796	19	5,796	19	-	-	-	-	-	-
Venezuela c)	194,946	9,718	102,064	5,427	2,955	5	87,855	4,020	2,072	266
T O T A L	9,341,893	884,438	1,458,988	10,954	1,740,398	36,062	6,034,523	828,535	107,982	8,887

a) Information up to October. b) Does not include information for November. c) Information up to September

Table 7

EPIDEMIOLOGICAL SITUATION OF THE 21 COUNTRIES WITH ACTIVE MALARIA PROGRAMS, 1985

Country	Population Malarious areas	Slides		Specie of parasites				Epidemiological indicators			
		Examined	Posit.	P. falc.	P. vivax	P.mal.	Mixed	ABER	SPR	API	% of P.falc.
Argentina	3,833	23,611	774	3	770	1	-	0.62	3.28	0.20	0.39
Belize	160	20,905	2,800	97	2,703	-	-	13.07	13.39	17.50	3.46
Bolivia	2,533	85,378	14,354	892	13,454	-	8	3.37	16.81	5.67	6.21
Brazil	57,633	3,479,946	401,904	211,436	187,706	5	2,757	6.04	11.55	6.97	52.61
Colombia	19,112	334,062	55,791	21,284	34,291	86	130	1.75	16.70	2.92	38.15
Costa Rica	735	121,456	734	3	731	-	-	16.52	0.60	1.00	0.41
Ecuador	5,426	370,998	68,989	11,922	57,061	-	6	6.84	18.60	12.71	17.28
El Salvador	4,249	201,177	44,473	5,185	40,100	-	188	4.73	22.11	10.47	11.66
Guatemala	3,210	441,757	54,958	3,042	51,833	-	83	13.76	12.44	17.12	5.54
French Guiana a)	80	5,788	512	396	107	-	2	7.24	8.85	6.40	77.34
Guyana	955	53,276	7,900	2,291	5,564	-	45	5.58	14.83	8.27	29.00
Haiti b)	4,818	157,534	12,631	12,631	-	-	-	3.27	8.02	2.62	100.00
Honduras	3,999	410,720	33,828	1,510	32,212	-	106	10.27	8.24	8.46	4.46
Mexico	39,864	1,014,397	116,016	945	114,957	1	113	2.54	11.44	2.91	0.81
Nicaragua	3,272	424,681	15,130	298	14,840	-	-	12.98	3.56	4.62	1.97
Panama	2,101	367,839	126	48	78	-	-	17.51	0.03	0.06	38.10
Paraguay	2,769	131,196	4,568	19	4,549	-	-	4.74	3.48	1.65	0.42
Peru	6,536	213,487	35,026	17	35,009	-	-	3.27	16.41	5.36	0.05
Dominican Rep.	6,200	404,575	816	815	1	-	-	6.53	0.20	0.13	99.88
Suriname	296	56,953	1,635	1,380	255	-	-	19.24	2.87	5.52	84.40
Venezuela b)	13,538	194,946	9,718	2,586	7,123	2	7	1.44	4.98	0.72	26.61
T O T A L	181,319	8,514,682	882,683	276,800	603,344	95	3,445	4.70	10.37	4.87	31.36

ABER = Annual Blood Examination Rate
SPR = Slide Positive Rate
API = Annual Parasite Incidence

Table 8

SLIDES EXAMINED AND POSITIVES. BU SPECIE AND CLASSIFICATION
MAINTENANCE PHASE, 1985

Country	Blood slides examined	Total positivas	Specie of parasites				Classification of cases							
			P. falc.	P.vivax	P. mal.	Mixed Inf.	Autoch-thonous	Relaps-ing	Imported From abroad	Imported Other areas	In-duced	Intro-duced	Criptic and un-classif.	No in-vesti gated
Argentina	15,590	536	1	533	1	1	425	17	25	3	-	3	42	20
Belize	1,621	71	6	65	-	-	-	-	-	71	-	-	-	-
Brazil	118,321	1,099	340	699	1	59	28	17	2	1,003	11	7	-	31
Cuba	815,919	457 a)	208	241	2	1	-	-	441	-	-	16	-	-
Dominica	2	2	...	...	...	...	...	...	...	...	...	...	...	...
United States	1,037	1,037 b)	302	604	50	5	-	-	-	-	-	-	-	-
Grenada	940	0	-	-	-	-	-	-	-	-	-	-	-	-
Guadalupe	0	0	-	-	-	-	-	-	-	-	-	-	-	-
French Guiana	2,028	50	31	16	-	3	...	...	...	...	...	...	...	...
Guyana	4,671	1,704	602	1,101	-	1	37	-	5	833	-	1	6	822
Jamaica	490	2 c)	1	-	-	-	-	-	2	-	-	-	-	-
Martinique	13	13	12	2	-	2	-	-	13	-	-	-	-	-
Mexico	22,870	190	-	190	-	-	...	...	...	...	...	...	...	...
Paraguay	8,606	21	-	21	-	-	3	1	-	15	-	-	2	-
Puerto Rico	1	1	-	1	-	-	-	-	1	-	-	-	-	
Dominican Rep.	358,896	323	322	1	-	-	171	-	43	-	-	9	-	100
Saint Lucia	0	0	...	...	...	...	...	...	...	...	...	...	...	...
Suriname	123	2	2	-	-		-	-	-	1	-	-	-	1
Trinidad & Tabago	5,796	19	9	7	2	1	-	-	18	-	-	1	-	-
Venezuela d)	102,064	5,427	1,736	3,690	-	1	2,023	2	39	365	3	2,995	-	-
T o t a l	1,458,988	10,954	3,572	7,171	56	74	2,687	37	589	2,291	14	3,032	48	974

a) Five cases P. ovale. b) 21 cases P. ovale and 55 cases with unknown specie. c) One case with unkown specie.
d) Information up to September.

Table 9

SLIDES EXEMINED AND POSITIVES, BY SPECIE AND CLASSIFICATION
CONSOLIDATION PHASE, 1984

Country	Blood slides examined	Total cases	Specie of parasites			Origen of infection								
			P. falc.	P.vivax	P. mal.	Inf. mixtas	Autoch-thonous	Relaps-ing	Imported From abroad	Imported Other areas	In-duced	Intro-duced	Cryptic & Un-clasif.	No in-vesti-gated
Belize	2,055	166	7	159	-	-	-	166	-	-	-	-	-	-
Brazil	792,744	6,032	2,704	3,248	1	79	637	8	88	4,510	5	194	5	-
Colombia	111,535	2,581	444	2,131	-	6	957	2	11	16	1	14	296	-
Costa Rica	72,123	416	-	416	-	-	138	-	169	109	-	-	-	-
Ecuador	118,357	6,563	586	5,976	-	1	1,846	10	1	2,160	-	331	-	2,215
French Guiana a)	1,417	103	63	38	-	2	...	...	...	...	...	...	...	...
Mexico	342,865	16,937	106	16,822	-	9	-	-	-	-	-	-	-	-
Panama	199,712	27	6	21	-	-	-	-	17	10	-	-	-	-
Paraguay	45,892	126	1	125	-	-	90	1	1	34	-	-	-	-
Peru	33,515	2,949	2	2,947	-	-	2,749	1	6	161	-	-	-	32
Dominican Repub.	14,086	76	76	-	-	-	10	-	-	-	-	-	-	66
Suriname	3,142	81	80	1	-	-	-	-	1	16	-	-	-	64
Venezuela b)	2,955	5	-	5	-	-	3	-	-	2	-	-	-	-
T o t a l	1,740,398	36,062	4,075	31,889	1	97	6,430	188	294	7,018	6	539	301	2,377

... No information available. b) Does not includes information for November. c) Information up to September.

Table 10

SLIDES EXAMINED AND POSITIVES, BY SPECIE
ATTACK PHASE, 1985

Country	Slides examined			Specie of parasites			
	Examined	Positive	%	P. falci parum	P.vivax	P. malariae	Mixed Infec.
Argentina	8,017	234	2.92	-	234	-	-
Belize	17,229	2,563	14.88	84	2,479	-	-
Bolivia	85,378	14,354	16.81	892	13,454	-	8
Brazil	2,508,560	389,223	15.52	206,422	180,328	1	2,472
Colombia	222,527	53,210	23.91	20,840	32,160	86	124
Costa Rica	47,437	224	0.47	3	221	-	-
Ecuador	251,811	62,294	24.74	11,333	50,956	-	5
El Salvador	201,177	44,473	22.11	4,185	40,100	-	188
Guatemala	425,309	53,531	12.59	3,008	50,443	-	80
French Guiana a)	2,343	359	15.32	302	53	-	4
Guyana	48,605	6,196	12.75	1,689	4,463	-	44
Haiti b)	157,534	12,631	8.02	12,631	-	-	-
Honduras	408,101	33,437	8.19	1,507	31,825	-	105
Mexico	639,068	98,264	15.38	839	97,320	1	104
Nicaragua	424,681	15,130	3.56	298	14,832	-	-
Panama	168,127	99	0.06	42	57	-	-
Paraguay	76,125	4,400	5.78	18	4,382	-	-
Peru	179,972	32,077	17.82	15	32,062	-	-
Dominican Repub.	31,593	417	1.32	417	-	-	-
Suriname	43,074	1,399	3.25	1,157	242	-	-
Venezuela b)	87,855	4,020	4.58	814	3,198	2	6
T O T A L	6,034,523	828,535	13.73	266,496	558,809	90	3,140

a) Does not include November information. b) Information up to September

Table 11

SLIDES EXAMINED AND POSITIVE, BY SPECIE
NON-MALARIOUS AREAS, 1985

Country	Slides examined			Specie of parasited			
	Examined	Positive	%	P. falci parum	P.vivax	P. malariae	Mixed Infec.
gentina	4	4	100.00	1	3	-	-
hamas	481	1	0.21	1	-	-	-
rbados	1	1	100.00	...	...	...	...
azil	60,321	5,550	9.20	1,970	3,431	2	147
nada	219	219	100.00	...	...	...	...
sta Rica	1,896	94	4.96	-	94	-	-
uador	830	132	15.90	3	129	-	-
atemala	16,448	1,427	8.68	34	1,390	-	3
duras	2,619	391	14.93	3	387	-	1
yman Islands	14	2	14.29	-	2	-	-
xico	9,594	625	6.51	-	625	-	-
raguay	573	21	3.66	-	21	-	-
riname	10,614	153	1.44	141	12	-	-
nezuela a)	2,072	266	12.84	36	230	-	-
T O T A L	105,686	8,886	8.41	2,189	6,324	2	151

. No available information
) Information up to September

Table 12

COMPARATIVE RESULTS OF ACTIVE AND PASIVE DETECTION IN THE MALARIA PROGRAMS IN THE AMERICAS, 1985

Country	Number of Evaluators	Active case detection			Busqueda pasiva de casos					TOTAL		
		Blood slide examined	Positive	%	Product. Notific. Posts	Blood slides Examined	Positive	%	Average slides per productive Not. posts	Total Blood slides examined	Positive	%
Argentina	98	17,777	284	1.60	67	5,834	490	8.40	7.26	23,611	774	3.28
Bahamas	-	-	-	-	-	481	1	-	-	481	1	0.21
Barbados	-	-	-	-	-	...	1	-	-	1	1	-
Belize	11	15,163	2,341	15.44	254	5,742	459	7.99	1.88	20,905	2,800	13.39
Bolivia	...	60,652	6,847	11.29	...	24,726	7,507	30.36	...	85,378	14,354	16.81
Brazil	...	1,745,506	46,960	2.69	25,587	1,734,440	354,944	20.46	5.65	3,479,946	401,904	11.55
Canada a)	-	-	-	ERR	-	...	219	-	-	219	219	100.00
Colombia	135	83,992	8,185	9.74	2,815	250,070	47,606	19.04	7.40	334,062	55,791	16.70
Costa Rica	109	114,527	483	0.42	360	6,929	251	3.62	1.60	121,456	734	0.60
Cuba	...	43,944	0	0.00	...	771,975	457	0.06	-	815,919	457	0.06
Dominica	-	-	-	-	-	2	2	100.00	-	2	2	100.00
Ecuador	165	25,632	1,701	6.64	3,163	345,366	67,288	19.48	9.10	370,998	68,989	18.60
El Salvador	101	1,152	247	21.44	2,097	200,025	44,226	22.11	7.95	201,177	44,473	22.11
United States	-	-	-	-	-	1,037	1,037	-	-	1,037	1,037	100.00
Grenada	-	3,051	-	0.00	-	185	1	-	-	3,236	1	0.03
Guatemala	84	13,916	2,573	18.49	4,469	427,841	52,385	12.24	7.98	441,757	54,958	12.44
French Guiana b)				ERR				ERR	ERR	5,788	512	8.85
Guyana	38	...	...	-	109	53,276	7,900	14.83	40.73	53,276	7,900	14.83
Haiti c)	...	113,577	3,858	3.40	1,974	43,957	8,773	19.96	1.86	157,534	12,631	8.02
Honduras	115	54,231	1,275	2.35	...	356,489	32,553	9.13	...	410,720	33,828	8.24
Cayman Islands	-	-	-	-	-	14	2	-	-	14	2	14.29
Jamaica	...	482	0	0.00	-	10	2	20.00	-	492	2	0.41
Martinique	-	-	-	-	-	13	13	100.00	-	13	13	100.00
Mexico	1,845	582,900	36,089	6.19	9,699	431,497	79,927	18.52	3.71	1,014,397	116,016	11.44
Nicaragua	154	95,310	1,405	1.47	2,783	329,371	13,725	4.17	9.86	424,681	15,130	3.56
Panama	298	200,145	86	0.04	207	167,694	40	0.02	67.51	367,839	126	0.03
Paraguay	...	62,485	1,678	2.69	956	68,711	2,890	4.21	5.99	131,196	4,568	3.48
Peru b)	...	114,349	12,319	10.77	1,000	99,138	22,707	22.90	11.02	213,487	35,026	16.41
Puerto Rico	-	-	-	-	-	1	1	-	-	1	1	100.00
Dominican Rep.	182	318,077	635	0.20	2,096	86,498	181	0.21	3.44	404,575	816	0.20
Suriname	64	22,681	256	1.13	105	34,272	1,379	4.02	27.20	56,953	1,635	2.87
Trinidad y Tabag	-	5,796	19	0.33	-	-	-	-	-	5,796	19	0.33
Venezuela c)	490	148,632	3,778	2.54	420	46,314	5,940	12.83	12.25	194,946	9,718	4.98
T o t a l		3,843,977	131,019	3.41	-	5,491,908	752,907	13.71	-	9,341,893	884,438	9.47

a) Information up to November. b) Does not include information of November. c) Information up to September.

Table 13

INSECTICIDES USED IN THE MALARIA PROGRAMS, 1985 AND ESTIMATED 1986

Country	D D T (Kg)				DDT (Liters)		Propoxur 50% (Kg.)		Fenitrothion 40% (Kg.)		O t h e r	
	1985		1986		1985	1986 (Est.)	1985	1986 (Est.)	1985	1986 (Est.)	1985	1986 (Est.)
	100%	75%	100%	75%								
Argentina	88	2,669	-	10,000	-	-	-	-	-	-	-	-
Belize	8,000	1,600	...	...	-	-	-	-	-	-	-	-
Bolivia	-	41,802	-	90,000	-	-	-	-	-	-	600 a)	1,300 a)
Brazil	86,493	1,417,659	185,000	1,800,000	12,180	35,000	-	-	-	-	-	-
Colombia	1,027	150,781	8,000	400,000	-	-	-	-	8,783.00	25,000	-	-
Costa Rica	102	1,272	500	2,000	-	-	377	500	-	-	9,956 b)	20,000 b)
Ecuador	155	198,202	10,000	260,000	-	-	-	-	40,000	180,484	4,920 c)	23,500 d)
El Salvador	-	-	-	-	-	-	46,725	71,000	-	-	23,140 e)	94,000 e)
Guatemala	-	-	-	-	-	-	-	-	43,562	91,499	30,509 f)	37,430 f)
French Guiana												
Guyana	-	1,840	-	6,400	1,655	-	-	-	-	-	-	-
Haiti	-	-	-	-	-	-	-	-	147,000	375,000	-	-
Honduras	-	-	-	-	-	-	811	-	129,519	300,000	10,888 g)	40,000 g)
Mexico	8,060	191,012	11,000	136,075	-	-	-	-	-	-	81,010 h)	190,165 h)
Nicaragua	-	8,708	-	46,000	-	-	35,000	30,000	-	-	21,785 i)	35,000 i)
Panama	575	15,602	5,000	20,000	-	-	2,434	2,500	1,275	10,000	-	-
Paraguay	-	-	-	48,190	-	-	-	-	-	-	-	292 j)
Peru	-	144,304	1,000	557,200	-	-	-	-	50,000	100,000	-	-
Dominican Repub	-	-	-	-	-	-	-	-	-	-	900 k)	10,065 k)
Suriname	412	361	1,500	1,500	-	-	-	-	-	-	-	-
Venezuela	-	106,699	725	218,089	46,559	101,213	-	-	19,000	160,000	32,686 l)	40,386 l)
T O T A L	104,912	2,282,511	222,725	3,595,454	60,394	136,213	85,347	104,000	439,139	1,241,983	216,394	492,138

a) Liters of Malathion. b) In 1985 includes 7,007 kg. Malathion 50% & 2,749 Lt. Malathion 50%. In 1986 it is estimated

Table 14

SPRAYINGS WITH RESIDUAL INSECTICIDES APPLIED IN 1984 AND 1985, IN THE MALARIA PROGRAMS OF THE AMERICAS

Country	Sprayings applied in 1984				Sprayings applied in 1985			
	DDT	PROPOXUR	FENI-TROTHION	OTHER	DDT	PROPOXUR	FENI-TROTHION	OTHER
Argentina	6,199	-	-	-	5,374	-	-	-
Belize	28,228	-	-	-	22,935	-	-	-
Bolivia	56,869	-	-	-	56,205	-	-	-
Brazil	1,888,740	-	-	-	2,241,251	-	-	-
Colombia	429,845	-	-	-	250,531	-	5,602	24,855 a)
Costa Rica	12,484	247	-	2,263 b)	2,955	1,076	-	13,783 b)
Ecuador	202,415	-	47,262	16,391 c)	322,948	-	38,753	39,459 a)
El Salvador	-	68,795	-	-	-	77,497	-	-
Guatemala	-	-	46,924	23,095 d)	-	-	131,314	363,339 d)
French Guiana	6,240	-	-	-	...	...	...	...
Guyana	1,257	-	-	-	4,982	-	-	-
Haiti	-	-	293,714	-	-	-	179,230	-
Honduras	2,784	-	135,390	-	5,629	952	134,212	-
Mexico	338,538	-	-	-	278,628	-	-	-
Nicaragua	64,262	-	-	143,118 e)	17,610	-	13,626	14,120 d)
Panama	45,597	9,930	989	-	30,980	5,700	4,122	-
Paraguay	63,486	-	-	-	42,712 f)	-	-	13,277 b)
Peru	269,129	-	-	-	201,473	-	-	-
Dominican Repub.	113,713	-	-	-	-	-	-	-
Suriname	15,724	-	-	-	7,835	-	-	-
Venezuela	241,436	-	-	7,202 g)	178,560 h)	-	-	-
T O T A L	3,786,946	78,972	523,290	192,069	3,670,608	85,225	506,859	468,833

a) Includes sprayings with DDT and Fenitrothion. b) Sprayings with Malathion. c) Sprayings with DDT, Fenitrothion & Malathion. d) Sprayings with Deltametrin. e) Sprayings with Chlorfoxim & Deltametrin. f) Includes DDT & Fenitrothion. g) Includes DDT and dieldrin. h) Sprayings up to September, which include DDT, Dieldrin & Fenitrothion.

Table 15

INTRADOMICILIARY SPRAYINGS WITH RESITUAL INSECTICIDES
APPLIED IN 21 COUNTRIES

Insecticide	1982		1983		1984		1985	
	Number of countries	Sprayings	Number of countries	Sprayings	Number of countries	Sprayings	Number of countries	Sprayings
DDT	19	4,541,133	18	3,629,088	18	3,725,155	16	3,683,885
FENITROTHION	5	810,753	5	1,027,150	6	524,279	9	506,859 a)
PROPOXUR	6	85,848	4	13,942	3	78,972	4	85,225
CHLORFOXIM	2	135,721	2	52,863	1	103,500	-	-
MALATHION	-	-	2	40,404	1	2,263	2	27,060
CARBARYL	1	...	1	...	-	-	-	-
DELTAMETRINE	1	16,717	1	...	2	62,713	2	377,459
HCH	1	16,717	-	-	-	-	-	-
DIELDRIN	-	-	-	-	1	2,916	1	b)
T O T A L	-	5,606,889	-	4,763,447	-	4,499,798	-	4,680,488

... No information available.
a) Number of sprayings with Propoxur of two countries are included in the sprayings with DDT
b) Number of aprayings with dieldrin are included in the DDT sprayings.

Table 16

ANTIMALARIAL DRUGS USED IN THE MALARIA PROGRAMS IN 1985 AM ESTIMATED REQUIREMENTS FOR 1986

Country	Chloroquine 150 mg.		Primaquine 15 mg.		Primaquine 05 mg		Chloroquine/Primaquine combined Adult dose		Infant dose		Pyrimethemine 25 mg		Other	
	1985	1986 a)	1985	1986 a)	1985	1986 a)	1985	1986 a)	1985	1986 a)	1985	1986 a)	1985	1986 a)
Argentina	12.5	20.0	12.8	15.0	18.0	15.0	-	-	-	-	-	-	-	-
Belize	153.0	140.0	35.0	30.0	53.0	45.0	-	-	-	-	-	-	-	-
Bolivia	1,469.2	1,500.0	557.1	600.0	336.2	400.0	7.0	-	0.4	-	-	-	-	-
Brazil	14,000.0 b)	14,000.0 b)	3,470.0	700.0	280.0	300.0	680.0	700.0	280.0	300.0	-	-	1,093.0 c)	1,900.0 c)
Colombia	1,215.1 b)	2,000.0 b)	296.4	800.0	34.0	60.0	101.3	1,000.0	-	-	233.3	150.0	939.8 d)	1,700.0 d)
Costa Rica	785.2	1,000.0	177.8	200.0	67.7	100.0	41.3	5.0	-	-	-	-	-	-
Ecuador	1,543.0 b)	1,203.0 b)	69.7	190.0	88.5	190.0	30.0	170.0	94.0	17.0	-	-	5.6 e)	16.0 e)
El Salvador	1,119.6	919.9	674.8	285.0	310.0	147.3	3,138.6	5,365.6	959.3	1,201.2	-	-	-	-
Guatemala	2,453.7	4,000.0	815.9	1,000.0	215.4	700.0	-	117.0	-	55.0	-	-	-	-
French Guiana	...	...	...	....	...	...	...	...	...	...	...	...	...	...
Guyana	150.4 b)	192.0 b)	106.8	300.0	10.6	100.0	22.3	-	9.0	-	33.9	5.0	41.4 f)	152.0 g)
Haiti	3,075.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Honduras	1,196.4	3,000.0	210.6	1,000.0	239.0	900.0	-	-	-	-	-	-	-	
Mexico	8,973.5	8,300.0	626.5	820.0	1,044.1	1,400.0	3,774.9	767.7	-	-	-	-	-	-
Nicaragua	4,474.1	8,500.0	1,110.0	2,200.0	545.0	1,110.0	-	-	-	-	-	-	h)	-
Panama	123.0 b)	248.7 b)	15.0	20.2	-	6.5	133.0	85.0	26.0	20.0	5.0	1.2	0.6 i)	6.0 i)
Paraguay	245.0	...	35.0	...	11.8	...	-	-	-	-	-	-	-	-
Peru	851.0	1,505.0 b)	151.0	500.0	5.0	20.0	-	-	-	-	-	-	-	1.0 i)
Dominican Rep.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Suriname	180.5 b)	200.0 b)	11.0	30.0	13.0	20.0	-	-	-	-	1.0	-	282.0	202.0
Venezuela	2,276.0	3,125.0	0.5	625.0	81.5	110.0	482.0	840.0	900.0	800.0	42.0	60.0	5.6 j)	6.7 j)
T O T A L	44,296.2	49,853.6	8,375.9	9,315.2	3,352.8	5,623.8	8,410.4	9,050.3	2,268.7	2,393.2	315.2	216.2	2,368.0	3,983.7

a) Estimated. b) Includes Chloroquine and Amodiaquine 150 mg. c) In 1985 it is included 593,000 Tabs. Fansidar & 500,000 Tabs. Quinine sulphate and in 1986 includes 700,000 and 1,200,000 tabs. respectibly. d) Includes Fansidar tablets, quinine capsules, and 11,000 Quinine ampules. e) Fansidar tablets. f) Includes, Fanasil, Fansidar, Quinine and Tetracyline Tabs.
h) It was also used 300 Amp. Quinine sulphate. i) Fanasil tablets. j) Includes Fansidar and Quinine sulphate tablets.

Table 17

ANTIMALARIAL DRUGS USED IN 21 COUNTRIES OF THE AMERICAS
1981-1985

Medicamentos		Quantities				
		1981	1982	1983	1984	1985
4-Aminoquinolines:						
Chloroquine 150 mg.	Tabs.	49,965,200	26,945,700	24,627,900	35,092,360	44,296,200
Amodiaquine 150 mg.	Tabs.	-	6,018,400	6,628,800	9,382,000	9,943,000
8-Aminoquinolines						
Primaquine	Tabs.	7,697,600	4,623,900	7,097,300	10,058,800	8,375,900
Primaquine 05 mg.	Tabs.	6,295,800	3,921,400	3,340,700	5,055,700	3,352,800
Chloroquine/Primaquine (150/15)	Tabs.	7,742,300	9,340,200	10,706,500	10,521,400	8,410,400
Chloroquine/Primaquine (75/7.5)	Tabs.	1,585,600	5,779,400	4,990,200	3,219,300	2,268,700
Pyirimethamine 25 mg.	Tabs.	970,000	1,617,100	650,200	121,600	315,200
Sulphadoxine 500 mg.	Tabs.	301,000	425,600	181,100	109,030	130,671
Sulphadoxine/Pyrimethemine	Tabs.	60,000	104,400	464,400	527,050	742,755
Chloroquine/Pyrimethamine	Tabs.	121,000	187,400	143,000	23,600	797,790
Amodiaquine/Primaquine	Tabs.	-	-	1,360,000	110,000	44,600
Paludrine	Tabs.	-	-	4,000	11,000	4,000
Tetracicline	Tabs.	-	-	-	810	1,666
Lapudrine 20 mg.	Tabs.	-	-	-	-	14,000
Quinina - Sulphate (200 y 300 mg)	Tabs.	-	-	272,600	416,300	532,461
Quinina	Kilos	-	-	10	10	-
Quinina - Sulphate	Ampoules	-	900	-	13,800	11,300

Table 18

PERSONNEL EMPLOYED IN THE MALARIA PROGRAMS IN THE AMERICAS
1984 Y 1985 a)

CATEGORY	1984	1985
Engineers	65	39
Spraying chiefs	449	452
Sector chiefs	572	565
Squad chiefs	1,507	1,342
Spraymen	7,191 b)	8,464 b)
Draftsman	67	51
Medical officers	150	111
Entomologists	55	54
Assistant entomologists	296	301
Statisticians & Statist. Assist.	643	459
Evaluation Inspectors	2,299 b)	2,384 b)
Evaluators	8,195 b)	7,666 b)
Microscopists	1,123	1,127
Administrators	57	51
Administrative Assistants	478	266
Accountants	39	43
Disbursing officers	44	29
Storekeepers	64	58
Storekeepers' assistants	72	39
Secretaries	279	237
Other	652	327
Transport chiefs, mechanics and assistant mechanics	307	212
Drivers	856	867
Motorboat operators	268	234
Boatmen	126	56
T O T A L	25,854	25,434

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

b) In some programs this personnel performs other activities with same category.

Table 19

NATIONAL AND INTERNATIONAL CONTRIBUTIONS TO THE MALARIA PROGRAMS OF THE AMERICAS EXPENDITURES 1984-1985 AND ESTIMATED 1986

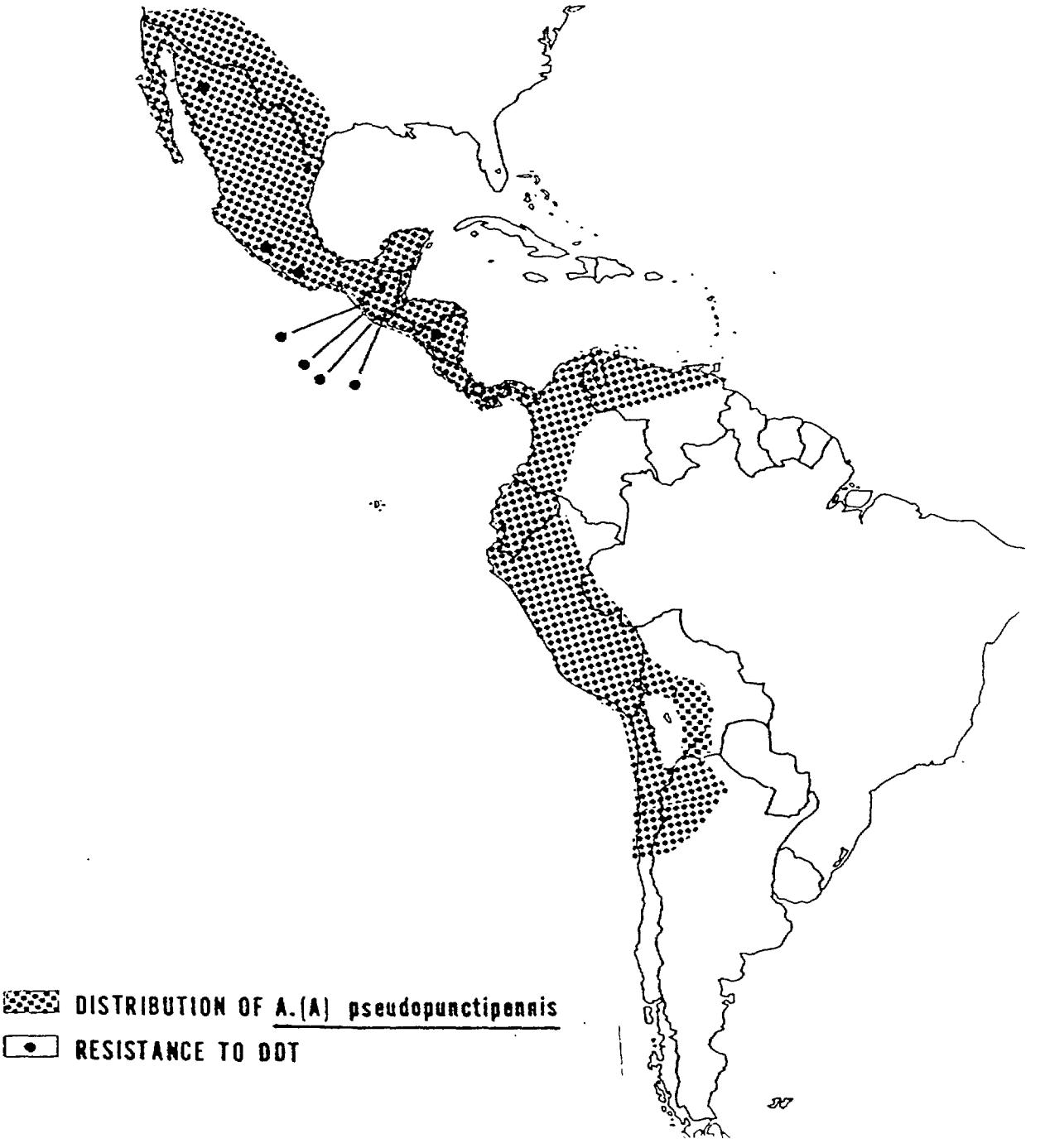
País	National expenditures a)			PAHO/WHO contributions			Grants and loans			T o t a l		
	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
Argentina	128,368	102,595	322,348	-	-	...	-	-	-	128,368	102,595	322,348
Belize	282,425	295,263	...	8,964	8,954	...	-	-	-	291,389	304,217	0
Bolivia	...	...	...	69,125	69,125	...	-	-	-	69,125	69,125	0
Brasil	31,829,219	97,523,788	68,484,142	173,425	173,425	...	5,535,808	101,523	-	37,538,452	97,798,736	68,484,142
Colombia	8,964,488	8,588,616	999,220	189,435	189,435	...	-	-	-	9,153,923	8,778,051	999,220
Costa Rica	1,041,904	1,245,833	1,188,679	-	-	...	-	-	-	1,041,904	1,245,833	1,188,679
Ecuador	3,989,637	4,635,834	5,298,545	-	-	...	-	2,260,000	1,590,000	3,989,637	6,895,834	6,888,545
El Salvador	1,772,672	1,776,104	969,242	75,946	75,946	...	-	-	-	1,848,618	1,852,050	969,242
Guatemala	3,804,108	2,705,823	1,002,157	57,706	57,706	...	-	-	-	3,861,814	2,763,529	1,002,157
French G.	1,330,526	1,288,095	...	-	-	...	-	-	-	1,330,526	1,288,095	0
Guyana	133,333	123,908	...	55,402	55,402	...	-	-	-	188,735	179,310	0
Haiti a)	280,000	280,000	...	247,640	247,640	...	-	-	-	527,640	527,640	0
Honduras	3,363,262	3,117,587	3,397,476	-	-	...	-	-	-	3,363,262	3,117,587	3,397,476
Mexico	3,603,842	3,167,641	...	20,540	20,540	...	-	-	-	3,624,382	3,188,181	0
Nicaragua	...	...	...	-	-	...	-	-	-	0	0	0
Panama	2,540,907	2,474,788	2,321,980	8,000	8,000	...	-	-	-	2,548,907	2,482,788	2,321,980
Paraguay	1,240,225	1,545,453	980,531	9,886	9,886	...	-	-	-	1,250,111	1,555,339	980,531
Peru b)	3,728	...	...	-	-	...	-	15,000	-	3,728	15,000	0
Dominican Re	1,349,878	515,360	...	-	-	...	-	-	-	1,349,878	515,360	0
Suriname	874,576	...	...	-	-	...	-	-	-	874,576	0	0
Venezuela c)	6,861,843	6,054,939	5,934,073	-	-	...	-	-	-	6,861,843	6,054,939	5,934,073
Inter-country Proyects & Hqs.	-	-	-	757,647	758,000	644,909	-	350,000	1,680,400	757,647	1,108,000	2,325,309
											0	0
											0	0
											0	0
Total	73,394,941	135,441,627	90,898,393	1,673,716	1,674,059	644,909	5,535,808	2,726,523	3,270,400	80,604,465	139,842,209	94,813,702

a) Conversion to USA dollars, according to official exchange rate of each year.
b) Estimated based on Operating Budget, 1984-1985

... No available information

MAP 5

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



MAP 6

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

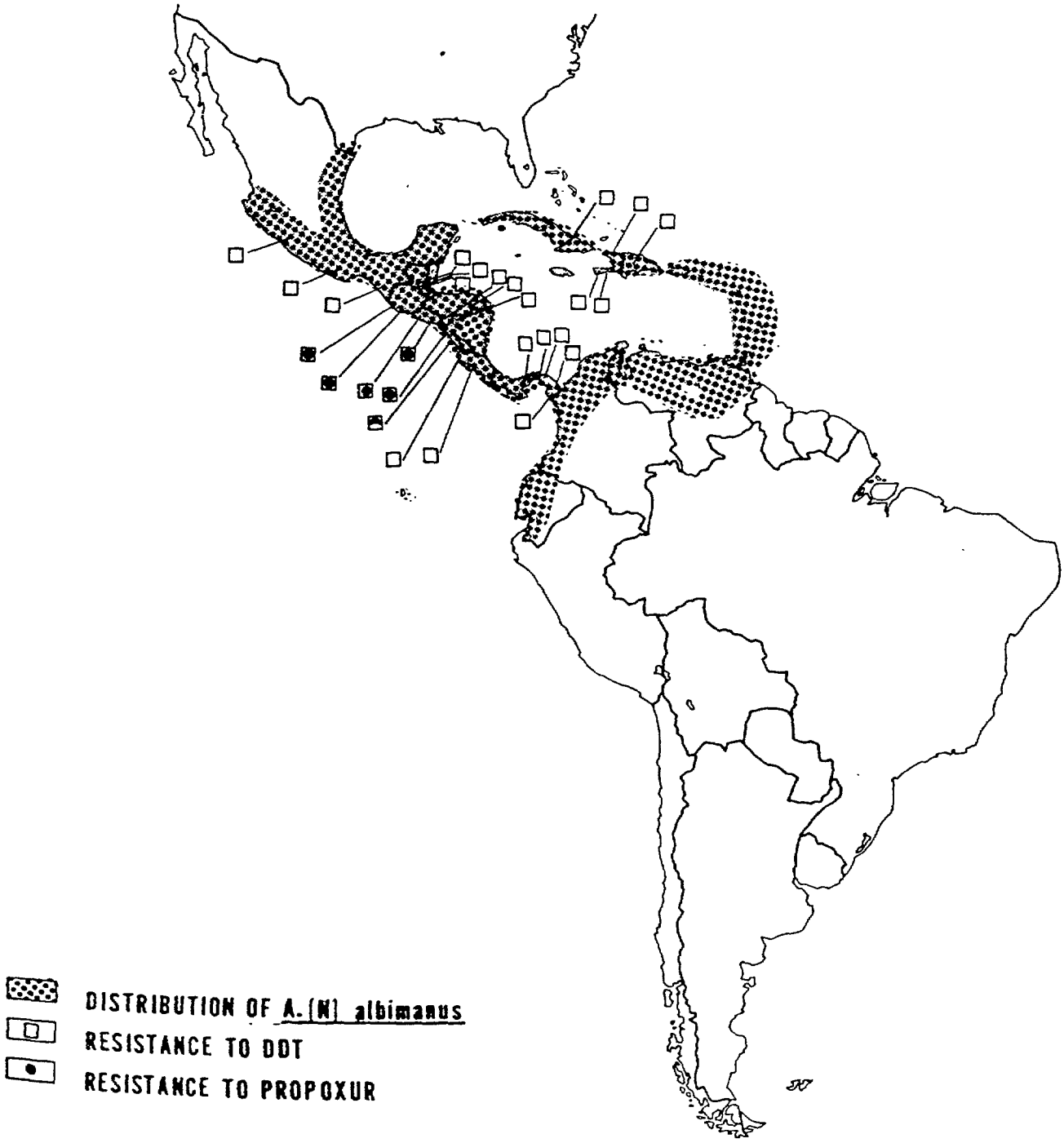


Table 20

GEOGRAPHICAL DISTRIBUTION OF AREAS WITH TECHNICAL PROBLEMS

Paises y areas	Poblacion areas malaricas	Area km2	Insecticida		Numero de casos	Vectores principales	Causas del problema
			Tipo usado	Anos de cobertura			
Argentina: Tartagal, Oran Iruy, Santa Victoria	91,607	11,275	DDT	26	235	A. pseudopunct.	Migraciones internas y externas accesibilidad limitada; factores climatologicos, economico/financieros. Frontera internacional
Bolivia: Departamento Beni Prov. Vaca Diez a)	56,706	22,434	DDT	26	602	A. darlingi	Migraciones; construccion precaria; insuficiente cobertura resistencia de P. falciparum a las 4 aminoquinoleinas
Brasil: Acre, Amapa, Amazonas, Goias, Maranhao, Mato Grosso, Para, Rondonia, Roraima	14,991,260	5,112,940	DDT	18	387,045	A. darlingi	Intensos movimientos migratorios, vivienda precaria, resistencia de P. falciparum y elevada densidad anofelica
Colombia: Magdalena Medio; Catatumbo; Sarare; Amazonia; Litoral Pacifico; Uraba; Bajo Cauca	1,942,351	305,659	DDT Prop. Malat. Fenit.	19 a 25	43,907	A. darlingi A. nunestovari A. albimanus	Baja cobertura de rociado; problemas sociales; resistencia del vector y del parasito; vivienda precaria; colonizacion y ares sin cobertura por problemas sociales
Ecuador: Esmeraldas	321,392	17,807	DDT Fenitrotion	15 5	22,776	A. punctimacula A. albimanus A. pseudopunct.	Problemas operacionales y administrativos; vivienda precaria; parasito resistente a la Cloroq. Resistencia al DDT
El Salvador: Costa del Pacifico	...	4,819	Propoxur	7	34,855	A. albimanus	Resistencia del vector a casi todos los insecticidas; movimiento de poblacion, vivienda precaria escases de recursos humanos, materiales y financieros

a) Las cifras de poblacion de Bolivia se refieren a 1983

Cuadro 20 (Pag. 2)

POBLACION GEOGRAFICA DE LAS AREAS CON PROBLEMAS TECNICOS, 1985

Paises y areas	Poblacion areas malaricas	Area km2	Insecticida		Numero de casos	Vectores principales	Causas del problema
			Tipo usado	Anos de cobertura			
Guatemala:							
Zonas Norte, Sur y Centro-Oriental	3,210,101	80,350	Prop. Clorf. Fenit. Deltam.	De 4 a 6	54,945	A. albimanus A. vestitipennis A. pseudopunct.	Resistencia del vector a los Insect. Movimiento de poblacion; Escaso presupuesto ticidas.
Guayana Francesa:							
Twanke, Antecome, Maripo-soula, Grand Santi, Camopi, Trois Sauts, St. George, Rasire, Montjoly, Macouria and Montsinery	11,360	217	DDT	De 4 a 16	759	A. darlingi	Migraciones internas y externas
Guyana:							
Rupununi, Region Noroeste, Mazaruni/Cuyuni/Potaro Pomeroon	69,000	34,200	DDT	20	6,196	A. darlingi	Rociamientos incompletos; poblacion nomada; dificil tratamiento de enfermos
Haiti:							
No hay informacion	...	...	...	...	...	...	...
Honduras:							
No hay informacion	...	...	...	...	...	...	...
Mexico:							
Estados de: Campeche, Quintana Roo, Oaxaca, Tabasco, Chiapas, Sinaloa, Guerrero, Michoacan, Nayarit y Colima	4,604,122	203,910	DDT y dieldrin	27	58,226	A. psudopunct. A. albimanus	Migracion interna; vivienda precaria casas temporales; modificacion de vivienda; resistencia del vector al DDT; agresiones a superficies rociadas; limitaciones financieras; alto costo de materiales; problemas laborales

Cuadro 20 (Pag. 3)

POBLACION GEOGRAFICA DE LAS AREAS CON PROBLEMAS TECNICOS, 1985

Paises y areas	Poblacion areas malaricas	Area km2	Insecticida		Numero de casos	Vectores principales	Causas del problema
			Tipo usado	Anos de cobertura			
Nicaragua:							
Depto. Chinandega, Leon y Managua. Depto. Granada Rivas	3,165,100	118,958	DDT Mal. Deltam.	24 5 4	15,702	A. albimanus	Resistencia del vector al DDT, al malation y al propoxur
Panama:							
Bocas del Toro; Puerto Pina, Tobobe, Puerto Obadia, Tucuti, San Blas	17,673	6,326	DDT Prop. Mal.	27 De 1-10 2	146	A. albimanus	Migracion; vivienda precaria, movimiento de poblacion
Paraguay:							
Area especial	245,122	20,000	DDT	16	241	A. darlingi	Focos residuales; migracion interna y externa; formacion de lagos y represa hidroelectrica
Republica Dominicana:							
No hay informacion	...	...	...	...	...	...	...
Peru:							
Colon. San Lorenzo; Bigote, Chinchipe, Bagua Santiago, Ene-Satipo, Bajo Maranon Pucalpa	248,527	143,350	DDT	20-25	11,403	A. albimanus A. pseudopunct. A. rangeli A. benarrochi	Alta vulnerabilidad; vivienda prec ria; migraciones laborales; casas temporales; agresiones a superfici rociadas; cobertura insuficiente
Venezuela:							
Areas Occidental y Meridional	719,990	139,603	DDT	37	...	A. nuneztovari	Exofilia del vector; movimiento de poblacion; problemas antropolog
T o t a l	20,819,256	2,921,661	-	-	571,508	-	-

Nota: Tambien existen en las Americas, regiones con caracteristicas especiales de problemas de todo tipo como las de la Cuenca del Rio Amazonas que comprende areas de Bolivia, Colombia, Ecuador, Peru y grandes extensiones de Brasil; en este pais, por ejemplo, un amplio plan de desarrollo socio-economico que contempla la construccion de infinidad de caminos y proyectyos de colonizacion determina que la lucha antimalarica se ejecute con un programa a largo plazo.