Pan American Sanitary Organization | World Health Organization

XIV Pan American Sanitary Conference | VI Meeting Regional Committee

Santiago, Chile
October, 1954

CSP14/36 (Eng.)
8 October 1954
ORIGINAL: SPANISH

Topic 32: ERADICATION OF MALARIA IN THE AMERICAS

The problem of malaria has been receiving preferential attention by the Pan American Sanitary Bureau. As a means of maintaining interest in the problem, which, for many years was the most serious one in extensive areas of the Continent, the Bureau has been sponsoring the periodic presentation of special reports on the achievements and expectations for the future of the antimalaria campaign in the American Continent. These periodic reports were presented to the XI Pan American Sanitary Conference (1942), the V Meeting of the National Directors of Health (1944), and the XII Pan American Sanitary Conference (1947), by the Pan American Malaria Committee, and to the XIII Pan American Sanitary Conference (1950), by Dr. Carlos A. Alvarado, as Special Consultant of the Bureau.

In view of the favorable reception given to these reports and the usefulness of continuing them, the Bureau considered it appropriate and timely to prepare one covering the period 1950 to 1953, and entrusted the task to the same Consultant. The Director therefore, has the honor to present this report to the XIV Pan American Sanitary Conference for consideration.

Since the introduction of residual insecticides and to the extent they have been available, the Bureau has endeavored to stimulate the development of antimalaria programs in the Continent, being convinced that the appropriate use of such insecticides, in radically changing former campaign methods -- which were slow, costly, and of limited effectiveness --, would permit the countries to reach once and for all an economic solution to the malaria problem, which had been hampering progress in extensive regions of the Hemisphere and reducing the beneficial effects of the general public health programs.

The XIII Pan American Sanitary Conference recognized that, owing to "the adoption of new techniques of malaria control and

to sufficiently intensive and coordinated efforts on the part of Member Countries and territories" it would be possible to eradicate malaria from the American Continent; and recommended that the Bureau continue "the development of such activities as are necessary to provide for greatest intensification and coordination of antimalaria work in the Hemisphere, stimulating existing programs, facilitating interchange of information and furnishing technical and, whenever possible, economic assistance to the various countries with a view to achieving the eradication of malaria from the Western Hemisphere." (Resolution XVIII, XIII Pan American Sanitary Conference, Ciudad Trujillo, 1950.) To carry out the terms of this resolution, the Bureau has been placing increasing emphasis on the antimalaria campaign, utilizing the resources of its regular budgets, and those of the Technical Assistance Program of the United Nations, as well. Thus, it has been possible to provide collaboration to a considerable number of countries and territories, the majority of which have also received the collaboration of UNICEF, which has provided materials and equipment needed for field activities.

This report, as well as the summary of the four-year reports of the Member Governments, present information that shows the remarkable advances made by some countries in their programs against malaria. However, it will be noted also that there are extensive and important areas of the Continent where the situation has remained static and malaria still constitutes one of the most important causes of mortality and morbidity, and is a decisive factor in the lack of social and economic progress of the population. These facts have prevented the fulfillment of the hopes expressed by the XIII Pan American Sanitary Conference; this fact makes it necessary to persist in and extend our efforts if this objective is to be achieved on a continental scale.

The Director wishes to call particular attention to the possibility of the development of resistance to residual insecticides by the Anopheles. Information is available to the effect that such a resistance has appeared under natural conditions in certain regions of the world after several years of repeated spraying; and there are some indications that the appearance of the same phenomenon in American vectors is possible. Therefore, there are strong reasons to consider that the "time" factor is vital and that it is necessary to eliminate all "sources of infection" without delay, before the biological phenomenon of resistance develops in Anopheles throughout the New World. Consequently, there is a grave responsibility that must be resolutely faced and a period of time -- one that might be relatively short -- in all possible efforts should be concentrated

if the countries wish to put an end to malaria.

Furthermore, there is information that indicates that once malaria transmission is interrupted, the infection disappears more rapidly than had previously been believed, as the result of the natural dying out of the parasite, even in the absence of chemotherapeutic measures.

A compelling economic reason should be added to the above. The cost of operations of a program simply for the control of malaria amounts, in the long run, to a high figure, since annual expenditures must be made if low transmission indices are to be maintained. The cost of an eradication program, although high during a certain period, decreases with the relatively lower cost of the surveillance necessary to obtain the definite assurance that eradication has been achieved. Moreover, it is worthwhile recalling the well-known fact that the cost of a malaria eradication program is repaid in the long run, and with interest in the form of gains made in all aspects of living.

Malaria eradication can no longer be considered merely a local or national problem. It should be undertaken on a continental scale, since the persistence of "malaria foci" in any region of the Hemisphere is a threat to those countries that have eradicated the disease. It should be recognized,that this danger arises not only from the importation of the malaria infection itself, but also from the importation of Anopheles resistent to insecticides.

It is usually difficult to achieve a general acceptance of the absolute and urgent need for eradication programs as the rational solution in the campaign against certain communicable diseases or vectors.

This difficulty is due largely to the belief that there is no justification for continuing expenses after partial beneficial results have been obtained and the prevalence indices have been substantially reduced. However, it should be remembered that such partial results may lead to failure when, owing to circumstances that could have been avoided, a disease or vector reappears with the same or greater intensity.

The Director of the Bureau hopes that the XIV Pan American Sanitary Conference will give this matter the attention it deserves and that it take the action it considers appropriate, so that the eradication of malaria throughout the Continent may become a reality as soon as possible. One of the steps of major

importance to achieve this objective would be to provide the necessary financial resources to the Bureau, which is ready to assume the obligations as the "Central Coordinating Sanitary Agency" of the countries of the Western Hemisphere, as is expressly provided in the Pan American Sanitary Code.

However, it should be pointed out that the Bureau could not adequately carry out such obligations with the personnel and regular financial resources that are available to it at the present time. It is essential that it have available trained technical experts to give the direct technical aid requested by the countries for the duration of the program, and sufficient funds to enable the Bureau to cover the costs of these activities. Such funds should be considered as extraordinary, that is, not subject to the regular budgetary processes, so as to permit long-range planning and the administrative flexibility required to meet the various situations that might arise. It should be added that the experience acquired by the Bureau enables it to state that the said extraordinary funds would be administered . . . in such a way as to ensure the speediest and best results at the least possible cost.

- - - - -

It is incumbent upon the XIV Pan American Sanitary Conference to decide whether the aspiration of achieving the eradication of malaria in the Americas can become a reality.

CSP14/36 (Eng.)
ANNEX I
7 October 1954
ORIGINAL: SPANISH

STATUS OF THE ANTIMALARIA CAMPAIGN IN THE AMERICAS

V Report

By Dr. Carlos A. Alvarado
WHO/PASB Regional Malaria Consultant

To continue the tradition established at the XI Pan American Sanitary Conference (Rio de Janeiro, 1942), the Pan American Sanitary Bureau charged the undersigned with the preparation of the V Report on the status of the antimalaria campaign in the Americas. Like the last report, which was presented to the XIII Conference at Ciudad Trujillo, October 1950 (Publication No.261, Annex B, August 1951), the present report consists of two parts: one containing an over-all comparative and analytical study on the present status and achievements of antimalaria work in the Western Hemisphere; and a second, referring to the urgent need for a permanent consolidation of the past gains through a coordinated plan on a continental scale for the eradication of malaria in the Americas. With this aim in mind and in order to give the most complete picture of the situation, special efforts were made to include data on all political divisions of the Continent, including also those not responsible for the conduct of their international relations, which, for purposes of this study, are referred to as "territories".

To facilitate comparison with previous data, the method of presentation used in the IV Report has, as far as possible, been followed in the present study.

I. PROGRESS OF ANTIMALARIA WORK IN THE CONTINENT

A - GENERAL VIEW

The present status of the antimalaria campaign in the Continent shows that significant qualitative and quantitative changes have taken place since the preparation of the IV Report. Taken as a whole, the picture may be considered favorable, although the vigorous impulse of the former period has lagged somewhat during the last four years, and some countries have not taken full advantage of the splendid benefits obtained through campaigns using imagocides.

A well-integrated antimalaria campaign should proceed in two directions: a) in breadth, until all malarious zones of the country are covered, and b) in depth, until total eradication is achieved. Only four countries and two territories report that they have reached the first of these goals. The second objective has been achieved almost completely by only one country and, in some areas by four other countries and three territories.

Such factors as the spectacular reduction in the number of cases, the drastic lowering of parasitic indices, and the enthusiasm awakened by the collateral action of the imagocides against other arthropodes, have all exerted a negative influence on the planning of antimalaria programs, on the structure of organizations concerned, and on the policy of health authorities. Malariology, with its out-dated malariometry, based on measures that were useful in the days of antilarval campaigns and sanitary engineering work, has not yet devised evaluation methods to suit the strategy and speed of imagocide action. Consequently, since the results of campaigns used to be measured and evaluated with yardsticks designed for other purposes, public health responsibility was considered fulfilled when indices dropped below a certain figure or when malaria no longer occupied one of the first places in mortality statistics. It was not realized that it was comparable to detaching merely a segment of a tapeworm and that any parasitic index lower than 0.0, but not absolute zero, meant the survival of the head of the taenia worm. It is out-dated objectives and out-dated standards that have, therefore, prevented the four-year period 1950-53 from keeping the same pace and raising the level reached during the previous period, and thus the hopes expressed in the IV Report were not realized. The report had said that "if it were remembered

that these results had been or were about to be achieved after a campaign of only three years and in an area that was equivalent to two thirds of the malaria region of the Continent, the extent of the progress made could be appreciated, as could the well-founded hope that malaria could really be eradicated in the Americas within a relatively short time".

B. STATUS AND ORGANIZATION OF NATIONAL MALARIA SERVICES

In this report, as in former ones, the term "National Malaria Service" (NMS) will be used as the generic term to indicate the service in charge of the antimalaria campaign. Table 1 shows the administrative status and the specific name of the NMS in each country or territory.

The status of the NMS within the respective National Public Health Service (NPHS) has changed somewhat since the former report was issued. In 1953 Argentina set up a primary service exclusively in charge of malaria and yellow fever work, although the management and administration of the service continue to be shared with the General Health Department of the North. In Ecuador the National Malaria Service is at present also a primary service, although it is under the same direction and administration of the Institute of Hygiene. In El Salvador there is no single service with complete responsibility for this work, field operations being under one service (Vector Control) and epidemiology and drug distribution under another (Antimalaria Service), both of which are coordinated within the Division of Epidemiology. In the United States, where all federal participation in the antimalaria campaign has been suspended since 1953, only a program of epidemiological surveillance is being carried on under a section (National Malaria Surveillance Program) of the Epidemiology Branch, Communicable Diseases Center (CDC) of the Public Health Service. In Guatemala, Haiti, and Nicaragua primary services were organized under the name of "Insect Control"; services were organized also in Paraguay, but they occupy a secondary position. In Perú, the old and renowned Department of Malaria became the Vector Control Department. In this country as well as in two others (Guatemala and Paraguay) the term "malaria" is no longer used to designate sections of the public health services (even though malaria continues to be a serious problem).

With regard to the territories, Santa Lucia has no NMS but the insect control program is a special service of the NPHS. There is no NMS in Dominica or British Honduras,

the antimalaria activites being included in the general functions of the Public Health Service. No data are available for Guadaloupe, Surinam, or the Canal Zone.

As to the internal organization of the NMS, some changes have occurred. Some have been profitable and others detrimental, but the over-all picture continues to be favorable. Argentina and Mexico have established insecticide laboratories. The latter country now also has investigation and publications sections. Brazil has organized a library in its Malariology Institute, and Ecuador issues regular publications on the activities of its NMS. The Dominican Republic has set up sections for entomology and administration. On the other hand, the NMS in Bolivia no longer has its own administration, and in Peru the entomology, parasitology, statistics, and administration sections have become part of the Division of Communicable Diseases.

Beyond analyzing the structure of the NMS, it is of even greater importance to consider whether their work covers all aspects of the malaria problem (anti-Anopheles campaign, epidemiological evaluations, distribution or application of treatment, registry of patients, parasitological confirmation of clinical cases, and epidemiological investigation of confirmed cases), or whether it is limited to only a few of these activities; and whether the NMS undertakes other activities related to or coordinated with the antimalaria campaign, or completely unrelated activities. Table 2 shows these activities in detail. It will be noted that only Argentina and Venezuela approach the problem on a complete and over-all scale. The United States (federal service) has dropped certain activities from its program as it has found them no longer necessary. Following the two former countries, as regards scope of the activities, are Brazil, Ecuador, British Guiana, Puerto Rico, and Santa Lucía. In the other countries and territories (excepting Cuba) the basic activity is Anopheles control with imagocides, and decreasing emphasis is being placed on epidemiological evaluations, registry of patients, and parasitologic confirmation of clinical cases. Only three countries -- Argentina, the United States, and Venezuela -- make epidemiological investigations of each confirmed case of malaria.

In 14 countries and 9 territories, the NMS are charged with Aëdes aegypti eradication and thus, in an activity closely related to their regular work, contribute toward the

fulfillment of the important resolution adopted by the Directing Council of the Pan American Sanitary Organization at its First Meeting (Buenos Aires, 1947).

C. - TECHNICAL PROFESSIONAL PERSONNEL

The tabulation of technical professional personnel does not include part-time workers, who are few in number and of less importance. Table 3 shows the figures by country, and by professional groups. The United States reports a total of 30 medical officers with specialized training (as compared with 1 in 1950) but these participate also in other activities of the CDC. Not counting this group, the total is the same as for 1950. The total number of non-specialized physicians (but with accredited experience) has doubled (41 as compared with 20).

The total for engineers is lower, but this decrease is due exclusively to their reduction in number in the United States and Argentina. There are also fewer entomologists (27 as compared with 109 in 1950), but this sizeable reduction is accounted for by decreases in only two countries, the United States and Brazil, which had 40 and 55, respectively, in 1950.

Five countries (Argentina, Brazil, Ecuador, the United States, and Venezuela) have training facilities for all types of personnel and these facilities can be extended to personnel from other countries. Fellowships are granted in two countries, Ecuador and Venezuela; in the former country, room and board are included at the "Leopoldo Izquieta Pérez" National Institute of Hygiene, and in the latter a sum of money is granted to cover these expenses (Bs.500 per month). Travel and study fellowships in the other countries must be obtained from other sources. Colombia, Costa Rica, Dominican Republic, El Salvador, Panama, Paraguay, and Peru report that they have training facilities for field personnel only.

Mention should be made of the debt owed by the countries of the Americas to the School of Malariology of Venezuela, which has trained the majority of professional malariologists now directing or working with the NMS of all Latin American countries (with the exception of Brazil).

D. - MAINTENANCE OF THE ANTIMALARIA CAMPAIGN AND BUDGET OF THE NATIONAL MALARIA SERVICES

In almost all countries of the Americas the organization of antimalaria campaigns continues to be the responsibility of the national government. The most notable exception is the United States, where the responsibility rests with the states, which have the cooperation of the counties. From 1951 on, federal support for antimalaria programs in that country was gradually withdrawn, leaving only an epidemiological service to give supervision and to verify the results ("National Surveillance Program"). In Brazil, the State of São Paulo continues to maintain an independent program but no specific data could be obtained on its activities.

The most significant facts for 1950 are the above-mentioned withdrawal of federal support for antimalaria campaigns in the United States and the collaboration offered by WHO-PASB and UNICEF in 12 countries and 6 territories. Only Cuba and Puerto Rico have reported that their antimalaria activities are supported exclusively by the national government. Elsewhere, either the states, provinces or departments, municipalities, private enterprises, or international agencies (UNICEF and WHO-PASB; SCISP) collaborate in their operation and maintenance.

Table 4 presents, in detail, all the information obtained on the type and amount of the contributions made toward the maintenance of antimalaria campaigns.

Table 5 gives the annual budgets for the four-year period 1951-1954, it being understood that where the fiscal year begins on 1 July, the year referred to is that beginning with the fiscal period. The budgets are given in the national currency of each country, and the last column shows the 1954 budgets converted into U.S. dollars at the free rate of exchange in effect in July of the same year.

In the study of budgets, it is evident that in spite of the fact that the majority of the countries report an increase in funds allocated to antimalaria campaigns, the percentage of the total public health budget allotted to this activity in the individual countries has dropped, in some countries to a considerable degree. In large part this decrease has been caused by the fact that, while other public activities have been increasingly expanded, antimalaria

programs have remained the same. It would seem that the increase in funds allotted for antimalaria work in many of the countries is the result not of actual expansion of activities, but rather of increases in the cost of material and equipment and of salaries of personnel. In some cases the NMS budget has really been decreased, as in the case of Argentina, owing to change in the structure of the Service and a reduction in the area of operations. Several NMS have taken on new responsibilities, making it necessary for the costs of administrative-technical services to be met with funds from antimalaria and other activities, with the result that the specific budget for antimalaria work is sometimes greatly reduced.

The figures in Table 4 are designed to show, for a considerable number of countries, the financial collaboration of the various local agencies and international organizations. It is apparent, from the extensive participation of states, municipalities and private enterprises, that community interest in the antimalaria campaign has been kept alive. After mentioning the case of the United States, where all activity is carried out on a local scale, it is fitting to point out that the states of Venezuela contribute the equivalent of 16.7% of the budget; the municipalities in Honduras contribute 16%; private enterprises in Guatemala, 34.6%; and in Mexico and Argentina the total contribution of these groups is 21% and 13.1%, respectively. (In Mexico, in addition, other governmental agencies contribute each year amounts almost as great as the budget of the NMS itself.) In Brazil, although the contribution of these groups represents only 1.5% of the total budget of the NMS, the sum of 9,400,000 cruzeiros contributed by the states alone, is of considerable importance.

Undoubtedly, the most promising and significant development in the antimalaria campaign in the Continent is the expansion of the programs promoted by the WHO-PASB, with the financial support of UNICEF. Five countries and one territory received assistance in 1950; the number that continued or began working with the equipment, transportation facilities, and technical assistance furnished by the above-mentioned international organizations increased to 12 countries and 6 territories.

E. - LEGISLATION

With the exception of Cuba, El Salvador, Haiti, Nicaragua, and Panama, all the countries and territories mentioned in this report have legislation on malaria, and the majority of them make it compulsory to combat this disease. Ecuador, in referring to the campaign against malaria, declares its eradication as an urgent national enterprise. Argentina, Panama, and Venezuela also classify the problem as one of national interest, although not to the same extent as does Ecuador. The remaining countries do not put the same emphasis on the problem, but an analysis of the legislation in force shows the importance given to the legal aspects of the antimalaria campaign throughout America.

Argentina, Brazil, Panama, Peru, and Venezuela all have exhaustive legislation on the subject, the most complete being the Argentinian law complemented by its reglamentary decree. In the other countries, measures concerning the antimalaria campaign are included in laws covering communicable diseases in general, in sanitary codes, or in laws, decrees, or statutes aimed at combating the problem through united action against noxious or vector insects. However, in these cases, all aspects of the antimalaria campaign are not covered. Unfortunately, therefore, in the majority of the countries, legislation has not been adequately adapted to new concepts of antimalaria strategy. As a result of this fact, some of the fundamental and indispensable activities for the conduct and evaluation of operations (such as compulsory and immediate reporting, and parasitological verification of clinical cases occurring in regions under treatment with imagocides or where malaria is presumed to be eradicated) can only be carried out with considerable effort, unless a high level of health education of the public exists.

Declaration of "malaria zones" is not compulsory in all countries and where it is, such a declaration is made by the responsible health authority, upon advice of the agency specifically charged with the antimalaria campaign.

Environmental sanitation works designed to physically improve the environment, combat larvae, or protect communities by mechanical means, are under the responsibilty in almost all nations and territories, first of the governments, and second, of property holders, managers, tenants, etc. It is upon that subject that the most emphasis has been placed in the legal bodies concerned; steps taken have covered the most

minute details. The use of imagocides in residences is covered specifically only in the legislation of Argentina and four territories (Grenada, British Guiana, French Guiana, and Santa Lucía), although that of Peru, by referring to "other insecticides", leaves the way open for the use of other types that have appeared recently. The fact that only two countries and four territories emphasized such responsibility is easily explained in that almost all the legislation in force was passed before the discovery of the modern insecticides. The effectiveness of environmental sanitation, in every aspect, is based upon the obligation imposed by some laws to give public health personnel access to any property or residence that is to be covered.

In some countries the government and various agencies have been made responsible for the supply of drugs. Only the laws of Argentina refer to the supervision of the distributing and dispensing of such drugs -- which is an important measure since, when notification is lacking, cases of malaria that have not been reported in due time can be recognized and traced through this procedure.

Only Brazil and Argentina have laws referring to new or temporary dwellings and making it compulsory to report their installation, so as to make the antimalaria campaign more effective.

Special importance is now placed on the reporting of malaria cases. The majority of the countries require such reporting; some fix definite time limits and specify who should have the responsibility for doing it, to whom the report should be made, in what form and under what conditions, and if the report should be accompanied by a blood sample or any other evidence. Only Argentina, British Guiana, and Puerto Rico have made it compulsory for blood tests to be sent for parasitological confirmation. In connection with this requirement, some countries make it the duty of the patient to seek treatment and to submit to a blood test.

In order to make the afore-mentioned standards effective in practice, the majority of the countries have established various penalties for failure to comply with any of the legal requirements. Argentina imposes severe fines on those who are responsible for reporting malaria cases and fail to do so, as well as on persons who are required to submit to blood tests and refuse.

The real importance of clearly defining in legal statutes the logical compulsory measures for combating and eliminating diseases is undeniable. From this brief analysis can be seen the urgent need for bringing present legislation up to date, for promoting such legislation in those countries where it does not exist, for adapting legislation to the new methods and requirements of the modern campaign to combat malaria, and, above all, for accomplishing the supreme objective of eradication.

Table 6 contains a review of the provisions included in antimalaria legislation now existing in the Americas.

F. - SCOPE OF THE PROBLEM

In this same chapter of Report IV, the extent of the malaria problem in the Americas was analyzed and discussed. Taken as a basis for the discussions were the area of the malaria zone in each country and the population in that zone, facts that were important as a starting point for the initial evaluation of the problem.

At present, as in the future, the evaluation of the scope of the problem should be based on a knowledge of current conditions and for this reason additional factors should also be considered. In this report figures on inhabitants will be given for a) "eradication zones", b) "protected zones" (inhabitants directly or indirectly protected), and c) "unprotected zones". These figures cover the "malaria zone". Table 7 presents this information. As a supplement, Table 8 shows the corresponding areas covered. The countries, now having a better knowledge of the situation, apparently have made adjustments in the total population figures for the malaria zone, these figures being more or less different from those in the IV Report.

Without taking into account Guadaloupe, Surinam, and the Canal Zone, which did not send data, the total population of the Continent residing in the "malaria zone" would be 135,000,000, of which 60,000,000 (44.4%) live in the "eradication zones", 45,000,000 (33.3%) in the "protected zones", and 30,000,000 (22.2%) in the "unprotected zones". The present extent of the problem can be expressed as 55.5% of the original figure. Undoubtedly, the eradication of malaria in the United States brought about this sharp change in the continental picture. As to the present extent of the problem, 3/5 of these inhabitants are within the "protected zones". With

respect to the remaining 2/5, as yet untouched, the responsibility, in absolute and proportionate terms, rests with the following countries (in decreasing order):

	Country	Unprotected Population (in thousands)	% of Total Population Unprotected in the Continent
1	Mexico	19,159.1	63.7
2	Colombia	3,928.7	13.1
3	Brazil	1,900.0	6.3
4	Haiti	1,800.0	6.0
5	Peru	1,229.0	4.1
6	El Salvador	516.4	1.7
7	Paraguay	397.0	1.3
	12 other countries	1,050.6	3.8

A study of the areas (Table 8) reveals a close relationship between the figures for unprotected population and the area of unprotected zones:

	Countries	Area of Unprotected Zones (km^2)	% of Total Area Unprotected in the Continent
1	Mexico	1,800,000	44.8
2	Colombia	786,341	19.6
3	Peru	613,582	15.3
4	Brazil	355,000	8.8
5	British Guiana	180,556	4.5
6	Bolivia	150,000	3.7
7	Paraguay	69,500	1.7
	9 other countries	62,677	1.6

It can be seen that in both lists Mexico and Colombia hold first and second places; the order of Brazil and Peru remains practically the same; and Paraguay continues in seventh place. But in "unprotected zones", British Guiana and Bolivia take the places of Haiti and El Salvador.

Special mention should be made of the Lesser Antilles zone. The majority of the area has a history of malaria epidemics (Bahamas, St. Vincent, Grenada, Barbados); others had small endemic foci (Antigua, Martinique, St Kitts, Nevis, Anguilla) that have disappeared in recent years. The remaining areas have no record of malaria (Caimán, Turcas, Caicos, Virgin Islands, Aruba, and Curacao). Guadaloupe sent no data.

Although Chile gives no data on malaria cases, it reports an "eradication zone" with an area of 15,000 square kilometers and 10,000 inhabitants, and a total of 102,789 persons protected with imagocides and antilarval measures. Only Uruguay and Canada have remained completely free from autochthonous malaria.

A map was to have been presented to show the malaria zones, in the Continent, including former and present zones, endemic and epidemic; eradication zone; zones covered by imagocide operations; and zones with no protection whatever. But only 9 countries (Argentina, Bolivia, Costa Rica, Dominican Republic, Ecuador, Haiti, Honduras, Nicaragua, and the United States) and 6 territories (Puerto Rico, Dominica, Santa Lucía, Grenada, Trinidad, and British Guiana) stated that they could prepare this map. Although apparently other countries, such as Brazil, El Salvador, Mexico, and especially Venezuela, know the distribution of their malaria zones, they did not have time to prepare maps. It is hoped that these data can be obtained for inclusion in this report before it is printed in final form.

G - ORGANIZATION OF THE ANTIMALARIA CAMPAIGN

The form that the antimalaria campaign takes, depends largely on the manner in which the NMS are organized. Information has been given previously as to the way in which the different countries and territories deal with the basic aspects of the problem. This chapter will discuss methods of malaria control based on engineering works and the use of larvicides and drugs. Because of their importance, the imagocides will be taken up in a separate chapter.

Table 13 shows that 4 countries (Cuba, Ecuador, Mexico, and Venezuela) and 6 territories (Dominica, Grenada, British Honduras, Puerto Rico, Santa Lucía, and Trinidad) continue carrying out the so-called "permanent control" works. In Ecuador, they are carried out exclusively by SCISP. These works certainly contribute to the physical improvement of the environment, but if the effort and investment made are weighed against the cost and effectiveness of the imagocides, it is clear that they are indeed a luxury in the antimalaria campaign. It is undoubtedly for this reason that they were abandoned in Bolivia, Brazil, Colombia, the Dominican Republic, Peru, and French Guiana, which in 1950 reported that they were planning and carrying out works of this kind. In the United States, water management programs continue in operation but only

under the responsibility of states and counties.

Table 13 also shows that 6 countries (Bolivia, Ecuador, Guatemala, Nicaragua, Panama, and the United States) and 3 territories (Jamaica, Santa Lucía, and Trinidad) apply anti-larval measures, although on a very reduced scale as compared with the four previous years.

Brazil has begun a far-reaching experiment of malaria prophylaxis by means of drugs, combining chloroquine with table salt used in the daily diet (Pinotti Method), at the rate of 50 mg. of diphosphate (30 mg. base) in each 10 g. of common salt. As the quantity of this salt consumed daily by man under normal dietary conditions is from 10 g. to 15 g., an adult would absorb daily from 50 mg. to 75 mg. of chloroquine (30 mg. to 45 mg. base) if chloroquine salt were all that was consumed. First experiences seem to have demonstrated the efficacy and innocuousness of this method, which would have a large field of application in regions inaccessible to imagocide campaigns or where the low population density makes these campaigns costly or uneconomical. The method could be useful also to supplement or even to replace insecticides in special situations in which the vector is found predominantly outside dwellings. Table 14 shows the results obtained in Brazil in two localities in which chloroquine salt was used, as compared with data for two neighboring localities used for control purposes.

H - ACTIVITIES WITH IMAGOCIDES

House spraying with imagocides is the principal and decisive factor in the antimalaria campaign in the Americas. The only exception to this is Cuba, which continues to stress sanitary drainage work and antilarval control. However, in the near future it plans to make use of imagocides in its campaign to eradicate malaria.

Table 15 shows that DDT is the most widely used imagocide. By reducing the other insecticides to a dose equivalent to 2 grams of DDT per square meter, the following distribution by percentage of sprayed surfaces is obtained:

with	DDT:	91.0%
"	BHC:	5.1%
"	Dieldrin:	3.6%
"	Clordane:	0.3%

The DDT dose utilized averages about 2 grams per square meter, which has been used since the very beginning and which

in practice has offered a margin of safety in this work. Preparations of 75% wettable DDT powder are now the most widely used thoughout the Continent. The NMS of Brazil is producing and using an 80% DDT emulsifiable paste, which in the first tests has given excellent results from an economic and technical point of view.

Table 16 shows that there is a tendency toward reduction of sprayings to one a year. Only the smaller countries continue to spray twice a year. It would seem that this practice is the result of operating difficulties in the field rather than of technical considerations. Over-all house spraying is carried out in all countries, except in some areas of Argentina and Paraguay, where it is limited to sleeping rooms and living rooms.

Almost all the countries and territories, with the exception of Mexico, Peru, and Dominica, report that imagocide applications follow a time schedule and an itinerary. Argentina had submitted a table and an explanation of its time schedule showing a strategic and economical method of field work; these are considered of sufficient interest to be reproduced in this report (Table 16-bis). This time schedule reduces operating costs, since it is based on a practical approach that takes into account the principal factors involved, i.e:

a) The epidemiology of malaria in northwestern Argentina, where the outstanding characteristic is a period of non-transmission varying according to latitude and elavation above sea level. Table 16-bis shows the correlation between movement of patients and capture of adult Anopheles. (The curves were plotted on the basis of data for the ten years prior to the use of DDT.)

b) Availability personnel and equipment.

c) Climate, since summer rains obstruct the work in rural areas by making the roads impassable.

Assuming that in torrid zones the residual action of DDT is of 6 months' duration and that of BHC 3 months' (250 mg. of gamma isomer per square meter), the first cycle is completed with DDT exclusively, starting with the lower and less accessible zones, where the population is more distant and dispersed; the entire house is treated. This is followed by partial treatment of villages and suburban areas (sleeping rooms and living rooms) since the inclusive action of partial

treatment of nearby houses is evident. Finally, the higher and temperate zones are treated but in this instance preferably using BHC, which is produced nationally and permits a savings in foreign exchange; at the same time it acts also against the triatomidae.

Table 17 shows the number and type of vehicles available in each country.

The organization of field services, as stated in the previous report, depends on such local factors as economic conditions, topography, transportation routes, and density of population.

In almost all the countries, sanitary engineers participate in the field work, although their responsibility is not always the same. The countries in which they hold more administrative positions are Argentina, Colombia, the Dominican Republic, Peru, and Venezuela.

In countries where the malaria zone is extensive, the zone has been divided into districts, where various squads operate under the direction of a chief. In the smaller zones the district coincides with the work area of one squad. The composition of the squad is quite varied, depending principally on the transportation facilities available. Motorized corps comprise generally a chief, a driver, and a number of sprayers, varying according to whether the squads work in rural or urban zones. The driver also acts as a sprayer, and in some cases the chief himself acts as driver. The composition of the motor squads in some of the countries is as follows:

Country	Chief	Driver	Sprayers	Auxiliary Staff
Argentina	1	1	2 to 3	0
Bolivia	1	1	3 to 4	0
Brazil	1	1	3 to 6	0
Colombia	1	1	6	0
Dominican Republic	1	1	3 to 4	0
Ecuador	1	-	4 to 6	1
El Salvador	1	-	5	0
Honduras	1	1	4	0
Mexico	1	-	5	0
Peru	1	-	8	2
Venezuela	1	1	3 to 8	1

Besides the motor corps, there are other squads that use several kinds of transportation such as launches, beasts of burden, "trollies", etc., as well as those that travel simply by foot. The number of sprayers, which is also very variable, ranges from 4 to 11.

In Argentina, Bolivia, and Brazil, besides the squads, there are so-called single sprayers (the "zoning" method), who are assigned a fixed number of houses (varying according to how widely scattered the houses are which they cover systematically using their own means of transportation, such as beasts of burden, bicycles, etc. This work is supervised by special inspectors.

It is impossible to present a critical study in this report on the organization of the staff that carries out the field work, since the information requested allows only a description of how it is constituted in the various countries. Taking into consideration this description and the lack of uniformity in the composition of the squads, it is believed that as soon as special studies are made showing the characteristics common to the problem in all the countries, as well as the local conditions in each one, it will be possible to determine what should be considered the most sensible structure for the staff. This aspect of the problem is undoubtedly one of the most important in the economic planning for malaria eradication.

I - COSTS AND PRODUCTIVITY

Table 18 shows the direct costs of operation that have been computed, taking into consideration the following four factors: (a) insecticides and solvents; (b) equipment and material; (c) transportation; and (d) field personnel.

Also appearing on this table is the percentage ratio between the cost of field projects and the budget of the service, a figure that indicates the purpose for which anti-malaria funds are invested. Operational costs are not "competitive" costs, to be compared between countries, because of the intervention which in some cases is exercised by the State, when purchases of insecticides or equipment are made at preferential exchange rates; because of the salary level established by the State; or because of the conditions under which personnel was contracted (permanent or temporary). For these reasons, the costs can only be contrasted within a single country by comparing them in various years and places.

The following table shows the costs, per application, for the years 1949 and 1953 (quoted in dollars).

Country	1949	1953
Argentina	1.71	1.04
Colombia	4.00	1.85
Dominican Republic	0.92	0.70
Ecuador	1.20	0.89
El Salvador	1.58	1.13
Honduras	0.95	1.44
Mexico	0.82	0.84
Venezuela	2.45	2.01
Jamaica	0.53	0.65

The figures quoted above are approximate; the object has not been to make a study of costs, but rather to promote interest in the economic analysis of projects using imagocides. The same comment should be made with regard to unit production yield in man-hours per application, which quotes figures that vary greatly according to the special circumstances in each country.

J - PRODUCTION OF INSECTICIDES, SOLVENTS, EMULSIFIERS, AND EQUIPMENT IN EACH COUNTRY

At the end of October 1954, there will be opened in Argentina a DDT plant having a basic annual production of 1,000 tons. This plant will not need to import raw materials. Thus, this insecticide will soon be produced in two countries of the Americas -- Argentina and the United States.

In addition to the United States, Argentina and Brazil produce benzene, hexachloride and Lindane, without need for importing any raw materials. The NMS of Brazil, which has expanded its own BHC factory, produces an excellent 80% DDT emulsifiable paste, as has already been mentioned, as well as its already accredited emulsifier "B-13".

Argentina, Brazil, the United States, and Trinidad produce emulsifiers, and all the countries with petroleum industries produce kerosene used as a solvent for 5% solutions.

At this time, special spray pumps are produced only in Brazil and the United States.

K - RESULTS OF THE CAMPAIGN

The results of the antimalaria campaign may be measured by: (a) partial or total eradication of malaria in a country; (b) decrease or elimination of malaria mortality; (c) disappearance or reduction of morbidity (clinical cases); (d) reduction of antimalaria drug consumption; and (e) decrease in the splenic and, above all, the parasitic indices (concurrent surveys).

Eradication.- Four countries and two territories have reported that malaria has been eradicated in some regions.

Argentina reports that it considers malaria eradicated as an endemic disease throughout the national territory. Nevertheless, in accordance with the strict standard of the National Malaria Society of the United States, - namely, three consecutive years without a single autochthonous case - malaria has been eradicated only in the Provinces of La Rioja, San Luis, Cordoba, San Juan, and Catamarca (with the exception of one department), in an area of 60,000 square kilometers and a population of 200,000 (this figure refers solely to the malaria departments of the afore-mentioned provinces and not to the total population). In accordance with the same standard, Ecuador reports that malaria has been eradicated from the malaria regions in the inter-Andean provinces of Pichincha, Imbabura, Carchi, and certain parts of Guayas, with a population of 220,000.

The United States reports that endemic malaria has been eradicated throughout the country, with the possible exception of the Counties of Hidalgo and Cameron, in Texas, the total areas being 3,016,548 square kilometers and the population, 57,790,489.

Venezuela, also according to the standard of the National Malaria Society of the United States, reports that malaria has been eradicated in 30% of the malaria region in the States of Anzoátegui (14 municipalities in the west); Aragua; Barinas (except for the southern part of the three southeastern municipalities); Falcón (34 eastern municipalities); Lara (20 eastern municipalities); Miranda; and the Federal District -- with an area of 180,000 square kilometers and a net population of 1,538,449 (estimated on the basis of the 1950 census).

With regard to the territories, British Guiana presents the most conspicuous example of eradication, not only concerning malaria, but also with respect to its vector, A. (N.) darlingi, in the three coastal counties (Demerara, Berbice,

and Essequibo), where 95% of the population is centered (442,000 inhabitants) in an approximate area of 5,000 square kilometers.

Finally, although it does not give any standard for evaluation or figures, Trinidad reports that malaria has disappeared in many districts.

French Guiana and Puerto Rico report that, although they cannot as yet speak of eradication, malaria is no longer endemic in their territories.

Contrary to previous reports, Chile states that there is an eradication zone only in the Province of Tarapacá, with an area of 15,000 square kilometers and a population of 10,000, while it reports a population of 102,789 protected by imogacides and antilarval measures. It would thus appear that the A. pseudopunctipennis has not been totally eradicated in that country, as was stated in the IV Report.

Mortality. Perhaps the least valuable of all the malariometric information available is that obtained from mortality data, and there are various reasons to support this statement.

In the first place, the normal or regular procedure is for the malaria services to take no direct part in the registry of deaths, this procedure being carried out independently and, on occasion, without any direct connection with health agencies. This circumstance gives rise to a startling paradox: malaria services are organized to detect and verify cases of malaria, but not to verify the diagnosis in the case of death. When this occurs, the death is recorded as due to malaria and, if the death certificate so records it, there is no further action. Second, it is well known that in countries where malaria was or is still endemic, it is customary to record many deaths of which the cause is undetermined as due to malaria. It is true that during the past few years, because of the progress made in imagocide work, a large number of well-informed physicians no longer follow that practice, but even today quite a few members of the profession still do so.

The value of mortality data is also decreased by the procedure established by some statistical offices of classifying as malaria deaths those caused by fevers in patients coming from malaria regions (International List of Causes of Death, Sixth Revision, 1948, No. 116), a procedure that is no longer justifiable in adequately protected regions.

Finally, there is the fact that no country has established an effective formula to discern whether deaths certified as due to malaria are in fact due to that disease.

With the sole exceptions of French Guiana, which reported that the two deaths recorded as due to malaria in 1950 were confirmed, and of Mexico and Panama, which reported, without specifying how, that a part of the recorded cases had been confirmed, the other countries record death figures stating that there was no certain confirmation of the diagnosis for malaria. If the value of data on deaths diagnosed as due to malaria is only relative, of even less value is that which can be obtained from a study of the figures for death due to unknown causes, these figures being quite high in a majority of the countries.

In spite of the difficulties mentioned, the mortality figures for malaria bring out some quite important facts. Thus, in those countries that have provided information, out of a total of 1,013,815 deaths due to all causes in 1952, it is presumed that malaria was the cause of 41,869 deaths; that is, 4.1 per 100 deaths were caused by this disease. Of these 41,869 deaths, 22,050 (52%) occurred in Mexico. The countries that provided information are shown on Table 12.

If a study is made of the malaria mortality trend in the countries that have given information, it may be seen that in Argentina and British Guiana the rate reached zero. In Puerto Rico only two deaths due to malaria occurred in 1953, and the figures for Costa Rica, El Salvador, Honduras, Nicaragua, Panama, Venezuela, and Trinidad show a sharp decline. From the information provided by the remainder of the countries and territories, there is no clear evidence of a downward trend in this specific mortality rate.

As can be noted on Table 12, there is still a number of countries and territories in which deaths due to malaria amount to from 5% to 10% of the total deaths from all causes.

Morbidity. -- The record of patients is not regularly kept in all countries and territories. Complete reports have been submitted only by Argentina, Puerto Rico, and the United States; in the remaining cases, one or more of the aspects covered by the questionnaire have not been dealt with.

With respect to autochthonous cases that have occurred in zones at present under treatment with imagocides, information has been submitted by 7 countries (Argentina, Colombia, Costa Rica, Mexico, Peru, the United States, and Venezuela) and 4 territories (British Guiana, French Guiana, Jamaica, and Puerto

Rico). Others (British Honduras, Brazil, Ecuador, and Guatemala) report on the total number of hematological examinations made, without specifying how many patients have been subjected to this test. The remainder give very fragmentary information (See Table 9). The only country to record no autochthonous case from 1952 on is the United States. Argentina, Costa Rica, and Venezuela show a sharp reduction, in 1953, as compared with the figures for 1950; the same is true of British Guiana and Puerto Rico.

As to autochthonous cases occurring in regions where treatment with imagocides has been suspended as being considered unnecessary, only the United States records three cases in 1952 and three more in 1953.

On autochthonous cases recorded in areas that have never or only irregularly been treated, little information has been obtained, a decided reduction in the number being observed in Argentina (epidemic malaria zone), Dominica, and the United States. In the remaining countries that have sent in reports, the extent of the problem continues more or less uncharged.

On this occasion information was also requested on non-autochthonous cases of foreign origin. Only Argentina, Puerto Rico, and the United States have replied to this question. In Puerto Rico and the United States the majority of the cases were observed among civilian or military personnel coming from the Far East. In the United States cases of Mexican origin were also recorded. In Argentina the cases in question were traceable to Bolivia and Paraguay.

Argentina states that the report includes only cases where unquestionable epidemiological documentation is available, though it is estimated that the real number of such cases is much higher, some included among those reported as autochthonous.

By way of general comment, attention is called to the need for modernizing the systems of registering patients in most countries and territories, and to the need for establishing standards and methods for ensuring the effectiveness and uniformity of such records with a view to stricter evaluation of antimalaria campaigns, especially if eradication is the objective.

Consumption and Distribution of Drugs. - Six countries (Argentina, Brazil, Colombia, Ecuador, Mexico, and Nicaragua) and four territories (British Guiana, Dominica, Santa Lucía, and Trinidad) have replied to the questionnaire on quantities of antimalaria drugs distributed as curatives.

The information is summarized in Table 10. From the study of the figures it can be seen that there is no definite tendency toward a specific type of medication. In the last four years some quinine has still been used (especially in Mexico, Nicaragua, and Santa Lucía) and considerable quantities of atebrine (Colombia and Mexico). There is no doubt that in recent years paludrine, and particularly choloroquine and its synonyms, have occupied a preferred place among the antimalaria drugs distributed by the NMS.

The question of the drugs used in malaria control deserves special study, since with the incomplete information obtained no comprehensive report can be presented on this subject. Apparently, on the basis of the information received, no reasonably adequate record of the use of these drugs is kept in the majority of the countries. Besides, it would seem that in some, the policy followed before the introduction of imagocides still prevails, that of indiscriminately filling defenseless people with curative antimalaria drugs, thereby obscuring or distorting the means of evaluating the results of present-day campaigns. Moreover, the opportunity is lost for these drugs to be of use as a means of detecting cases of malaria not reported at the proper time.

Parasitic Surveys.- These surveys have been classified in this report by taking into account the condition of the zones with respect to malaria control, as follows:

a) zones in which anti-*Anopheles* measures continue to be applied regularly (concurrent evaluation surveys); b) zones where malaria is considered eradicated; c) zones where no antimalaria measures are taken, or have been taken irregularly (exploratory surveys); and d) zones where drugs are utilized as the only regular method of control (not as curatives).

Table 11 shows that Argentina, Bolivia, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Nicaragua, Panama, Peru, Venezuela, French Guiana, and Jamaica regularly carry out evaluation surveys. Honduras began them in 1952.

Only Argentina, Ecuador, and British Guiana carry on surveys in zones where malaria is considered eradicated, and Venezuela, while furnishing no data, is known to do the same. Only three territories (Jamaica, Santa Lucía, and British Guiana) report surveys where no antimalaria measures are taken.

Brazil is the only country that has made surveys in zones where antimalaria drugs have been used experimentally as a preventive measure (not as curatives).

Consequently, Cuba, Guatemala, Haiti, Mexico, Paraguay, the United States, Dominica, Grenada, and Trinidad apparently do not carry out surveys regularly, while Puerto Rico has made them since 1951.

Of the 15 countries and territories that carry on evaluation surveys, 7 perform them through investigations in a single age group, as follows: Bolivia, the Dominican Republic, Honduras, Peru, French Guiana, and Jamaica, for the school-age group of from 6 to 15 years; Costa Rica does so for the ages between 0 and 14 years. Only two nations use two age groups as the basis of the surveys: Argentina, which uses the groups of 0-2 and 6-15 years of age, and Ecuador, with those of less than 5 and more than 16 years of age.

There are 5 countries that take three age groups: Brazil, Colombia, El Salvador, Nicaragua, and Panama, all of them with children under 5 years of age, from 6 to 15 years, and over 16 years of age. Finally, Venezuela uses all ages indiscriminately.

The number of persons examined in 1953 (all ages and all zones), its relation to the population of the malaria zone, and the parasitic index are set forth in the following table:

Countries and Territories	Persons Examined	Percentage of Population - Malaria Zone	Percentage-Positive Blood Parasites
Argentina	75,792	40.8	0.01
Ecuador	40,912	23.1	3.6
Venezuela	31,469	8.7	7.2
Brazil	29,055	1.1	2.3
Costa Rica	27,520	9.2	4.3
Peru	26,540	8.0	0.8
El Salvador	21,876	17.1	4.2
Panama	13,095	26.0	1.7
Bolivia	6,629	12.0	7.0
Jamaica	5,064	2.4	1.9
French Guiana ...	3,389	100.0	0
Colombia	2,281	0.3	3.0
Santa Lucía	2,603	30.0	7.5
Nicaragua	2,112	1.8	0
British Guiana...	1,512	3.2	3.0
Dominican Republic	1,108	1.0	3.4
Honduras	940	2.2	0.3

From the above it will be noted that Argentina, Ecuador, and Venezuela occupy the first three places in number of persons examined, but in relation to the population of the malaria zone, the first places go to: French Guiana (100%), Argentina (40.8%), and Santa Lucía (30.6%).

From a study of the parasitic indices shown by the surveys, it can be seen that the countries achieving the best results are: French Guiana (0%); Nicaragua (0%); Argentina (0.01%); Honduras (0.3%); and Peru (0.8%). In previous years the indices for Brazil were lower than for 1953, the explanation being that, instead of repeating the surveys in the same localities, it was preferred to carry them out in regions where cases of malaria were reported.

The percentage of infection with P. falciparum of the total positive hematological examinations was the following in 1953: a) in zones where regular anti-Anopheles measures are applied: Jamaica, 94.7%; Dominican Republic, 63.1%; Ecuador, 49.8%; Costa Rica, 41.1%; Panama, 37.1%; Bolivia, 34.2%; Honduras, 33.3%; Peru, 32.7%; Brazil, 29.9%; El Salvador, 24.6%; Venezuela, 10.4%; Colombia, 5.1%; Argentina, 0%; Nicaragua, 0%; and French Guiana, 0%; b) in areas where no antimalaria measures are applied: Jamaica, 90.8%; British Guiana, 85.0%; and Santa Lucía, 72.4%.

L. - PLANS FOR THE FUTURE

Table 19 shows the replies from each country on plans for the future. A study of their plans proves highly interesting:

Argentina, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, and Peru report over-all or partial programs for the eradication of malaria. In a supplementary report Cuba also mentions an eradication program.

Brazil, Bolivia, El Salvador, Haiti, Honduras, Mexico, Panama, and Paraguay describe plans to expand the control and treatment zones.

Mexico, Venezuela, Dominica, and Puerto Rico state specific plans to intensify the control of other vectors, particularly the house fly and the Aëdes aegypti.

French Guiana, as a step forward, stresses the treatment of immigrants infected with Plasmodium. This objective

should be given emphasis as an initial step toward treating malaria in the future as a quarantinable disease in those countries that have not eradicated the causal agent.

Concerning the advisability of coordinating activities with neighboring countries, 17 countries and 6 territories replied in the affirmative. Two territories -- Dominica and Jamaica -- replied in the negative, and Mexico and Puerto Rico failed to reply to the question.

Twelve countries and 4 territories desire economic aid or collaboration. Fifteen countries and 5 territories replied that they desired technical aid or collaboration.

The types of assistance the countries consider most necessary are: equipment and materials; fellowships and other facilities for training personnel; loans of technical personnel, particularly entomologists; and visits by experts.

Two countries (Argentina and the United States) requested this collaboration in the form of information on the status of malaria in the Continent, a request that emphasizes the importance now given to the malaria situation in other countries.

The following conclusions were derived from a study of this information:

1) That several countries are already planning a program for the eradication of malaria.

2) That several countries feel that they have overcome the problem to the point where they are planning to expand their activities to other fields in the campaign against other insect vectors.

3) That with two exceptions, the remainder of the countries and territories in the Hemisphere deem it advisable that their activities be coordinated, a fact that points to an awareness that the malaria problem in one country can be controlled but not entirely eliminated unless joint action is carried out among neighboring countries, in order to eliminate the possibility of reinfection.

4) That collaboration or aid provided to the different countries to enable them to pursue their own antimalaria programs, or to integrate them in a continental program, should be divided into four well-defined forms: a) information and coordination; b) facilities for training personnel; c) provision of equipment and materials; and d) assignment of technical personnel and visits made by experts.

II. NEED FOR A COORDINATED PLAN FOR THE ERADICATION OF MALARIA IN THE AMERICAS

Four years ago, the last part of the IV Report on the status of the antimalaria campaign in the Continent carried a discussion on the technical and economic possibilities of coordinating a plan for the eradication of malaria in the Americas. In considering these possibilities, the aspects of epidemiology, organization, technical assistance, and cost of an over-all program were analyzed, and finally summarized as follows: five years after the introduction of DDT, two countries (Argentina and the United States) had almost solved their endemic malaria problem; two others (Brazil and Venezuela) were on the way to an early solution; and a fifth country (Ecuador) was vigorously pursuing the same goal; these five countries accounted for 75% of the dwellings in the malaria zone of the Continent; and the programs started in Central America and other countries with the aid of the WHO/PASB, and UNICEF would reduce the remaining figure to only 20% by the beginning of 1951. There was therefore a reasonable expectation that the balance would be covered in the following five years.

Shortly before the end of the 5-year period, a new estimate showed that 22% of the inhabitants of the malaria zone are still without protection. It is therefore evident that the rate of progress achieved in the 5-year period 1945-1949 has slackened.

There are four apparent factors in this situation:

1) The decrease of interest in and concern with malaria, owing to the fact that this disease has ceased to be the public health, economic, and social problem it once was.

2) The lack of financial support to expand the programs, and, in some countries, even the restriction of funds previously allotted for this purpose.

3) The weakening of the intellectual "drive" to solve the problem on the part of the experts responsible for the campaign, which began after the unexpected success of their first operations had been confirmed, and especially when field work became a monotonous and uninteresting routine.

4) The additional responsibilities taken on by the NMS, particularly heterogeneous activities, which led to a dissipation of efforts and a lowering in the quality of antimalaria work.

If these four negative factors meant no more than a delay in the program to expand the antimalaria campaign to the whole continent, there would be no need, perhaps, to do anything more than adopt a policy of "patience and perseverance". But two other extremely serious factors have appeared in the period in question: in different parts of the world, a resistance to DDT in some anopheline vectors; and the appearance of another type of resistence--no less serious--in officials in charge of public funds who seem less and less inclined to increase or even to maintain allotments for a campaign that, both socially and politically, seems to have lost in timeliness.

The appearance of resistance in the Anopheles was foreseeable, in view of what happened to the house fly and to other insects harmful to agriculture. It was merely a question of determining under what circumstances and when this phenomenon would come about in natural conditions. The studies on the A. sacharovi in Greece unmistakably demonstrated the capacity of this species to acquire, after several years of exposure to DDT, a physiological resistance favored by the concurrent application of the same product as a larvicide. The same situation has occurred with the A. quadrimaculatus in some regions of the United States.

The expectation of neutralizing this resistance by alternating imagocides allows only a truce. Since all these substances (those of prolonged residual action) belong to the same chemical family (chlorinated hydrocarbons), it is reasonable to suppose that the same result will be obtained with the Anopheles as with other insects that on acquiring resistance to any member of the family (DDT, BHC, Chlordane, Dieldrin, etc.), develop at the same time a capacity to acquire resistance against the rest of the family much more quickly.

Observations on the A. albimanus in Panama show a yet more serious type of resistance; namely, that of changes in behavior (behavioristic resistance), which makes the insect capable of eluding to some extent the surfaces on which the imagocide has been applied. Although no specific studies have been made on this subject, 4 countries and 3 territories have reported observing the presence or increase of anopheline vectors in the houses sprayed, or some changes in their behavior. If there are no other affirmative replies as to confirmations of well-established resistance, it is probably not because they do not exist to some degree, but rather because no precise investigations have been

carried out, or because in the majority of countries the period of time in which such symptoms start to appear has not elapsed.

Very little imagination is necessary, then, to determine the prognosis of malaria in the Continent in future years, when DDT and other insecticides begin to lose their "virtue", unless the sources of infection are eliminated by then. To support this view it is appropriate to quote a paragraph from the 1953 Annual Report of the Director-General of WHO:

> "...the fact that in some countries in 1953 the local malaria vectors had developed DDT resistance after several years of spraying campaigns suggests that programmes of malaria control for a country or group of countries should be planned so that the application of the insecticides could be withheld before the time when resistance might develop (never less than five years, so far as has been reported). Obviously, when malaria transmission has ceased, this does not imply that the anopheline vector species has been eradicated; indeed, the anopheles density may even be nearly as high as before control. If subjects carrying malaria parasites come into the country, the transmission may be started again, but the danger would decrease in direct proportion to the number of neighbouring countries from which malaria was also eradicated. When active malaria control is interrupted, it will have to be replaced by a policy of defence against the reintroduction of malaria, and the prevention-or immediate suppression-of transmission. For this purpose, it will be necessary to ensure the adequate and immediate notification of new cases of malaria and the decentralization of facilities for diagnosis and for epidemiological research; and, in case of an epidemic it may be necessary to resume the insecticide spraying (which is why the campaign should be withheld when the insecticide is still active on the vector species) and the use of chemotherapeutics."

The other resistance mentioned previously -- that of those administering public funds -- has already begun to appear in several countries in which malaria has lost the power to attract the attention it previously evoked when it produced such disastrous effects. Thus, it is also of the greatest importance to eradicate all sources of infection before this type of resistance has become deeply rooted.

As a bright side to the dark picture given above, some events have taken place that should be pointed out and discussed.

1. Four countries and two territories have demonstrated that malaria can be eradicated and that this possibility results in immense public health, social, and economic benefits, these last being all the more obvious if operations can be suspended or discontinued.

2. Seven other countries indicate as aspirations for the future: the development of total or partial eradication programs, thereby demonstrating that a mature and widespread awareness of the need for eradication now exists in the Americas, in sharp contrast to the aspirations of little less than ten years ago, when the NMS still spoke of the "sanitation" of given places, which represented mere pinpoints of conquered territory on the malaria map of the country.

3. A revolutionary change has been brought about in the position of malaria in the field of international health. Until less than a decade ago, the assumption was that it constituted a local problem, of purely local importance, which should be approached and solved by way of local formulae. At present this problem and its repercussions, now beyond the sphere of national concern, have become a problem of international proportions. Two countries have already shown their interest in keeping up to date with the epidemiological situation of the rest, as happened in the case of plague, cholera, or smallpox at the beginning of this century; and one territory has announced its intention of keeping a parasitological check on immigrants. The word "imported" already figures in malaria terminology, and it is logical to foresee that those countries which have eradicated the desease, or are in process of doing so, will find that they are obliged to protect themselves by demanding from persons entering the country certificates attesting that they come from immune regions, or by imposing compulsory sterilizing treatment.

4. New residual-action insecticides have been discovered, and improved knowledge of the qualities and defects of those in use has made it possible to determine the one that proves most appropriate or desirable, and in what formulae according to the bionomic charasteristics of the vector, the environmental conditions under which transmission takes place, and economic factors.

5. New drugs have appeared and experiments have been carried out in new methods of treatment and of chemical prophylaxis (chloroquinated salt) by means of which not only can a radical cure be effected but also the appearance of new cases of infection can be prevented in communities subjected to a mass prophylaxis program.

6. New and improved knowledge of the epidemiological situation of malaria in the various countries and territories has been acquired, and tactical and strategical methods of achieving eradication have been perfected. It can therefore be asserted that an "eradication technique" is now available.

7. Seventeen countries and six terrotories have categorically declared themselves in favor of the coordination of activities in the antimalaria campaign.

To sum up: an awareness of the need for malaria eradication now exists in the Americas, as well as a widespread will to coordinate activities on regional or zone levels; and better means of waging the campaign and improved working techniques have been discovered. Yet with all this there is the spectre of the loss of all these gains if we are not able to take timely advantage and make adequate use of them. It is a serious responsibility with which the present generation is faced.

If it is decided to coordinate a hemispheric plan for the eradication of malaria in the Americas, the following suggestions are put forward:

1. <u>At the national level:</u>

(a) Reorganization of the NMS, entrusting them with the entire responsibility for the antimalaria campaign and granting them technical and administrative authority to carry out nationwide eradication programs.

(b) Assurances that the necessary financial resources will be available to cover the entire country.

(c) Promotion of adequate coordination of activities among all the institutional and public health services so as to ensure the correct recording and identification of malaria cases, and direct reporting to NMS.

(d) The bringing up to date of antimalaria legislation

by establishing as fundamental: the authorization of the public health service to spray imagocides in dwellings; the immediate reporting to the NMS of any cases; their parasitological confirmation, on the basis of a compulsory blood test; and the adequate treatment (radical cure) of the patient or carrier.

(e) Granting of facilities to the personnel of the NMS to attend advanced training courses and international meetings of the heads of NMS.

(f) Granting of training facilities to technical, auxiliary and field personnel, coming from neighboring countries.

At the hemispheric level:

Giving concrete form to the decision of the countries in an Agreement, with definite pronouncements on:

(a) Objectives: over-all campaign; eradication; prevention of the exportation of malaria.

(b) Means of achieving these objectives: coordination; cooperation; information; technical and economic assistance.

(c) Responsibility of the Pan American Sanitary Bureau for the preparation, promotion, and supervision of a coordinated plan for the eradication of malaria in the Continent.

3. In the international organizations (WHO - PASB)

(a) Provision, to those countries that require it, of the technical assistance indispensable for the organization of their NMS and for the preparation of over-all or progressive operational plans with a view to effective action carried out in both breath and depth.

(b) Encouragement of collaboration at the regional level by means of agreements between neighboring countries or groups of countries having common interests.

(c) The encouragement of economic participation of other international organizations interested in similar or related objectives.

(d) The standardization and distribution, on a permanent and periodical basis, of a systematic report on the malaria

situation in each country or territory, and on operational developments and the public health results obtained.

(e) The selection and permanent distribution of technical and scientific information on facts and advances of practical interest in the antimalaria campaign.

(f) The organization of regional meetings of those persons chiefly responsible for the antimalaria campaign in those areas of the Continent where the Bureau considers appropriate the discussion of the unification of techniques, the coordination of border activities, and improvement in the strategy of the antimalaria campaign.

(g) The promotion, in collaboration with such schools as offer facilities, of refresher courses for administrative personnel, planned to cover eradication techniques.

From the time of the International Sanitary Conference of the American Republics, held in Washington in 1902, fifty-two years ago, to this day, the countries of this Continent have continued to display at all Pan American public health meetings a united interest in the problem of malaria. In 1942, with the first report of the Pan American Malaria Committee submitted at the XI Pan American Sanitary Conference held in Rio de Janeiro, a record of the status of the antimalaria campaign in the Hemisphere was inaugurated; and this has been periodically brought up to date, the present report, No V, being the latest in the series.

No group of nations in the world has shown for more than 50 years so sustained an interest in malaria and can present over a period of 12 years so complete and up-to-date a history of the situation and the campaign; nor is there any other group that has been advocating coordinated action and the exchange of information for so many years, as the peoples of this Hemisphere.

At present, the coordination of a plan for the eradication of malaria in the Americas is, therefore, not merely a technical, public health, and economic need, but also a mandate of history.