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Topic 22: STATUS OF MALARIA ERADICATION IN THE AMERICAS

VI REPORT

TABLE OF CONTENTS

STATUS OF MALARIA ERADICATION IN THE AMERICAS

ROLE OF INTERNATIONAL ORGANIZATIONS IN MALARIA ERADICATION IN THE AMERICAS

FIGURES AND TABLES

A B B R E V I A T I O N S

PASB	Pan American Sanitary Bureau
WHO	World Health Organization
NMES	National Malaria Eradication Service(s)
NMS	National Malaria Service(s)
NPHS	National Public Health Service(s)
UNICEF	United Nations Children's Fund
ICA	International Cooperation Administration
WHO/TA	World Health Organization/Technical Assistance
PASO/SMF	Pan American Sanitary Organization/Special Malaria Fund

STATUS OF MALARIA ERADICATION IN THE AMERICAS

VI REPORT

Introduction

The XIV Pan American Sanitary Conference (Santiago, 1954) declared of the utmost urgency the need for carrying out the terms of Resolution XVIII of the XIII Conference (Ciudad Trujillo, 1950) referring to the eradication of malaria in the Americas, and it recommended to the governments the immediate conversion of their control programs into eradication programs. At the same time, it gave a mandate to the Pan American Sanitary Bureau to promote and coordinate this action, securing the necessary technical and financial assistance. Later, the Eighth World Health Assembly (Mexico City, 1955) recommended "the implementation of a program having as its ultimate objective the world-wide eradication of malaria."

Following the same pattern as that of the two previous reports,[1/] the present report, the sixth in the series, presents first a complete comparative and critical study of the present status of antimalaria activities in the Americas and a description of the progress achieved since the historical resolution of Santiago, Chile. This presentation differs from that adopted for the annual reports to the Directing Council, which consisted simply of an objective consolidation of the information furnished by the Member Governments.

The second part has a different purpose from that of previous reports, which were devoted to remarks and recommendations on the need for certain measures to intensify and perfect the antimalaria campaign or to promote and coordinate the eradication work. The present report will show the role played by international agencies and the manner in which the Organization has carried out the task entrusted to it in Santiago, Chile.

The third part contains a résumé of the present situation and the prospects for the future, together with proposals for plans of action.

In view of the historical and political importance of the decisions taken by the Governing Bodies of the international organizations on the subject of malaria eradication, the pertinent resolutions are reproduced as an annex to this document.

1/ PASB/WHO Publication Nº 261, Annex B. Situación de la Lucha Antimalárica en el Continente Americano, IV Informe, C. A. Alvarado; and PASB/WHO Scientific Publications Nº 27, Status of the Antimalaria Campaign in the Americas, V Report, C. A. Alvarado.

General Picture

The fight against malaria with imagocides was begun in the Americas as soon as the efficacy of residual-action insecticides became known and the products became commercially available. Dramatic progress was made between 1945 and 1949, by which time control operations had covered two thirds of the Hemisphere's malarious areas. During the four subsequent years (1950-1953) there was no setback in the antimalaria work, and some countries even extended the areas of malaria eradication or actually completed eradication. However, there was an evident slackening of the initial impetus and a contagious deterioration in the quality and status of the national malaria services that foretold a progressive reduction in the activities and a loss of the gains achieved up to that time. This situation, clearly explained in the V Report, and the increasing threat of resistance of the vectors to insecticides, led to the forceful resolution of Santiago. The change observed since that time is striking. With the exception of three small areas of little epidemiological importance (in Cuba, British Guiana, and Dominica), the entire Hemisphere is now covered by eradication programs. Figure 1 illustrates the status as of 31 July 1958. Only three countries (Brazil, Colombia, and Haiti) have yet to begin total-coverage operations; but active preparatory work is under way and the operations are to be initiated in September 1958 in Colombia and Haiti, and in January 1959 in Brazil. Nicaragua, which had begun total coverage, found it necessary to revise its plan of operations, and will resume total coverage probably before the end of the year. Table 1 shows an impressive "YES" line in the eradication program column, while only one affirmative reply appears in the column for control programs, to which should be added the reply of another country that did not forward information. The same table shows the initiation and termination dates of total coverage. The last column at the right thus gives the outlook for the malaria situation in the Hemisphere in 1962.

This extraordinary undertaking of the Americas will undoubtedly have important repercussions on the future of public health in this part of the world, not only because of the elimination of malaria, but because of the vast experience obtained for operations of great scope and because of what will be left for posterity as an example of continental collaboration and solidarity.

The program of malaria eradication in the Western Hemisphere has given great impetus to the development of the concept of "eradication" in public health. Some aspects of the program merit special comment: the collection of basic documentation and its detailed study; the development of procedures for geographic reconnaissance "inch by inch," for the purpose of locating and numbering all houses; the rigid planning of each operation, adapted to a strict chronology; the training and retraining of all personnel at the various levels; the establishment of a supervisory structure; the adjustment of administrative and financial measures; and the enactment of up-to-date legislation and regulations.

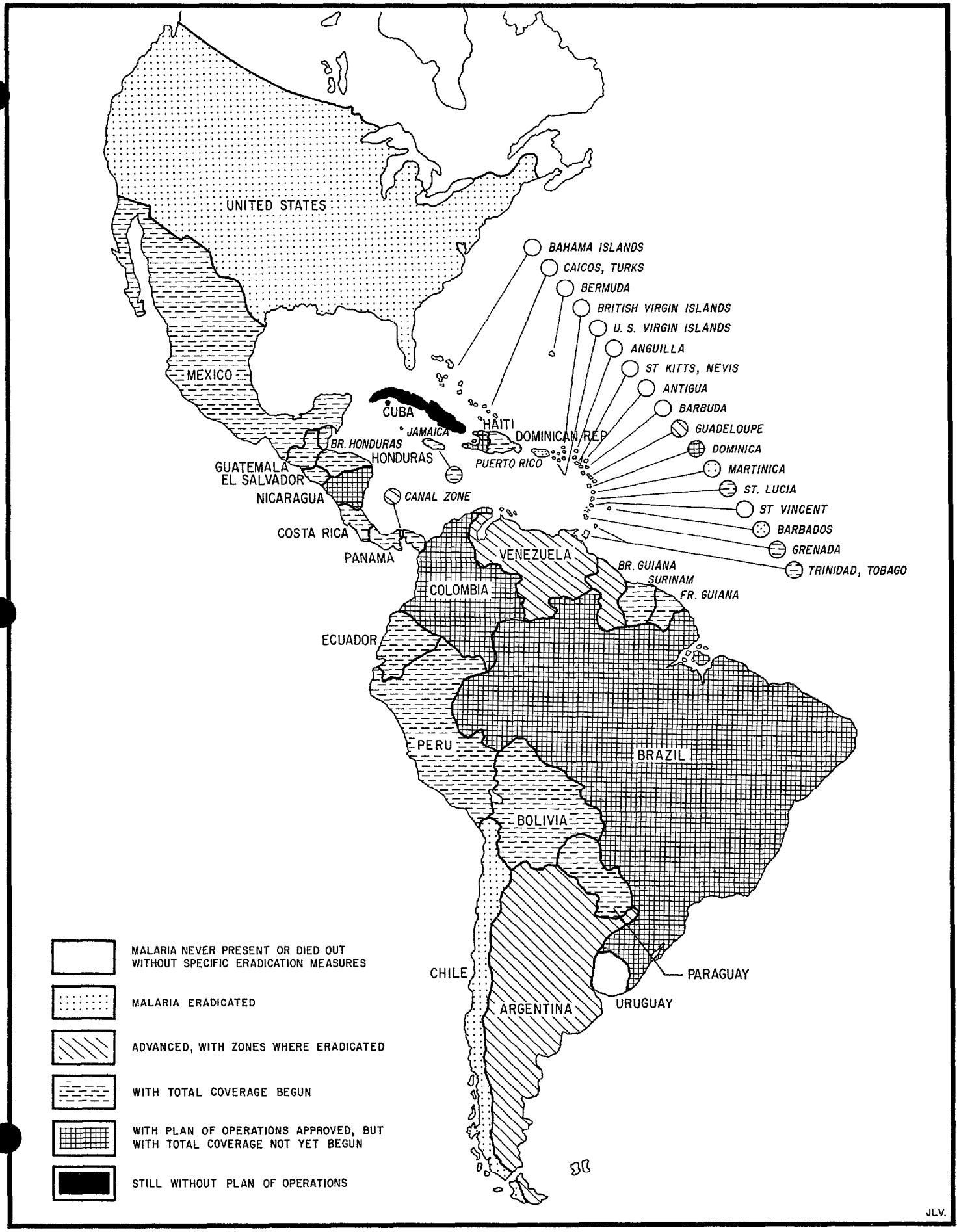

FIGURE I.- STATUS OF THE MALARIA ERADICATION PROGRAM IN THE AMERICAS, 31 JULY 1958.

Table 1

STATUS OF MALARIA ERADICATION CAMPAIGN IN THE AMERICAS, 1958

Country or Other Political Unit	Status of Program			Eradication by Total Coverage of Malarious Areas			
				Period of conversion		Period of total coverage	
	Eradication by total coverage of malarious areas	Eradication by areas	Control	Date started or will start	Date completed or will be completed	Date started or will start	Date completed or will be completed
Argentina	Yes	-	-	April 1949	Aug. 1949	Sept. 1949	a)
Bolivia	Yes	-	-	July 1, 1957	June 30, 1958	July 1, 1958	June 30, 1962
Brazil b)	-	Yes	-	Dec. 1957	Dec. 1958	Jan. 1959	a)
São Paulo	Yes	-	-	Dec. 1, 1957	Aug. 31, 1958	Sept. 1, 1958	Mar. 1, 1962
Colombia	Yes	-	-	Jan. 1, 1958	Sept. 7, 1958	Sept. 8, 1958	Mar. 8, 1962
Costa Rica	Yes	-	-	Jan. 1, 1956	June 30, 1957	July 15, 1957	Jan. 31, 1961
Cuba	**	**	**	**	**	**	**
Dominican Republic	Yes	-	-	Mar. 1, 1957	June 30, 1958	July 1, 1958	June 1962
Ecuador	Yes	-	-	Sept. 1, 1956	Feb. 28, 1957	Mar. 18, 1957	Mar. 31, 1961
El Salvador	Yes	-	-	Feb. 1955	June 30, 1956	July 1, 1956	Dic. 31, 1959
Guatemala	Yes	-	-	Feb. 1, 1955	July 31, 1956	Aug. 1, 1956	Sept. 15, 1960
Haiti	Yes	-	-	Oct. 1, 1957	Aug. 1958	Sept. 1958	Dec. 31, 1962
Honduras	Yes	-	-	June 1956	Jan. 1958	Jan. 1958	Jan. 1962
Mexico	Yes	-	-	Sept. 7, 1955	Dec. 31, 1957	Jan. 2, 1957	Dec. 31, 1960
Nicaragua	Yes	-	-	July 1956	Oct. 1957	c) Nov. 11, 1957	a)
Panama	Yes	-	-	Jan. 1, 1956	July 31, 1957	Aug. 19, 1957	Aug. 19, 1961
Paraguay	Yes	-	-	Jan. 1, 1957	Oct. 29, 1957	Oct. 30, 1957	Oct. 29, 1961
Peru	-	Yes	-	Jan. 1957	Nov. 1957	Nov. 15, 1957	a)
Venezuela	Yes	-	-	1945	1950	1950	1960
Other Political Units							
British Guiana	-	d) Yes	e) Yes	Jan. 1945	Jan. 1949	1947	d) 1949
British Honduras	Yes	-	-	Feb. 1, 1956	Dec. 31, 1956	Feb. 4, 1957	Dec. 31, 1961
Dominica	-	-	Yes	Aug. 1958	Dec. 1958	Jan. 1959	Jan. 1963
French Guiana	Yes	-	-	-	-	May 1948	f) 1953
Grenada	Yes	-	-	July 1956	Feb. 1957	Feb. 1957	Jan. 1960
Guadeloupe	Yes	-	-	1955	1956	1957	1960
Jamaica	Yes	-	-	April 1957	Dec. 1957	Jan. 1958	Dec. 1961
Panama Canal Zone	Yes	-	-	April 1956	...	...	...
St. Lucia	Yes	-	-	Jan. 1, 1956	June 30, 1956	July 1, 1956	Dec. 31, 1959
Surinam	Yes	-	-	Nov. 1957	April 1958	May 2, 1958	1961
Trinidad and Tobago	Yes	-	-	June 1957	Dec. 1957	Jan. 1958	Dec. 1961

a) To be determined.
b) Not including the State of São Paulo.
c) Program temporarily interrupted.
d) Refers only to the coastal area.
e) Eradication in the coastal area but control program for sparsely populated interior.
f) Reimportation in 1954, spraying recommenced.

- Nil.
** Report not received.
... Data not available.

Each country has done all this for the preparation of its malaria eradication plan, and all these efforts have produced invaluable documents that serve as guides for the campaign activities. Figure 2 shows some of these documents.

Another aspect is the unification of techniques and the periodic review of results. In frequent seminars, workshops, and meetings of directors and other executives of the malaria programs, each country reports on the different phases of its campaign and describes with unusual frankness the progress it has achieved, facts that are analyzed and discussed to the last detail by all participants, in an extraordinary atmosphere of comradeship and solidarity.

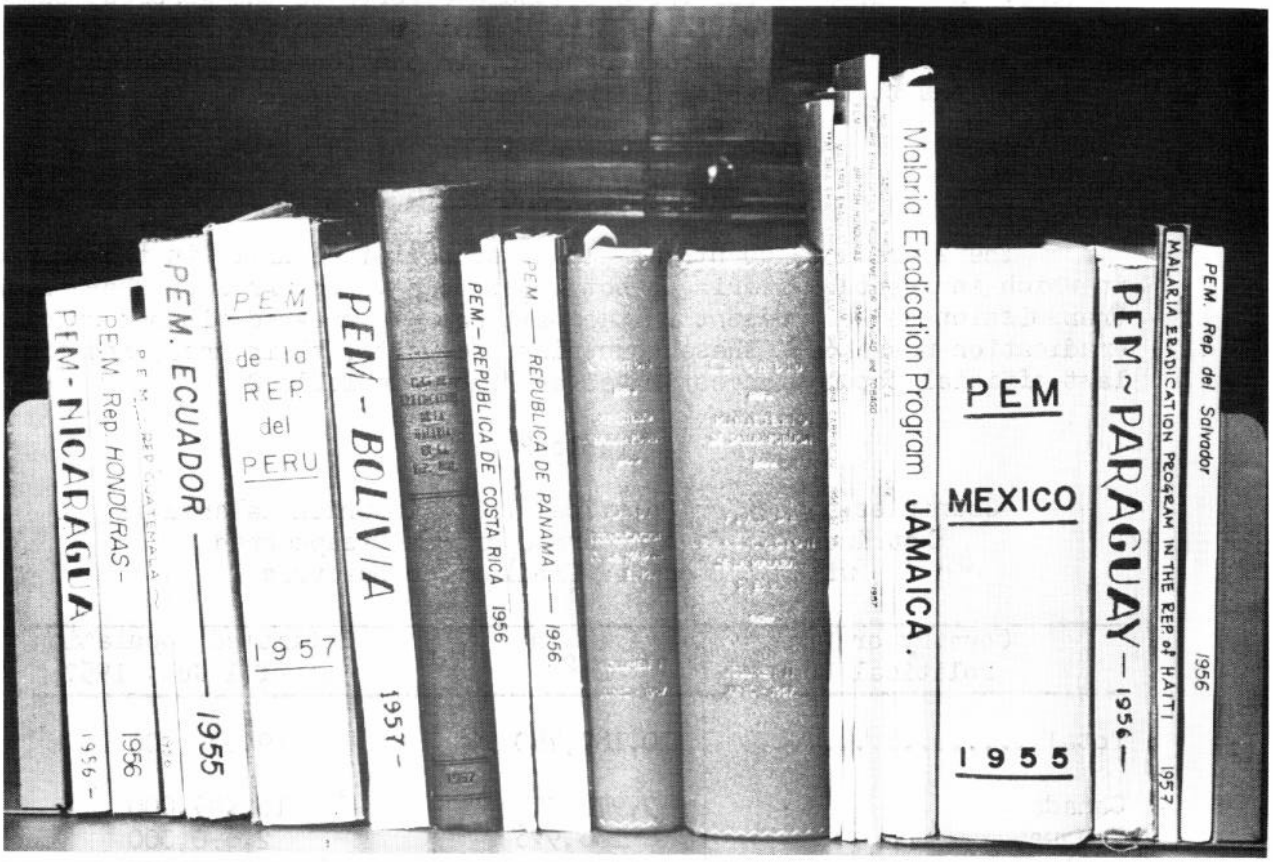

Fig. 2. The Plans of Operation for the Eradication of Malaria from the Americas.

In this way there have been developed new concepts and new techniques and procedures which are the heritage, not of any one country, but of all; and their underlying philosophy is that of achieving constant improvement and more effective results.

At the national level, the malaria eradication program has sought and obtained the collaboration of the entire community. The different agencies within the national health service, medical and paramedical groups, the schools, the armed forces, the clergy, social security institutions, private organizations, and the public in general all give their support to the campaign, thereby making this public health endeavor a program by the nation and for the nation.

At the international level, collaboration has been extensive and fruitful. An unmistakable demonstration of this is the fact that all the countries without exception have offered maximum facilities for the utilization of their programs as observation or training areas. Brazil, Jamaica, and Mexico have joined with the long-established and traditional School of Malariology of Venezuela to create other international training centers. And added to all these splendid efforts is the generous support offered by four other countries (the Dominican Republic, Haiti, the United States of America, and Venezuela) in the form of financial contributions to the Special Malaria Fund.

Extent of the Problem

There are some countries and other political units in the Americas in which indigenous malaria is not known to have occurred or where such transmission as was present in the past has disappeared without specific eradication measures. These countries and units, their area, and the last official population estimates are shown in Table 2.

Table 2

Countries and Other Political Units in which Malaria is Not Known to Have Occurred or Has Disappeared without Specific Eradication Measures

Country or Other Political Unit	Area in Km^2	Estimated Population as of 1 July 1957
Total	10,187,740	19,877,000
Canada	9,974,375	16,589,000
Uruguay	186,926	2,690,000
Antigua	442	55,000
Bahamas	11,396	120,000
Bermuda	53	42,000
Falkland Islands	11,961	2,000
Montserrat	83	17,000
Netherland Antilles	961	190,000
St. Kitts-Nevis -Anguilla	396	55,000
St. Pierre and Miquelon	240	5,000
St. Vincent	389	80,000
Virgin Islands (Br.)	174	8,000
Virgin Islands (U.S.A.)	344	24,000

In addition, there are others that are at present free from indigenous malaria as the result of active measures to eradicate the disease. Table 3 shows their area and population estimates, together with the original area in which malaria transmission had occurred and the population therein.

Table 3

Countries and Other Political Units Where Malaria Has Been Eradicated

Country or Other Political Unit	Area in Km^2	Population	Original Malarious Areas	
			Area in Km^2	Population
Total	10,098,948	179,993,000	2,322,691	45,014,000
Chile	741,767	6,681,000	55,287	112,000
United States of America	9,346,751	170,547,000	2,257,809	42,366,000
Barbados	431	230,000	430	228,000
Martinique	1,102	255,000	300	45,000
Puerto Rico	8,897	2,280,000	8,865	2,263,000

The countries and other political units referred to in Tables 2 and 3 will not be mentioned further in this report, with the exception of the United States of America, to which reference will be made in relation to its special epidemiological situation.

Table 4 shows the extent of the problem by area as of 31 July 1958 and Table 5 the extent of the problem in terms of population. From these tables it can be seen that Argentina, Brazil, Venezuela, British Guiana, Guadaloupe, and Surinam claim eradication in parts of their original malarious area. The total area from which malaria has been eradicated is 407,744 km^2, inhabited by an estimated 4,531,000 persons. Venezuela is responsible for the greatest part of this achievement, the 372,604 km^2 there, inhabited by some 3,065,000 persons, being the largest area from which malaria has been eradicated in the tropics.

It can therefore be said from Tables 3, 4, and 5 that the original malarious area in the Americas was 14,558,083 km^2, inhabited by 131,430,000 persons, and that as of 31 July 1958 malaria has been eradicated from 2,730,435 km^2 (18.8 per cent), thus protecting 49,545,000 persons or 37.7 per cent of the population initially at risk. The largest share of this population is in the United States of America.

Table 4

EXTENT OF MALARIAL PROBLEM BY AREA IN THE AMERICAS, 1958

Country or Other Political Unit	Total Area in Km²	Original Malarious Area in Km²	Area with Malaria Eradicated		Area under Surveillance		Area with Malaria not yet Eradicated	
			Three or more years without indigenous case		Less than three years without indigenous case		Regularly sprayed	Not regularly sprayed (a)
			Area in Km²	Spraying continued	Area in Km²	Spraying continued	Area in Km²	Area in Km²
Total	19,539,572	12,235,392	407,744		140,242		8,877,996	2,809,410
Argentina	2,778,412	120,000	26,200	No	23,000	No	70,800	-
Bolivia	1,098,581	842,018	-	-	-	-	842,018	-
Brazil b)	8,268,814	7,299,969	611	Yes	-	-	5,958,814	1,340,544
São Paulo	247,223	110,318	-	-	-	-	-	110,318
Colombia	1,138,355	1,026,433	-	-	-	-	-	1,026,433
Costa Rica	50,900	31,526	-	-	-	-	31,526	-
Cuba	114,524	**	**	**	**	**	**	**
Dominican Republic	48,734	41,010	-	-	-	-	41,010	-
Ecuador	270,670	153,498	-	-	-	-	153,498	-
El Salvador	20,000	19,310	-	-	-	-	19,310	-
Guatemala	108,889	80,380	-	-	-	-	80,380	-
Haiti	27,750	21,300	-	-	-	-	-	21,300
Honduras	112,088	87,383	-	-	-	-	87,383	-
Mexico	1,969,269	928,749	-	-	-	-	928,749	-
Nicaragua	148,000	127,199	-	-	-	-	8,126	119,073
Panama	74,470	68,499	-	-	-	-	68,499	-
Paraguay	406,752	42,286	-	-	-	-	42,286	-
Peru	1,249,049	154,191	-	-	-	-	154,191	-
Venezuela	912,050	600,000	372,604	Yes	36,464	Yes	190,932	-
Other Political Units								
British Guiana	215,800	215,800	4,940	No	-	-	19,760	191,100
British Honduras	22,965	22,965	-	-	-	-	22,965	-
Dominica	789	642	-	-	-	-	-	642
French Guiana	91,000	80,000	-	-	80,000	Yes	-	-
Grenada	344	160	-	-	-	-	160	-
Guadeloupe	1,780	1,136	69	...	752	Yes	315	-
Jamaica	12,188	10,050	-	-	-	-	10,050	-
Panama Canal Zone	1,432	1,438	-	-	-	-	1,438	-
St. Lucia	616	524	-	-	-	-	524	-
Surinam	143,000	143,470	3,320	No	-	-	140,150	-
Trinidad and Tobago	5,128	5,138	-	-	26	No	5,112	-

a) Includes areas not sprayed under a plan of total coverage.
b) Not including the State of São Paulo.

\- Nil.
** Report not received.
... Data not available.

Table 5

EXTENT OF MALARIAL PROBLEM BY POPULATION IN THE AMERICAS, 1958

Country or Other Political Unit	Total Population Estimate 1957	Population of the Original Malarious Area	Area with Malaria Eradicated		Area under Surveillance		Area with Malaria not yet Eradicated	
			Three or more years without indigenous case		Less than three years without indigenous case		Regularly sprayed	Not regularly sprayed (a)
			Population	Sprying continued	Population	Spraying continued	Population	Population
Total	177,795,000	86,416,000	4,531,000		1,493,000		53,865,000	26,527,000
Argentina	19,858,000	1,473,000	247,000	No	711,000	No	515,000	-
Bolivia	3,273,000	1,102,000	-	-	-	-	1,102,000	-
Brazil b)	58,538,000	29,495,000	638,000	Yes	-	-	19,921,000	8,936,000
São Paulo	2,730,000	2,678,000	-	-	-	-	-	2,678,000
Colombia	13,227,000	9,787,000	-	-	-	-	-	9,787,000
Costa Rica	1,035,000	451,000	-	-	-	-	451,000	-
Cuba	6,410,000	**	**	**	**	**	**	**
Dominican Republic	2,698,000	2,417,000	-	-	-	-	2,417,000	-
Ecuador	3,890,000	1,955,000	-	-	-	-	1,955,000	-
El Salvador	2,350,000	1,385,000	-	-	-	-	1,385,000	-
Guatemala	3,430,000	1,448,000	-	-	-	-	1,448,000	-
Haiti	3,384,000	4,096,000	-	-	-	-	-	4,096,000
Honduras	1,770,000	1,282,000	-	-	-	-	1,282,000	-
Mexico	31,426,000	15,588,000	-	-	-	-	15,588,000	-
Nicaragua	1,331,000	1,071,000	-	-	-	-	95,000	976,000
Panama	960,000	910,000	-	-	-	-	910,000	-
Paraguay	1,638,000	700,000	-	-	-	-	700,000	-
Peru	9,923,000	2,878,000	-	-	-	-	2,878,000	-
Venezuela	6,134,000	4,479,000	3,065,000	Yes	469,000	Yes	945,000	-
Other Political Units								
British Guiana	515,000	460,000	423,000	No	-	-	34,000	3,000
British Honduras	84,000	82,000	-	-	-	-	82,000	-
Dominica	62,000	51,000	-	-	-	-	-	51,000
French Guiana	29,000	25,000	-	-	25,000	Yes	-	-
Grenada	94,000	26,000	-	-	-	-	26,000	-
Guadeloupe	250,000	210,000	34,000	...	127,000	Yes	49,000	-
Jamaica	1,594,000	1,296,000	-	-	-	-	1,296,000	-
Panama Canal Zone	55,000	40,000	-	-	-	-	40,000	-
St. Lucia	91,000	68,000	-	-	-	-	68,000	-
Surinam	251,000	250,000	124,000	No	-	-	126,000	-
Trinidad and Tobago	765,000	713,000	-	-	161,000	No	552,000	-

a) Includes areas not sprayed under a plan of total coverage.
b) Not including the State of São Paulo.

- Nil.
** Report not received.
... Data nor available.

In considering this reported achievement one must keep in mind the criteria of malaria eradication as put forward by the WHO Expert Committee on Malaria in its Sixth Report,[1] which states;

"To establish the claim in relation to a specific defined area, there should exist:

(1) proof that an adequate surveillance system has operated in the area for at least three years, in at least two of which no specific anopheline control measures have been carried out; any claim based on a lesser period of post-operational surveillance would need to be supported by proof of a surveillance mechanism above the usual quality;

(2) evidence that in this period of three years no indigenous cases, originating within that time, have been discovered;

(3) the evidence of a register of malaria infections discovered during that time, it being established beyond reasonable doubt that each case was either:

(a) imported, as shown by the tracing of the case to its origin in an acknowledged malarious area; or

(b) a relapse of a pre-existing infection, as shown by the history of the case and the absence of any associated cases in the neighbourhood of its origin; or

(c) induced, as shown by its relation to a blood transfusion within an appropriate interval or to another form of parenteral inoculation to which infection could be properly attributed; or

(d) directly secondary to a known imported case."

In addition to those areas described above, from which malaria has been eradicated, Tables 4 and 5 show that 140,242 km^2, inhabited by some 1,493,000 persons, are reported to be under surveillance.

For the area from which malaria has not been eradicated, Tables 4 and 5 show a division based on the status of spraying operations. There are 8,877,996 km^2, with 53,865,000 inhabitants, where organized total-coverage spraying operations are under way. In 2,809,410 km^2, with a population of 26,527,000, spraying has not begun or is irregular or incomplete, but with the eradication programs soon to commence in Brazil, Colombia and Haiti, these figures will be dramatically reduced.

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[1] Wld Hlth Org. techn. Rep. Series, 1957, No. 123, p. 18.

Table 6 summarizes the achievements to date and gives an indication of the work still to be done for the eradication of malaria from the Americas.

Table 6

Present Status of the Eradication of Malaria by Area and Population in the Americas*, 31 July 1958

Status	Area	Per Cent	Population	Per Cent
Total	39,826,260	100.0	377,665,000	100.0
Malaria never indigenous or has disappeared without specific eradication measures	25,153,653	63.1	239,825,000	63.5
Malaria eradicated	2,730,435	6.8	49,545,000	13.1
Under surveillance	140,242	0.4	1,493,000	0.4
Malaria still present but organized program of total coverage under way	8,877,996	22.3	53,865,000	14.3
Malaria still present but eradication program in the preparatory phase	2,618,310	6.6	26,524,000	7.0
Transmission known to occur but no organized program of total coverage under way	305,624	0.8	6,413,000	1.7

* Not including Greenland

Present Status of National Malaria Eradication Services

The service in charge of the campaign against malaria, designated in this report as the "National Malaria Eradication Service" (NMES), has undergone important changes with respect to its standing in relation to the other services of the national public health administration. These changes are directly related to the change in concept from malaria control to malaria eradication. Control programs, on achieving their aim of reducing malaria as a major public health problem, came to be amalgamated with other related activities. This trend saw less emphasis

being given to malaria work, and in some cases the term "malaria" was no longer used to designate these sections, in spite of the fact that the disease continued to be an important health problem. In some countries, for example, the old and well-known "Malaria Service" became the "Vector Control Department" or "Section of Arthropod Control" or was incorporated with other activities to form a "Department of Rural Endemics" or became the basis for a "Regional Department of Public Health." Today, with the acceptance of the eradication concept and the all-out drive for eradication, the NMES is emerging again as an entity and assuming major importance in relation to other health services.

The NMES has a relationship to the ministerial authority and other public health services which is not necessarily comparable from one place to another. Figure 3 depicts the possible levels at which a NMES may operate, and permits a classification of the ranking of a NMES in relation to the over-all national health services.

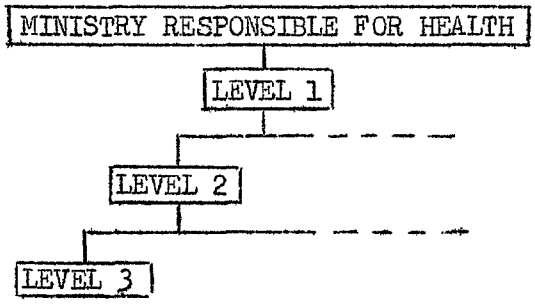

Fig. 3. Diagram Showing Possible Relationship of the NMES to the Health Authorities.

In this report the status of the NMES in the Americas, based on Figure 3, can be classified as follows:

1. The NMES is considered "autonomous" if it exists at Level 1, that is to say, the Director of the NMES is responsible directly to a ministerial level.

2. The NMES is considered "primary" when it operates at Level 2, its chief executive being responsible to the National Director of Health or his equivalent.

3. The NMES is considered "secondary" when, operating at Level 3, it has authority only through the two preceding levels. This situation exists where the NMES is but part of a broader service such as a "Section for Control of Insect-Borne Diseases" or a "Communicable Disease Division."

The position of the NMES in 1958, in accordance with the above definitions, is shown in Table 7, together with the official name of the service. The table shows clearly the high stature now held by the NMES within the respective National Public Health Services (NPHS). Two countries, Colombia and Mexico, have an autonomous NMES. All of the remaining countries and seven other political units which submitted reports have an NMES of primary rank. This is indeed a step forward from the position presented in the V Report, which showed twelve countries and two other political units of those submitting a report as having a National Malaria Service of secondary rank.

In some places (British Honduras, Grenada, St. Lucia) the malaria eradication program is the direct responsibility of the NPHS because the small volume of activity does not warrant a specific department.

The State of São Paulo in Brazil, in accordance with a special agreement with the Federal Government, has an independent malaria service which implements its own eradication program, although that program is coordinated with the national plan. For this reason, the tables presented in this report make two references to Brazil: one for the country as a whole, excluding São Paulo, and the other for São Paulo itself.

A new aspect in the administration of malaria eradication programs is the establishment of Advisory Committees or Councils, which at present exist in 9 countries (Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Nicaragua, Paraguay and Peru). The intensification and extension of the eradication programs have lead to the establishment of such bodies principally for advisory and coordinating purposes, although in two other countries (Brazil, Mexico) they have been invested with the authority to take decisions on both technical and administrative matters. These Councils are presided over by the Minister or National Director of Health, or a similar official. Their composition varies from country to country, but generally they are made up of representatives of the Ministries of Education, Social Security and National Defense, the universities, medical associations, and international agencies which collaborate in the program (PASB/WHO, UNICEF, and ICA). In some instances there are also representatives of the Ministries of Labor and Finance, the clergy, and private enterprises. The Director of the NMES is also a member of the Council.

The NMES have established within their functional structure well-defined departments for spraying operations, epidemiology, and administration. Within each of these departments, the principle of "one man, one job" is followed.

In view of the importance of health education and public information, these activities are the responsibility of specific units, usually sections, but in seven countries (Brazil, Colombia, Dominican Republic, El Salvador, Mexico, Nicaragua, and Paraguay), they reach the

Table 7

THE ORGANIZATION OF NATIONAL MALARIA SERVICES IN THE AMERICAS, 1957

Country or Other Political Unit	Official Name of Service	Position of Service	Activities Other than Malaria Eradication
Argentina	Dirección de Paludismo y Fiebre Amarilla	Primary	Campaign for the eradication of Aëdes aegypti
Bolivia	Servicio Nacional de Erradicación de la Malaria	Primary	None
Brazil a)	Campanha de Erradicação da Malária	Primary	None
São Paulo	Serviço de Profilaxia da Malaria b)	Secondary	Prevention of Chagas' Disease and Schistosomiasis
Colombia	Servicio Nacional de Erradicación de la Malaria	Autonomous	None
Costa Rica	Departamento de Lucha Contra Insectos Trasmisores	Primary	None
Cuba	**	**	**
Dominican Republic	División de Malariología	Primary	Campaign for the eradication of Aëdes aegypti; and insect control
Ecuador	Servicio Nacional de Erradicación de la Malaria	Primary	None
El Salvador	División de Lucha Anti-Palúdica	Primary	Anti-Aëdes aegypti campaign
Guatemala	Servicio Nacional de Erradicación de la Malaria	Primary	Eradication of Aëdes aegypti and vaccination against yellow fever
Haiti	Service National D'Eradication de la Malaria	Primary	None
Honduras	Servicio Nacional de Erradicación de la Malaria	Primary	Anti-Aëdes aegypti campaign
Mexico	Comisión Nacional Para la Erradicación del Paludismo	Autonomous	None
Nicaragua	Servicio Nacional de Erradicación de la Malaria	Primary	Anti-Aëdes aegypti campaign
Panama	Servicio Nacional de Erradicación de la Malaria	Primary	Control of yellow fever (Vaccination and Aëdes aegypti eradication)
Paraguay	Servicio Nacional de Erradicación del Paludismo	Primary	None
Peru	Servicio Nacional de Erradicación de la Malaria	Primary	None
Venezuela	División de Malariología	Primary	Aëdes aegypti eradication, control of Triatomidae, flies, rodents, etc.
Other Political Units			
British Guiana	Mosquito Control Service	Secondary	Aëdes aegypti and bancroftial filariasis control
British Honduras	Health Department	Primary	Yellow fever and other public health activities
Dominica	Anti-Malaria Activities under Sanitary Department	Primary	Insect control in general
French Guiana	Service de la Lutte Antipaludique et Antiamarile	Secondary	Yellow Fever campaign and destruction of other anthropods of Public Health import
Grenada	Medical Department	Primary	Other public health activities
Guadeloupe	Service Départemental de Désinsectisation	Secondary	Disinfection and disinsecting in general
Jamaica	Malaria Eradication Programme	Primary	None
Panama Canal Zone	Health Bureau, Canal Zone Government	Secondary	Pest mosquito and culicoides control, all phases of environmental sanitation, and sanitary engineering and entomological support for maritime quarantine
St. Lucia	Malaria Eradication Program	Primary	Anti-Aëdes aegypti campaign
Surinam	Malariabestrijdingsdienst	Primary	None
Trinidad and Tobago	Malaria Division	Primary	Aëdes aegypti eradication, general insect control and quarantine activities.

a) Not including the State of São Paulo.
b) Soon to be changed to "Serviço Especial de Erradicação de Malária".

** Report not received.

level of a department. It is also important to point out the steps taken for the maintenance of transport vehicles, for which a special section has been established under the Administration Department or, in a few cases, under the Department of Spraying Operations (Argentina, Colombia and Venezuela). In Honduras and Mexico, the office in charge of transport is at the departmental level and is referred to as the Department of Logistics. In some programs local training activities are the responsibility of a separate office, and in Brazil, Colombia, and Mexico this also has the status of a department. Only Mexico and Venezuela have Research Departments.

With regard to their executive organization, the NMES may be divided into two groups: those decentralized, as in the majority of countries (Argentina, Bolivia, Brazil including São Paulo, Colombia, Ecuador, Haiti, Mexico, Peru, and Venezuela) and those centralized, as in Central America, Paraguay, and other political units. In the first instance, the area of operations has been divided into "Zones", each with an organization similar to that of the Central Office (Sections of Spraying Operations, Epidemiology, Health Education, Administration, Transportation, etc.).

Parallel to the increasing importance of the NMES within a respective NPHS has been the acceptance of the desirable practice of confining the activities of the NMES to malaria eradication exclusively. The situation existing in 1958 is seen in Table 7, which shows that in nine countries and two other political units the NMES is devoted exclusively to malaria eradication. Of the remaining countries, Argentina, El Salvador, Guatemala, Honduras, Nicaragua, and Panama include activities related to Aëdes aegypti eradication and other yellow fever operations. Two others, Dominican Republic and Venezuela, extend the scope of the NMES to the control of insects in general, and Venezuela includes also the control of triatomidae, flies, and rodents and other miscellaneous activities. This is excellent progress, considering that only three of the 19 countries returning information in 1954 for the V Report had an NMS devoted only to malaria. In other political units the NMES in many cases still has the additional responsibility for control of insect vectors in general.

The V Report revealed that the health authorities were planning programs for the total coverage of the malarious areas with the aim of achieving eradication. The enormous progress made can be seen in a study of Table 1. There is now no country in the Americas, with the exception of Cuba, which does not have a concrete plan for the coverage of the entire area in a single operation or by progressive stages. The same is true for all other political units with the exception of Dominica and the sparsely populated dense jungle interior of British Guiana. Dominica is hastening to complete a plan for total coverage with the intention of beginning eradication operations before 1 January 1959.

Progress toward malaria eradication in terms of operating total-coverage programs is seen in the following summary of Table 1:

	Countries	Other Political Units	Total
With indigenous malaria	18	11	29
With operating program of total coverage on 31 July 1958	13	9	22
To begin operating program of total coverage by 1 January 1959	4	1	5
Without program for total coverage	1	1*	2

* British Guiana, one of the pioneers in eradication, has eliminated the disease from its coastal area but has only a control program for the jungle interior.

Table 1 shows that in most of the Americas the period of total coverage will be completed by October 1961.

Legislation

The adoption of legislative measures is still a further indication of the interest shown by the governments of the Americas in malaria eradication. A brief comparison between the laws in force in 1954 and the present legal situation shows the general picture to be significantly improved. The content of those measures has undergone considerable changes with reference to the basic procedures required for approaching and resolving this problem. It can easily be seen that the laws and decrees on the subject conform, in general terms, to the technical progress made and to the concepts that set the standards for carrying out the present task of malaria eradication.

With the exception of Cuba, the Panama Canal Zone and Surinam, which forwarded no information, all the countries and other political units included in this report have national laws or decrees on malaria; in the majority of countries these laws declare the problem to be of national interest, consequence, or emergency. In the rest, although the reference is not as explicit and final, the importance and significance of the antimalaria campaign is unquestionably emphasized.

The V Report indicated that Argentina, Brazil, Panama, Peru, and Venezuela all had exhaustive legislation on the subject, the most complete being Argentina's regulatory decree. At the present time,

many countries, among them Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua, have enacted more advanced and complete provisions encompassing new concepts of antimalaria strategy. Bolivia, Brazil, Colombia, Paraguay, Peru, and Jamaica have modified their legislation by establishing standards to conform to the present procedures and concepts.

The most outstanding achievement is the introduction of the concept of eradication, in lieu of control, in the legislation of 15 countries. Some laws contain very advanced provisions, e.g.: obligation to report on construction or renovation of dwellings, and on migratory movements among the population; obligation to request authorization to paint or wash sprayed walls; and prohibition against occupancy of unsprayed premises.

As a result of this new trend, the classical environmental sanitation measures, malaria control procedures, and mechanical protective devices have become but a memory of the efforts and concern of a past era.

In a few countries and political units, however, the antimalaria measures are still included in laws covering communicable diseases in general, in sanitary codes, or in various provisions aimed at controlling vector insects. But the emphasis is obsolete, and it is now the exception rather than the rule. At the time the V Report was issued, six countries required the obligatory use of imagocides; at present this is true of ten countries and four other political units. The remaining countries have established provisions, though not on a compulsory basis, for the application of residual-action insecticides and of any other measures proven scientifically to be effective for the attainment of the ultimate goal.

The obligation to report malaria cases has also been given special attention. A limit of 24 hours has been established in the legislation of 12 countries and "immediate" notification is required in one country and in three other political units. In the rest, there is a seven-day limit, except in Grenada, which has a 30-day limit. At present nine countries and one other political unit require a blood smear for parasitological confirmation, whereas only two required this in 1950. As for the obligation of the patient to take treatment, the number requiring this has increased from two to eleven.

In an effort to make available maximum facilities, some countries, such as Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Mexico, and Venezuela, grant exemption from customs fees and duties on all equipment and material intended for malaria eradication. Several have taken even further measures to grant postal and telegraphic franking privileges.

Thirteen countries and one other political unit establish provisions for the supply of drugs, although only Argentina, Costa Rica, El Salvador, and São Paulo have regulations for the control of their distribution and circulation.

Table 8

COMPARATIVE ANTIMALARIA LEGISLATION IN THE AMERICAS, 1958

Subject	Argentina	Bolivia	Brazil a)	São Paulo	Colombia	Costa Rica	Cuba	Dominican Republic	Ecuador	El Salvador	Guatemala	Haiti	Honduras	Mexico	Nicaragua	Panama	Paraguay	Peru	Venezuela b)	British Guiana b)	British Honduras	Dominica	French Guiana	Grenada	Guadeloupe	Jamaica	Panama Canal Zone	St. Lucia	Surinam	Trinidad and Tobago
Has special legislation	x	x	x	x	x	x	**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	...	x	...	x
Obligation to combat malaria	x	x	x	x	x	x	**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	x	x	-	-	...	x	...	x
Declaration of malarious zones	x	x	-	x	x	x	**	-	-	-	-	-	-	-	-	-	-	x	x	-	-	x	-	-	-	-	...	-	...	x
Declaration of the problem as being of national interest	x	x	-	-	x	x	**	x	-	x	x	x	x	x	x	x	-	x	-	-	-	-	-	-	-	-	...	-	...	-
Application of the concept of eradication	-	x	x	-	x	x	**	x	x	x	x	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-	...	-	...	-
Obligation to apply imagocides	x	x	-	-	-	x	**	x	-	x	x	-	x	-	x	x	-	x	-	x	-	-	x	x	-	-	...	x	...	-
Obligation to permit access to houses	x	x	-	x	-	x	**	x	x	x	x	-	x	-	-	x	x	x	-	x	x	-	x	x	x	x	...	x	...	-
Obligation to give drugs	x	x	x	x	-	x	**	-	x	-	x	x	x	-	x	-	x	x	x	-	-	-	-	-	-	-	...	x	...	-
Control of distribution and dispensing of drugs	x	-	-	x	-	x	**	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	...	-	...	-
Obligation to report the construction or renovation of dwellings	x	-	x	-	-	-	**	-	-	-	x	x	-	-	-	x	x	-	-	-	-	-	-	-	-	-	...	-	...	-
Compulsory case reporting	x	x	x	x	x	x	**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	-	x	...	x	...	-
Time limit (No. of days)	1	1	-	c)	-	1	**	1	c)	1	1	1	1	1	1	1	1	7	7	c)	7	30	-	-	-	c)	...	7	...	-
With blood sample	x	-	-	-	-	x	**	x	-	-	x	x	x	-	x	x	x	-	-	x	-	-	-	-	-	-	...	-	...	-
Obligation of patient to take treatment	-	x	-	-	-	x	**	x	x	-	x	-	x	-	x	x	x	-	x	-	x	-	-	-	-	-	...	-	...	-
Obligation of patient to permit blood extraction	x	-	-	-	-	x	**	x	-	-	-	x	x	-	x	x	-	-	x	-	x	-	-	-	-	x	...	-	...	-
Sanctions	x	x	x	x	-	x	**	x	x	x	x	x	x	-	x	x	x	-	x	x	x	x	x	x	-	-	...	x	...	x
Obligation of authorities, firms, and individuals to cooperate	x	x	-	x	x	x	**	x	x	x	x	x	x	-	x	x	x	x	-	-	-	-	-	-	-	-	...	-	...	-
Exemption from customs duties	-	x	-	-	x	x	**	-	x	x	-	-	-	x	-	-	-	-	x	-	-	-	-	-	-	-	...	-	...	-
Obligation to spray aircraft and ships	-	-	x	x	-	-	**	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	...	-	...	-
Postal franking privileges	-	-	-	-	-	x	**	-	-	-	x	-	x	-	x	x	x	-	-	-	-	-	-	-	-	-	...	-	...	-
Obligation to report on painting or washing of sprayed premises	-	-	-	-	-	x	**	-	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	...	-	...	-
Reporting on migratory movements	x	x	x	-	-	x	**	x	-	-	x	-	x	-	x	-	x	-	-	-	-	-	-	-	-	-	...	-	...	-
Prohibition against occupancy of unsprayed premises	-	-	-	-	-	x	**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	...	-	...	-
Obligation to carry out environmental sanitation activities	x	x	x	x	x	x	**	x	x	x	x	-	-	x	-	x	-	x	x	x	x	x	x	x	x	-	...	x	...	x

a) Not including the State of São Paulo.
b) Information taken from V Report.
c) Immediate reporting but without set time limit.

x Yes.
- Nil.
** Report not received.
... Data not available.

The majority of the legal provisions studied establish the obligation of authorities, organizations, public and private firms, associations, and the population in general to cooperate in malaria eradication.

Table 8 gives the comparative summary of the various provisions of antimalaria legislation in the Americas. The references used include the latest legal measures enacted as well as earlier provisions that have not been revoked.

Personnel

Because a malaria eradication program demands the full-time service of all the staff employed in its execution, and since there are in fact few persons employed on a part-time basis, only full-time personnel will be considered in this report.

The information in Table 9 is presented in order to give a rapid, realistic indication of the manpower at present employed, being trained, and needed as of 31 March 1958 for the eradication of malaria from the Americas.

The categories of personnel listed in Table 9 may not include every person employed in each of the NMES, but no activity of major importance has been omitted. The figures shown include information from the State of São Paulo but not from the federal malaria service of Brazil, which is at present converting from a program of malaria control to one of eradication by stages. Once the Brazilian program is in operation, these personnel figures will be considerably increased. The rapidly developing eradication program in Colombia has need of some 2,367 personnel of all categories, accounting for a large part of the 3,139 vacancies shown in the table. The number of laborers seems large in comparison with other categories, but of the 454 shown in Table 9, 192 and 103 are employed in the programs of Mexico and Venezuela respectively.

It must also be appreciated that the duties within a specific category may vary from one NMES to another. For this reason the presentation of data has been restricted to personnel whose functions are believed to be comparable. Table 10 shows some of the professional and technical personnel employed as of 31 March 1958. There are, of course, other professional and technical personnel not included in Table 10, e. g., microscopists appear in Table 12 in relation to evaluation activities.

Table 9

Personnel Employed, In Training, and Still Needed in the Americas as of 31 March 1958

Title	Employed	In Training	Vacancies
Total	11,709	214	3,139
Physicians	194	47	9
Engineers	90	44	4
Entomologists	19	-	4
Entomological assistants	88	-	9
Chief microscopists	50	-	9
Assistant microscopists	239	11	55
Administrators	58	-	9
Administrative assistants	322	1	30
Statistical assistants	60	-	7
Disbursing officers	41	-	8
Storekeepers	76	-	19
Assistant storekeepers	78	-	3
Draftsmen	69	-	23
Secretaries	364	-	69
Sector chiefs	332	34	56
Squad chiefs	1,238	31	211
Spraymen	5,486	7	1,732
Evaluation inspectors	89	18	37
Evaluators	951	15	209
Mechanics	87	-	26
Assistant mechanics	95	-	27
Drivers	607	-	250
Motorboat-men	55	-	70
Boatmen	3	-	74
Watchmen and messengers	188	-	52
Laborers	454	-	15
Others	376	6	122

The professional or technical personnel shown in Table 10 are assigned to headquarters or the field, but because the place of assignment is dependent on the organizational structure of a particular NMES and does not necessarily reflect time spent in actual field work, such a breakdown is not shown here. It is of interest, however, to consider the broad responsibilities of this personnel within the NMES. Of the 178 physicians listed, 79 have responsibility in more than one operation, 68 are concerned directly with evaluation operations, 30 with auxiliary operations, and one with spraying. Seventy-seven of the 90 engineers are responsible only for spraying operations, nine have responsibilities in more than one operation, and four are employed in auxiliary operations.

Of the 108 entomologists and their assistants, 55 are employed in evaluation, 24 in auxiliary operations, and 29 have responsibility in more than one operation.

Table 10

Professional and Technical Personnel Employed in Malaria Eradication Programs in the Americas as of 31 March 1958

Country or Other Political Unit	Total Personnel	Physicians	Engineers	Entomologists	Entomology Aides
Total	376	178	90	20	88
Argentina	10	7	2	-	1
Bolivia	5	5	-	-	-
Brazil a)	...	...	...	...	...
São Paulo	25	7	-	1	17
Colombia	20	11	3	1	5
Costa Rica	5	1	2	1	1
Cuba	**	**	**	**	**
Dominican Republic	6	2	2	1	1
Ecuador	17	11	2	-	4
El Salvador	8	2	1	1	4
Guatemala	10	5	2	1	2
Haiti	12	5	3	1	3
Honduras	3	2	-	1	-
Mexico	140	60	59	3	18
Nicaragua	10	6	1	1	2
Panama	8	1	1	2	4
Paraguay	5	3	1	1	-
Peru	26	13	6	1	6
Venezuela	31	25	4	2	-
Other Political Units					
British Guiana	3	1	-	-	2
British Honduras	1	1	-	-	-
Dominica	-	-	-	-	-
French Guiana	1	1	-	-	-
Grenada	1	1	-	-	-
Guadeloupe	2	1	-	1	-
Jamaica	3	3	-	-	-
Panama Canal Zone	4	1	1	-	2
St. Lucia	1	1	-	-	-
Surinam	1	1	-	-	-
Trinidad and Tobago	18	1	-	1	16

a) Not including the State of São Paulo.

- Nil.
... Data not available.
** Report not received.

The totals of the above-mentioned categories of technical and professional personnel are interesting in the light of similar information for 1954 presented in the V Report. At that time there were 196 physicians, 40 engineers, 34 entomologists, and 166 entomology aides.

With respect to the physicians it must be noted that of the 196 mentioned for 1954, 67 were from Brazil and 30 from the United States of America. The figure 178 in Table 10 does not include the United States of America, nor do we have at this time the number for Brazil, which is converting to an eradication program. It can be said, therefore, that the over-all change from control to eradication has more than doubled the physician strength of the National Malaria Services.

The increase from 40 engineers in 1954 to 90 in 1958 will be supplemented by those to be employed in the program of Brazil.

The apparent reduction of entomologists and their aides from 200 in 1954 to 108 in 1958 is in large part again due to the fact that Brazil, which had 57 of these workers in 1954, has not yet supplied this information for the current eradication program. In addition, seven entomologists in the program of the United States of America in 1954 are absent from the 1958 total, and 30 entomology aides present in 1954 in Venezuela do not appear in Table 10.

Some categories of personnel employed in the spraying operations other than those in Table 10 are shown in Table 11.

In brief, some 7,724 persons are at present employed in the actual task of getting the insecticide on the walls, and 2,323, mostly for the Colombian program, are still needed. There are on the average four to five spraymen to the brigade and a sector chief is responsible for the work of four brigades. This ratio, of course, varies between countries and within countries, depending on operational and administrative factors. Because of the importance of having the actual spraying work as near perfection as possible, it is necessary to give serious consideration to this ratio so as to ensure that a supervisor can in fact check in detail the work of the men for whom he is responsible.

The malaria eradication services have full-time personnel for the collection of blood smears in the search for cases of malaria. The number of such personnel, those responsible for their supervision, and the microscopists available for the examination of blood smears for the year 1958 are shown in Table 12.

A striking feature of this table are the figures for Venezuela. Of the total 1,390 persons employed in this phase of the program by the countries and other political units shown in Table 12, Venezuela contributes 444, or 31.9 per cent. Of these 444, 361 are evaluators, i.e., 37.9 per cent of the total 953 evaluators listed in the table (not including Brazil). An idea of the relative emphasis placed on the evaluation operations by Venezuela is clearly seen by a consideration

Table 11

FIELD PERSONNEL EMPLOYED IN SPRAYING OPERATIONS IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1958

Country or Other Political Unit	Total			Sector Chiefs			Squad Chiefs			Spraymen			Drivers			Motorboat-Men		
	At present	No. of vacancies	In training	At present	No. of vacancies	In training	At present	No. of vacancies	In training	At present	No. of vacancies	In training	At present	No. of vacancies	In training	At present	No. of vacancies	In training
Total	7,724	2,323	72	330	56	34	1,236	212	31	5,497	1,735	7	606	250	-	55	70	-
Argentina	160	18	-	9	-	-	29	2	-	86	7	-	36	9	-	-	-	-
Bolivia	38	278	-	10	22	-	-	24	-	24	192	-	4	33	-	-	7	-
Brazil a)	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...
São Paulo	360	13	-	13	-	-	54	-	-	254	10	-	38	3	-	1	-	-
Colombia	96	1,825	27	-	31	27	22	153	-	34	1,384	-	31	194	-	9	63	-
Costa Rica	108	2	2	3	-	-	12	2	2	80	-	-	13	-	-	-	-	-
Cuba	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Dominican Republic	181	-	26	6	-	-	26	-	26	134	-	-	15	-	-	-	-	-
Ecuador	256	-	-	14	-	-	41	-	-	181	-	-	16	-	-	4	-	-
El Salvador	308	-	4	8	-	4	49	-	-	204	-	-	46	-	-	1	-	-
Guatemala	255	-	-	8	-	-	34	-	-	172	-	-	40	-	-	1	-	-
Haiti	359	4	-	15	-	-	74	-	-	249	4	-	21	-	-	-	-	-
Honduras	201	76	13	8	-	3	31	7	3	138	59	7	22	10	-	2	-	-
México	2,884	102	-	111	3	-	520	23	-	2,214	76	-	33	-	-	6	-	-
Nicaragua	142	-	-	5	-	-	19	-	-	93	-	-	20	-	-	5	-	-
Panama	149	-	-	6	-	-	25	-	-	113	-	-	5	-	-	-	-	-
Paraguay	129	-	-	4	-	-	16	-	-	83	-	-	24	-	-	2	-	-
Peru	689	-	-	18	-	-	96	-	-	480	-	-	95	-	-	-	-	-
Venezuela	712	-	-	48	-	-	84	-	-	513	-	-	60	-	-	7	-	-
Other Political Units																		
British Guiana	57	4	-	-	-	-	7	1	-	44	3	-	4	-	-	2	-	-
British Honduras	53	-	-	8	-	-	10	-	-	30	-	-	4	-	-	1	-	-
Dominica	16	1	-	1	-	-	2	-	-	12	-	-	1	1	-	-	-	-
French Guiana	19	-	-	6	-	-	-	-	-	13	-	-	-	-	-	-	-	-
Grenada	15	-	-	1	-	-	2	-	-	10	-	-	2	-	-	-	-	-
Guadeloupe	40	-	-	1	-	-	6	-	-	30	-	-	3	-	-	-	-	-
Jamaica	240	-	-	16	-	-	33	-	-	149	-	-	42	-	-	-	-	-
Panama Canal Zone	31	-	-	2	-	-	10	-	-	15	-	-	2	-	-	2	-	-
St. Lucia	22	-	-	2	-	-	4	-	-	16	-	-	-	-	-	-	-	-
Surinam	79	-	-	4	-	-	12	-	-	48	-	-	4	-	-	11	-	-
Trinidad and Tobago	125	-	-	3	-	-	18	-	-	78	-	-	25	-	-	1	-	-

a) Not including the State of São Paulo.

- Nil.
... Data not available.
** Report not received.

Table 12

PERSONNEL EMPLOYED IN EVALUATION OPERATIONS IN THE MALARIA ERADICATION PROGRAMS OF THE AMERICAS AS OF 31 MARCH, 1958

Country or Other Political Unit	Total			Evaluation Inspectors			Evaluators			Microscopists		
	At present	No. of vacancies	In training	At present	No. of vacancies	In training	At present	No. of vacancies	In training	At present	No. of vacancies	In training
Total	1,390	585	44	147	37	18	953	484	15	290	64	11
Argentina	108	10	-	19	-	-	74	6	-	15	4	-
Bolivia	5	30	2	-	-	-	-	22	-	5	8	2
Brazil a)	...	...	...	...	...	...	...	...	...	...	...	...
São Paulo	24	4	-	-	-	-	-	-	-	24	4	-
Colombia	88	183	18	-	32	18	63	120	-	25	31	-
Costa Rica	20	3	4	3	1	-	12	2	4	5	-	-
Cuba	**	**	**	**	**	**	**	**	**	**	**	**
Dominican Republic	18	-	13	-	-	-	13	-	11	5	-	2
Ecuador	47	-	-	-	-	-	33	-	-	14	-	-
El Salvador	34	-	-	4	-	-	25	-	-	5	-	-
Guatemala	37	-	-	1	-	-	20	-	-	16	-	-
Haiti	63	52	-	3	3	-	57	49	-	3	-	-
Honduras	32	16	6	-	-	-	17	10	-	15	6	6
Mexico	154	277	-	58 b)	-	-	57	275	-	39	2	-
Nicaragua	26	-	-	-	-	-	19	-	-	7	-	-
Panama	38	-	-	2	-	-	25	-	-	11	-	-
Paraguay	16	-	-	6	-	-	-	-	-	10	-	-
Peru	31	9	-	-	-	-	20	-	-	11	9	-
Venezuela	444	-	-	40	-	-	361	-	-	43	-	-
Other Political Units												
British Guiana	2	-	-	-	-	-	-	-	-	2	-	-
British Honduras	96	-	-	7	-	-	85	-	-	4	-	-
Dominica	2	-	-	-	-	-	2	-	-	-	-	-
French Guiana	-	-	-	-	-	-	-	-	-	-	-	-
Grenada	4	-	1	-	-	-	3	-	-	1	-	1
Guadeloupe	5	-	-	-	-	-	2	-	-	3	-	-
Jamaica	40	-	-	-	-	-	26	-	-	14	-	-
Panama Canal Zone	4	-	-	2	-	-	-	-	-	2	-	-
St. Lucia	4	-	-	-	-	-	3	-	-	1	-	-
Surinam	9	1	-	1	1	-	5	-	-	3	-	-
Trinidad and Tobago	39	-	-	1	-	-	31	-	-	7	-	-

a) Not including State of São Paulo.
b) Physicians.

- Nil.
** Report not received.
... Data not available.

of the ratio of evaluators, first to spraymen employed in the program, and secondly to the population of the area in which malaria transmission occurs. Table 11 shows 513 spraymen to be employed in the NMES of Venezuela, that is to say, there are two evaluators for every three spraymen. The population in the area under surveillance and in which malaria is still present is 1,414,000, which means there is one evaluator to every 3,900 persons.

Argentina also has a large number of evaluators in relation to the size of its program. There are almost as many evaluators as spraymen, and one evaluator for 16,600 persons in the area in which malaria is still present or under surveillance.

It is interesting to note that Mexico employs 58 physicians as evaluation inspectors, and when the 275 vacancies for evaluators are filled this country will have a strong team for this important phase of the malaria eradication operations.

There is variation in the background and training of evaluators and their supervisors, and in some programs their duties include activities other than the routine collection of blood smears from persons with fever or a history of fever. As indicated previously, there are in addition physicians who devote their time to the planning, organization, and supervision of the work of those employed in the evaluation operations.

Budgetary Aspects of Malaria Eradication

In a malaria eradication program, where success or failure is measured against zero transmission, the required financial resources must be provided in full; anything less means failure. From the financial viewpoint, the most critical time is the period of total-coverage spraying.

Table 13 shows the annual requirements for national costs in malaria eradication programs, together with budgetary appropriations or, in the case of 1958, budgetary commitments starting with the year when total coverage commenced. Budgets for the control and pre-eradication periods are also shown, but without an estimate of requirements. In this table it will be noted that, of the three programs in 1956 and the ten in 1957 starting total coverage, all except one, Nicaragua in 1957, had made adequate budgetary provision. By the end of 1958 all but three campaigns should have started total-coverage spraying. In some countries resources may be insufficient to meet national commitments. To fill this gap, the International Cooperation Administration has allocated funds to supplement national resources. These countries are indicated by footnotes in the table; the related ICA allocations are shown in Table 14.

Table 14 shows the monetary value of international participation (PASB/WHO, UNICEF, and ICA) in antimalaria programs, both for the pre-eradication period and the total-coverage period, as designated.

Table 13

ESTIMATED REQUIREMENTS AND NATIONAL BUDGETS* FOR MALARIA ERADICATION IN THE AMERICAS, 1956-1958

Country or Other Political Unit	Date of initiation of total coverage	1956		1957		1958	
		Estimated requirements	National budget	Estimated requirements	National budget	Estimated requirements	National commitments
Argentina	Sept. 1949	...	210,878	...	348,886	...	...
Bolivia	1 July 1958	...	...	...	81,300a)	395,455	395,455 b)
Brazil c)	Jan. 1959	...	2,944,741a)	...	2,258,290a)	...	...
São Paulo	1 Sept. 1958	...	...	...	...	...	...
Colombia	8 Sept. 1958	...	840,235a)	...	747,575a)	2,566,667	2,066,667
Costa Rica	15 July 1957	...	181,818a)	246,913	246,913	246,913	246,913
Cuba	**	**	**	**	**	**	**
Dominican Republic	1 July 1958	...	379,060a)	...	379,060a)	450,000	450,000 d)
Ecuador	18 Mar. 1957	...	274,576a)	351,507	433,664e)	576,933	510,267
El Salvador	1 July 1956	470,479	461,753e)	497,600 f)	530,208e)	564,800	564,800
Guatemala	1 Aug. 1956	480,000	448,706	480,000	480,000	655,000 f)	655,000 g)
Haiti	Sept. 1958	...	144,532a)	...	340,486a)	788,322	596,322 h)
Honduras	Jan. 1958	...	165,000a)	...	318,110a)	375,000	318,000 g)
Mexico	2 Jan. 1957	...	2,400,000a)	2,400,000 f)	4,160,000	4,160,000	4,160,000
Nicaragua	11 Nov. 1957 i)	...	175,764a)	245,857 f)	207,807	259,537 f)	259,537 g)
Panama	19 Aug. 1957	..	246,310a)	446,657 f)	456,052	428,304	428,304
Paraguay	30 Oct. 1957	...	16,000a)	233,334	130,841	266,667 f)	266,667 g)
Peru	15 Nov. 1957	...	...	1,068,186	525,862j)	1,175,500	1,175,500
Venezuela	1950	...	4,321,014	...	7,140,154	...	...
Other Political Units							
British Guiana	Jan. 1947 k)	...	91,296	...	86,481	...	...
British Honduras	4 Feb. 1957	...	35,386a)	20,068	37,330e)	38,500	38,500
Dominica	Jan. 1959	...	2,059a)	...	2,059a)	1,941 a)	1,941 a)
French Guiana	May 1948 l)	...	78,853	...	105,878	...	...
Grenada	Feb. 1957	...	16,962a)	13,860 f)	19,344	15,912	15,912
Guadeloupe	1957	...	90,803a)	...	100,977	...	...
Jamaica	Jan. 1958	...	239,389a)	...	277,778a)	332,157 f)	332,157 g)
Panama Canal Zone	...	...	...	...	50,000	...	...
St. Lucia	1 July 1956	22,308	17,595	22,308	17,440	22,308	22,308
Surinam	2 May 1958	...	60,526a)	...	60,526a)	129,475	129,475
Trinidad and Tobago	Jan. 1958	...	284,338a)	...	285,294a)	248,658	248,658

a) Preparatory period only.
b) Provided jointly by Government and I.C.A. (See Table 14).
c) Not including the State of São Paulo.
d) Commitments in draft plan of operations.
e) Based on reported expenditures.
f) Original estimate subsequently increased.
g) To be supplemented with I.C.A. assistance (See Table 14).
h) To be met with PASO assistance.
i) Program temporarily interrupted.
j) Western Peru only.
k) Refers only to the coastal area.
l) Reimportation in 1954, spraying recommenced.

* All amounts shown are in U.S. dollars.
... Data not available.
** Report not received.

Table 14

INTERNATIONAL CONTRIBUTIONS* TO MALARIA PROGRAMS IN THE AMERICAS, 1956-1958

Country or Other Political Unit	Date of initiation of total coverage	1956			1957			1958			
		PASO/SMF	WHO/TA	UNICEF ≠	PASO/SMF	WHO/TA	UNICEF ≠	PASO/SMF	WHO/TA	UNICEF ≠	ICA of USA (Fiscal year) a)
Total		-	193,868.	512,100 .	510,540·	169,944	4,148,300·	1,060,470·	235,367	5,956,900	3,012,000
Argentina	Sept. 1949	-	-	-	9,692	-	-	11,453	-	-	-
Bolivia	1 July 1958	-	10,995 b)	-	-	11,222 b)	-	46,910	13,849	256,000	450,000 c)
Brazil d)	Jan. 1959	-	-	-	13,737 b)	-	-	-	-	-	1,490,000 e)
São Paulo	1 Sept. 1958	-	-	-	-	-	-	31,432	-	-	
Colombia	8 Sept. 1958	-	10,000 b)	40,000 b)	59,260 b)	10,575 b)	-	100,032	15,603	1,142,000	500,000 e)
Costa Rica	15 July 1957	-	1,000 b)	-	16,510	2,000	96,100	22,583	-	48,000	-
Cuba	**	-	-	-	-	9,836 b)	-	-	-	-	-
Dominican Republic	1 July 1958	-	5,000 b)	62,000 b)	30,106 b)	5,000 b)	-	74,416	-	108,000	-
Ecuador	18 Mar. 1957	-	-	-	14,236	9,205	277,000	36,522	26,213	127,000	100,000 e)
El Salvador	1 July 1956	-	5,000	105,000	20,891	5,000	180,600	44,068	23,306	151,000	-
Guatemala	1 Aug. 1956	-	17,000	254,000	13,567	10,051	137,500	39,163	15,985	198,000	50,000 c)
Haiti	Sept. 1958	-	15,000 b)	-	42,400 b)	15,000 b)	-	259,910	19,319	170,000	75,000 e)
Honduras	Jan 1958	-	5,000 b)	-	13,302 b)	5,000 b)	-	15,875	11,876	207,000	150,000 c)
Mexico	2 Jan. 1957	-	28,524 b)	-	99,183	30,423	2,400,000	117,932	51,976	2,625,000	-
Nicaragua	11 Nov. 1957 f)	-	5,000 b)	-	27,558	5,000	167,000	25,228	6,922	-	100,000 c)e)
Panama	19 Aug. 1957	-	12,000 b)	-	15,615	12,368	148,000	26,189	18,292	86,000	-
Paraguay	30 Oct. 1957	-	1,825 b)	-	23,203	-	146,000	25,373	14,125	87,000	85,000 c)e)
Peru	15 Nov. 1957	-	28,524 b)	-	49,670	4,264	514,000	60,321	17,901	404,000	-
Venezuela	1950	-	-	-	-	-	-	2,070	-	-	-
Other Political Units											
British Guiana	Jan. 1947 g)	-	-	-	-	-	-	1,580	-	-	-
British Honduras	4 Feb. 1957	-	1,000 b)	-	2,348	1,000	18,700	4,380	-	8,000	-
Dominica	Jan. 1959	-	-	-	-	-	-	-	-	-	-
French Guiana	May 1948 h)	-	-	-	-	-	-	-	-	-	-
Grenada	Feb. 1957	-	12,000 b)	-	-	12,000	4,400	10,225	-	5,000	-
Guadeloupe	1957	-	-	-	897	-	-	7,271	-	-	-
Jamaica	Jan. 1958	-	-	-	24,466 b)	-	-	44,516	-	204,600	12,000 c)
Panama Canal Zone	...	-	-	-	-	-	-	-	-	-	-
St. Lucia	1 July 1956	-	12,000	8,600	5,127	12,000	6,500	10,328	-	-	-
Surinam	2 May 1958	-	12,000 b)	-	4,108 b)	5,000 b)	-	35,232	-	22,300	-
Trinidad and Tobago	Jan. 1958	-	12,000 b)	42,500 b)	24,664 b)	5,000 b)	52,500 b)	7,461	-	108,000	-

a) ICA fiscal year does not necessarily correspond to the respective natl. fiscal years.
b) Preparatory period.
c) Local costs.
d) Not including the State of São Paulo.
e) Imported supplies.
f) Program temporarily interrupted.
g) Refers only to the coastal area.
h) Reimportation in 1954, spraying recommenced.
* All amounts shown are in U.S. Dollars.
≠ UNICEF contribution is listed under year of implementation even though allocation may have been made in a previous year.
\- Nil.
** Report not received.
... Data not available.

International participation consists primarily of technical advisory services, training, and imported supplies. As indicated below, such assistance is also available in some cases to supplement national resources in meeting local costs.

PASB/WHO participation is financed from WHO/TA funds for technical personnel and fellowships, and from the PASO Special Malaria Fund for technical personnel, fellowships, and imported supplies and equipment, primarily antimalarial drugs, protective equipment, and laboratory supplies.

The figures for PASB/WHO in Table 14 include only the participation in country projects. There are also very substantial activities on a regional level in training, research, field investigations, seminars, and specialized technical advisory services, as well as services provided by headquarters and zone office staff. The following figures show total costs specifically attributed to malaria activities, but not including any estimate of the portion of time devoted by headquarters and zone executive and administrative staff to the antimalaria program:

	1956 US$	1957 US$	1958 US$
PASO/Regular	97,418	133,212	92,409
PASO/SMF	-	922,345	2,000,000
WHO/TA	193,868	169,944	235,367

UNICEF participates by providing imported supplies, primarily insecticides, vehicles, sprayers, and laboratory equipment.

ICA participation may include provision of imported supplies and equipment or assistance with local costs, according to circumstances. Imported supplies may be provided in countries where UNICEF is not participating (e. g., Brazil) or where revised estimates indicate requirements higher than UNICEF had established as its commitment within its available funds (e. g., Colombia).

In summary, Tables 13 and 14 indicate that the total national and international resources already made available or committed appear to be sufficient to carry out the campaigns started or to be started by the end of 1958, provided the level of appropriation or contribution for these respective sources is maintained.

In three areas (Brazil, Cuba, and Dominica) total-coverage spraying will not start in 1958. Future plans for Cuba are not settled. Brazil, because of its size and physical characteristics, presents special problems which require a somewhat different type of campaign for different parts of the country. The program in Brazil will be conducted in progressive stages, and as a result the financial requirements will be spread over a longer period than in other countries. Plans for Dominica are progressing

rapidly, and it is possible that total coverage may be started even before 1959.

Although the above-described tables are the only ones of importance for analyzing adequacy of resources for successful eradication, it is considered desirable to present additional information on the development of national antimalaria activity within the framework of the total public health program. Table 15 shows the portions of national budgets devoted to antimalaria campaigns in the period 1954-1957 and the relationship of these funds to the total budget for public health in the same period. For most countries, 1954, 1955 and 1956 represented the continuation of control activities and pre-eradication preparation. The sharp change which takes place upon conversion from control to eradication is evident, with a corresponding increase in the percentage devoted to antimalaria work.

Field Operations

The shift from control to eradication programs has resulted in an almost complete cessation of antilarval operations and associated engineering work. In only one country and six other political units are the NMES continuing antilarval activities which do not have malaria eradication as their aim. Fundamentally, therefore, the interruption of malaria transmission is based on the intensive application of residual-action imagocides, complemented where necessary with the use of modern antimalarial drugs. For these reasons, this report will refer only to operations with insecticides (spraying) and operations with drugs, in addition to the corresponding epidemiological activities.

Spraying operations

Spraying and all other operations of a malaria eradication program must be evaluated in the light of work still to be done, and not by what has been achieved.

In most of the NMES, spraying operations are being planned, conducted, and supervised by a special office or department. With few exceptions, they are generally directed by engineering staff that report directly to the executive chief at the national or zone level.

Techniques regarding the surface to be sprayed inside the houses differ according to the after-feeding resting habits of the prevailing vector species. The general rule is to spray all indoor surfaces, walls, and ceilings up to a height of 3.5 meters, which is the height a sprayman can reach from the floor using standard equipment. All surfaces of furniture which could be resting places are also sprayed.

DDT and dieldrin, primarily in wettable powder formulations (75% and 50%, respectively) are the two insecticides generally used at the intended dose of 2 g DDT (technical) and 0.6 g dieldrin (technical) per square meter. In French Guiana a limited use of BHC is also made.

Table 15

PUBLIC HEALTH AND ANTIMALARIA PROGRAM BUDGETS IN THE AMERICAS, 1954-1957

Country or Other Political Unit	Monetary unit	Appropriation in National Currency											
		1954			1955			1956			1957		
		Total public health budget	Specific total for antimalaria program	Per cent	Total public health budget	Specific total for antimalaria program	Per cent	Total public health budget	Specific total for antimalaria program	Per cent	Total public health budget	Specific total for antimalaria program	Per cent
Argentina	Peso	589,474,500	6,894,500	1.2	930,376,700	8,435,100	0.9	1,250,706,700	8,435,100	0.7	1,259,188,000	14,129,900	1.1
Bolivia	Boliviano	...	...	...	...	...	...	...	...	...	10,092,997,590	642,274,283	6.4
Brazil a)	Cruzeiro	...	233,892,910	...	...	250,302,970	...	...	250,302,970	...	...	164,855,160	...
São Paulo	Cruzeiro	1,772,569,782	...	...	2,165,081,831	...	...	2,368,733,873	...	...	2,995,713,739	...	...
Colombia	Peso	42,285,626	2,558,000	6.0	41,925,436	2,663,000	6.4	46,080,900	4,033,126	8.8	45,700,000	4,485,451	9.8
Costa Rica	Colón	9,021,509	674,800	7.5	9,128,186	734,601	8.0	10,406,763	1,200,000	11.5	10,416,933	1,400,000	13.4
Cuba	Peso	**	**	**	**	**	**	**	**	**	**	**	**
Dominican Republic	Peso	5,410,969	124,740	2.3	4,052,544	234,060	5.8	4,736,622	379,060	8.0	6,970,052	379,060	5.4
Ecuador	Sucre	20,984,800	3,800,000	18.1	24,007,890	3,800,000	15.8	24,679,920	4,805,078	19.5	24,975,000	6,776,404	27.1
El Salvador	Colón	15,200,000	640,000	4.2	16,155,000	1,150,000	7.1	13,100,000	1,130,000	8.6	16,853,950	1,184,000	7.0
Guatemala	Quetzal	...	...	...	7,894,551	303,282	3.8	9,038,350	448,706	5.0	9,782,746	480,000	4.9
Haiti	Gourde	18,578,145	310,645	1.7	18,947,542	486,408	2.6	18,103,892	722,658	4.0	19,208,837	1,702,430	8.9
Honduras	Lempira	4,291,759	200,000	4.7	4,634,399	230,000	5.0	6,640,579	330,000	5.0	7,410,007	636,220	8.6
Mexico	Peso	219,900,000	...	...	255,200,000	2,500,000	1.0	314,500,000	30,000,000	9.5	381,900,000	52,000,000	13.6
Nicaragua	Córdoba	7,763,970	1,039,700	13.4	8,408,906	1,117,650	13.3	9,045,102	1,230,350	13.6	9,185,217	1,454,650	15.8
Panama	Balboa	4,926,814	170,660	3.5	5,450,860	201,720	3.7	8,045,304	246,310	3.1	10,373,330	456,052	4.4
Paraguay	Guaraní	25,934,340	900,000	3.5	53,820,760	...	...	70,240,000	2,000,000	2.8	118,786,608	14,000,000	11.8
Peru	Sol	...	...	...	...	...	...	...	...	...	497,120,115	9,991,371	2.0
Venezuela	Bolívar	165,300,000	15,034,480	9.1	177,023,065	14,380,668	8.5	184,118,768	14,691,448	8.0	206,440,644	24,276,523	11.8
Other Political Units													
British Guiana	Dollar (BG)	4,967,814	178,418	3.6	4,634,786	168,393	3.6	4,241,618	155,204	3.7	5,477,793	147,018	2.7
British Honduras	Dollar (BH)	415,176	39,870	9.6	419,540	40,491	9.7	425,741	49,540	11.6	500,996	53,328	10.6
Dominica	Dollar (BWI)	24,136	3,000	12.4	26,381	3,000	11.4	33,182	3,500	10.5	39,463	3,500	8.9
French Guiana	Franc	118,528,714	20,415,685	17.2	151,459,846	26,468,563	17.5	137,702,719	27,598,610	20.0	182,773,776	37,057,146	20.3
Grenada	Dollar (BWI)	622,555	23,700	3.8	721,208	19,835	2.8	637,939	28,835	4.5	722,198	32,885	4.6
Guadeloupe	Franc	...	...	...	151,244,000	31,585,000	20.9	180,319,000	31,781,000	17.6	216,635,000	35,342	16.3
Jamaica	Pound (St.)	1,890,311	76,769	4.1	2,133,187	93,401	4.4	2,342,761	86,180	3.7	2,484,635	100,000	4.0
Panama Canal Zone	Dollar (USA)	...	...	...	...	...	...	...	...	...	6,148,200	50,000	0.8
St. Lucia	Dollar (BWI)	316,737	22,078	7.0	388,047	35,558	9.2	399,856	29,912	7.5	483,644	29,648	6.1
Surinam	Florin	6,128,280	115,000	1.9	6,367,997	115,000	1.8	6,614,640	115,000	1.7	7,477,905	115,000	1.5
Trinidad and Tobago	Dollar (BWI)	8,026,168	450,993	5.6	8,722,693	480,374	5.5	10,236,850	483,374	4.7	11,322,070	485,000	4.3

a) Not including the State of São Paulo.

... Data not available.

** Report not received.

As a general rule DDT is sprayed twice a year, whereas dieldrin is sprayed only once. However, several exceptions exist where DDT is applied only once a year or, as in Guadeloupe, three times, and in certain areas of Venezuela, four times.

Table 16 summarizes the number of houses planned to be sprayed in 1957, the number of those actually sprayed, the approximate amounts of the insecticides used, and the date of initiation of total coverage. Few conclusions can be drawn from this table, inasmuch as it shows figures on antimalarial programs in very different phases: (a) eradication programs with a year or more of total coverage, such as in Argentina, El Salvador, Guatemala, Mexico, Guadeloupe, and St. Lucia; (b) eradication programs with less than one year of total coverage, as in Costa Rica, Ecuador, Nicaragua, Panama, Paraguay, Peru, British Honduras, and Grenada; (c) eradication programs in the preparatory phase, as in Bolivia, Colombia, Dominican Republic, Haiti, Honduras, Jamaica, Surinam, and Trinidad; and (d) control programs still in progress, as in Brazil, Cuba, and Dominica. The most significant feature has undoubtedly been the number of houses actually sprayed in relation to the estimated figure. The latter was established by dividing the 1957 estimated population by the average number of inhabitants per house, but as the result of geographical reconnaissance in which the houses were numbered, the total figure was always higher. This discrepancy increases with the passage of time, owing to the construction of new houses, and often at a rate greater than expected because of migration from non-malarious areas, produced by the health guaranties assured by the eradication campaign.

The structure of peripheral organizations for spraying operations and the composition of the spraying squads do not appear to have changed significantly since the detailed description given in the V Report.

A large increase has occurred in the number of operating squads because of the intensification of the campaign in several countries and other political units. The position at the end of 1957 is presented in Table 17. The number of mounted squads, those travelling on foot, and those with transport of more than one type is an interesting feature of Table 17. In Mexico, for example, there are 249 mounted squads and 123 squads travelling on foot, as compared with 161 squads transported by motor vehicle. Colombia also has more mounted squads than those transported by motor vehicle. This is the picture of eradication. No area in which malaria transmission occurs is inaccessible in a plan of total coverage and, as can be seen, every house planned to be sprayed in the Americas will be reached, if not by motor vehicle, launch or canoe, then by beast or on foot.

In most countries the actual spraying is carried on throughout the year, but in some there is a trend to concentrate it within a shorter time. Pressure sprayers, conforming to the specifications recommended by the World Health Organization Expert Committee on Insecticides, are the standard equipment in the majority of countries, but a few services use stirrup pumps and knapsack sprayers.

Table 16

HOUSES SPRAYED AND INSECTICIDE USED IN THE ANTIMALARIA CAMPAIGN IN THE AMERICAS, 1957

Country or Other Political Unit	Times sprayed per year	Number of houses		Type and quantity of insecticide used			Date of initiation of total coverage
		Planned to be sprayed	Actually sprayed	DDT, technical in Kgs.	Dieldrin technical in Kgs.	Other in Kgs.	
Argentina	One	14,203	20,681	34,519	-	-	Sept. 1949
	Two	44,995	41,155				
Bolivia	...	...	...	...	...	...	1 July 1958
Brazil a)	...	...	1,722,741	1,005,570	-	-	Jan. 1959
São Paulo	...	535,889	...	40,900	-	-	1 Sept. 1958
Colombia	One	135,450	132,480	62,880	-	-	8 Sept. 1958
Costa Rica	One	-	42,969	21,650	-	-	15 July 1957
	Two	67,059	-				
Cuba	**	**	**	**	**	**	**
Dominican Republic	...	...	...	...	...	...	1 July 1958
Ecuador	One	245,950	257,102	29,160	25,380	-	18 March 1957
	Two	40,996	18,927				
El Salvador	One	181,348	191,284	151,670	28,630	-	1 July 1956
	Two	115,366	126,329				
Guatemala	One	272,177	290,352	-	33,280	393 Dieldrex 100%	1 Aug. 1956
Haiti	One	771,996	13,638	-	1,600	-	Sept. 1958
Honduras	...	...	...	...	...	...	Jan. 1958
Mexico	One	258,714	459,064	1,710,380	67,000	-	2 Jan. 1957
	Two	2,103,971	2,298,952				
Nicaragua	One	26,400	15,521	-	2,120	-	11 Nov. 1957 b)
Panama	One	70,122	53,431	-	6,970	-	19 Aug. 1957
Paraguay	One	16,205	16,291	-	1,760	-	30 Oct. 1957
Peru	One	323,015	294,570	108,190	-	-	15 Nov. 1957
	Two	35,160	4,290				
Venezuela	Two	129,287	128,900	106,644	117,902	-	1950
Other Political Units							
British Guiana	One	9,132	7,509	3,245	-	-	Jan. 1947 c)
British Honduras	One	17,655	17,082	-	2,160	-	4 Feb. 1957
Dominica	One	3,382	3,182	474	-	459 BHC	Jan. 1959
French Guiana	One	14,000	12,073	3,950	-	544 BHC 7.5%	May 1948 d)
Grenada	One	7,129	7,237	3,750	-	-	Feb. 1957
	Two	6,586	6,193				
Guadeloupe	One	19,987	19,525	13,915	-	-	1957
	Two	12,181	12,170				
	Three	482	482				
Jamaica	One	-	121,837	27,400	-	-	Jan. 1958
	Two	140,000	30,243				
Panama Canal Zone	Two	...	518	...	...	...	...
St. Lucia	Two	12,800	12,200	4,950	-	-	1 July 1956
Surinam	One	24,673	24,673	18,460	46	13 BHC	2 May 1958
	Two	2,586	2,586				
Trinidad and Tobago	One	116,000	103,059	30,390	4,310	-	Jan. 1958
	Two	...	5,364				

a) Not including the State of São Paulo.
b) Program temporarily interrupted.
c) Refers only to the coastal area.
d) Reimportation in 1954, spraying recommenced.

- Nil.
... Data not available.
** Report not received.

Table 17

NUMBER OF SPRAYING SQUADS BY MODE OF TRANSPORTATION IN THE MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1958

Country or Other Political Unit	Total Number of Squads Working	By Motor Vehicle	By Motorboat or Canoe	Mounted Squads	On Foot	With Transportation of More Than One Type
Total	1,624	692	74	510	148	200
Argentina	29	29	-	-	-	-
Bolivia	-	-	-	-	-	-
Brazil a)	...	...	...	...	...	...
São Paulo	39	36	3	-	-	-
Colombia	387	151	40	196	-	-
Costa Rica	16	-	-	-	-	16
Cuba	**	**	**	**	**	**
Dominican Republic	26	26	-	-	-	-
Ecuador	41	9	2	10	-	20
El Salvador	49	-	1	-	-	48
Guatemala	34	-	-	-	-	34
Haiti	74	28	-	30	16	-
Honduras	26	-	-	-	-	26
Mexico	540	161	7	249	123	-
Nicaragua	19	-	-	-	-	19
Panama	25	8	5	2	-	10
Paraguay	18	11	4	-	2	1
Peru	117	117	-	-	-	-
Venezuela	82	41	5	23	-	13
Other Political Units						
British Guiana	6	2	2	-	-	2
British Honduras	10	3	1	-	6	-
Dominica	2	-	-	-	-	2
French Guiana	6	-	-	-	-	6
Grenada	2	2	-	-	-	-
Guadeloupe	6	6	-	-	-	-
Jamaica	33	33	-	-	-	-
Panama Canal Zone	3	1	1	-	1	-
St. Lucia	4	4	-	-	-	-
Surinam	12	6	3	-	-	3
Trinidad and Tobago	18	18	-	-	-	-

a) Not including the State of São Paulo.

- Nil.
... Data not available.
** Report not received.

The organization and management of transport in malaria eradication programs have different patterns. In the majority of cases a special section or department in the national malaria service is responsible for the allocation and supervision of vehicles. There is in Mexico, as stated previously, a Logistics Department to handle exclusively all matters regarding motor vehicles and other means of transportation used in the malaria eradication program. In all cases the operation of motor transport is decentralized to the field unit which it serves.

Maintenance still constitutes a very important problem. Central workshops for routine inspection and up-keep of motor vehicles are not yet generalized. In one instance, at least, this function has been given to private contractors. The number of vehicles and various types of transport used in spraying operations or for other purposes in the malaria eradication programs under way are presented in Table 18.

The total 1,811 different forms of transport shown in Table 18 does not include animals. This total is more than twice as great as that shown in the V Report, which listed 697 forms of transport in the programs of the countries shown in Table 18. This twofold increase is accounted for principally by the increase in the number of jeeps (146 to 495) and pick-ups (197 to 926) and is related to the increase in the number of working squads and quantities of material and equipment that must be transported. Table 18 also shows 2,963 beasts of burden used in the program. In addition to this number, five countries and one political unit hire animals as they are required.

It should be noted that the degree of efficiency and expected duration of service for motor transport varies to a great extent according to the condition of the vehicles and the treatment they receive. It is, however, envisaged that in most programs vehicles will last until the final phases of the eradication campaign as forecast by the respective plans of operation.

According to information received, important factors have, to a varying extent, deleteriously influenced and delayed spraying operations. Among these factors are: delay in fund allocations due to bureaucratic machinery outside the NMES, and/or mismanagement of the funds inside the NMES; inadequate planning and supervision by NMES departments responsible for maintenance of vehicles, provision of gasoline, replacement of parts and equipment; difficulty of transportation due to poor condition of roads and weather conditions; high percentage of closed houses, causing otherwise unnecessary duplicate visits by spraying personnel to certain localities in order to attain total coverage; delay in receipt of supplies and materials from governments and international agencies, and administrative difficulties in handling these supplies; absenteeism and turnover of personnel, on account of low salaries, with the resultant loss of time and need for training new personnel.

Table 18

TRANSPORTATION SYSTEM IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1958

Country or Other Political Unit	Vehicles in Service or Which will be in Service								Beasts of Burden
	Total *	Station Wagons and Automobiles	Jeeps	Pick-ups	Trucks	Motorboats	Out-Board Motors	Other	
Total	1,811	110	495	926	112	62	65	41	2,963
Argentina	109	5	25	43	28	-	-	8 a)	-
Bolivia	15	-	3	8	1	-	2	1	182
Brazil b)	...	...	...	...	...	...	...	...	...
São Paulo	38	6	6	18	5	-	3	-	-
Colombia	54	5	19	25	2	3	-	-	710 c)
Costa Rica	35	1	7	11	1	6	9	-	d)
Cuba	**	**	**	**	**	**	**	**	**
Dominican Republic	66	4	23	38	1	-	-	-	d)
Ecuador	98	2	29	31	7	20	9	-	35
El Salvador	51	4	15	28	1	1	2	-	-
Guatemala	46	5	8	30	-	-	3	-	d)
Haiti	50	4	23	21	2	-	-	-	-
Honduras	46	4	8	29	2	-	3	-	d)
Mexico	653	2	201	416	16	3	5	10 e)	1,538
Nicaragua	33	-	12	11	2	3	5	-	d)
Panama	65	6	16	25	2	8	8	-	12
Paraguay	31	1	8	18	1	1	1	-	...
Peru	167	4	23	125	8	-	7	-	-
Venezuela	104	45	36	8	4	11	-	-	486
Other Political Units									
British Guiana	7	3	-	-	1	1	1	2 f)	-
British Honduras	5	1	-	3	-	-	1	-	d)
Dominica	7	-	2	1	1	-	-	3 g)	-
French Guiana	11	2	1	4	1	1	-	2 h)	-
Grenada	5	-	-	2	-	-	-	3 g)	-
Guadeloupe	7	-	3	1	3	-	-	-	-
Jamaica	43	2	15	12	14	-	-	-	-
Panama Canal Zone	16	-	-	7	-	1	2	6 i)	-
St. Lucia	10	3	1	3	-	-	-	3 g)	-
Surinam	16	-	2	2	2	3	4	3 g)	-
Trinidad and Tobago	23	1	9	6	7	-	-	-	-

a) Six tank trucks and two motorcycles.
b) Not including the State of São Paulo.
c) To be acquired.
d) Rented as necessary.
e) Ten buses.
f) One carrier-cycle and one tender.
g) Three motorcycles.
h) Two trailers.
i) Six rowboats.

* Includes motorboats, outboard motors and others.
\- Nil.
... Data not available.
** Report not received.

As can be seen, none of these negative factors are of purely technical character and most of them can be controlled. The Organization has therefore decided to establish posts of Advisers for Administration and Vehicle Maintenance Techniques, in order to assist the programs in solving these problems.

Epidemiological operations

In the Americas, epidemiological operations generally begin with the "pre-eradication survey" carried out during the preparatory phase; they continue with "evaluation operations" during the attack phase (total coverage), and subsequently with "surveillance and elimination of residual foci" during the consolidation phase.

The purpose of the pre-eradication survey is to obtain the fullest information on the malarious area, on the period of transmission, and on the vectors. The studies to delimit the malarious area were not very detailed, their purpose being to confirm the presence of the disease rather than its intensity, although in some cases the conventional techniques continued to be used (splenic and parasitic indices).

Evaluation operations begin with the first spraying and have the following objectives: (a) to discover the persistence of transmission and to determine its causes; and (b) to confirm the progressive disappearance of malaria. The only way to accomplish both objectives is through case searching, zero being the only reference for evaluating the results of a program. Therefore, any comparison with previous figures becomes invalid in appraising those results.

The following procedures are being utilized as a means of attaining these objectives:

A. Search for cases:

1. Reporting of all suspect malaria cases and taking of blood smears: (a) "clinically suspect cases" by physicians and paramedical personnel; (b) "epidemiologically suspect cases" (febrile cases) by official and voluntary collaborators.

2. Case-finding: house-to-house visits by service personnel; taking of blood smear from all persons with fever or recent history of fever.

B. Epidemiological investigation:

1. Registration and analysis of information and epidemiological material.

2. Epidemiological inquiry: (a) primary, to determine whether the case occurred after spraying; (b) exhaustive, to determine origin and relations.

In the consolidation phase, after the discontinuation of spraying, the epidemiological operations follow the same pattern, though the objectives differ as follows: (a) to confirm the absence of malaria cases during a period of three years, in order to substantiate the fact that eradication has been achieved; (b) to discover and eliminate any residual foci of malaria; and (c) to detect any reintroduction of the parasite and prevent the re-establishment of endemicity.

Several aspects are of fundamental importance in evaluation operations in the Americas: (1) their early initiation (at the beginning of the attack phase); (2) the compulsory notification of all known or suspect malaria cases; (3) the organization of an extensive network of "voluntary collaborators" for blood sampling of all fever cases; and (4) the establishment of facilities for immediate parasitological diagnosis.

With respect to the results of reporting and case-finding for 1957, Table 19 has been arranged to show cases reported by the same group of areas used in Tables 4 and 5, namely, those in which malaria has been eradicated, those under surveillance, those with malaria not yet eradicated but sprayed regularly, and those with malaria not eradicated and in which spraying has not yet started or is irregular and incomplete.

Table 19 shows also the number of known cases according to the source of reporting, as follows: (1) private physicians, hospitals, clinics, etc.; (2) routine investigation of fever patients in hospitals, clinics, etc.; (3) house-to-house visits; (4) voluntary collaborators; and (5) other sources.

The first four of these categories have been chosen because they represent a pattern which is emerging in the eradication programs of the Americas. The relative importance of these categories varies from country to country, as can be seen in the table. In addition, there may be some overlapping in this choice of classification. Any discussion of malaria cases in an eradication program must be restricted to those parasitologically confirmed; therefore, the need of a blood smear accompanying every suspect case must be a prime responsibility in the evaluation operations of any NMES.

Argentina, Venezuela, and British Guiana reported 93 malaria cases in eradication areas. Of these, 80 were "imported", ten "induced", two "sporadic", and one from British Guiana was not classified.

It is pertinent to include here information received for the continental United States of America, where 146 suspect cases were reported in 1957. Of the 138 so far appraised by the Communicable Disease Center of USPHS, 97 were confirmed as positive, of which 86 were imported and 11 indigenous. Taking these indigenous cases into account, the USPHS considers eradication in the United States of America to be "virtually completed."

Table 19

CASE-FINDING FROM VARIED SOURCES IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1957

Country or Other Political Unit	Source of Cases											Total of positive cases	Form of infection				Nature of cases			
	Private physicians, hospitals, clinics, etc.		Routine investigation of fever cases in hosp., etc.		House-to-house visits			Voluntary collaborators		Other										
	Number notified	Number positive	No. of slides taken	Number positive	Number of visits	No. of slides taken	Number positive	No. of slides taken	Number positive	No. of slides taken	Number positive		P. vivax	P. falciparum	P. malariae	Mixed	Imported	Sporadic	Induced	Indigenous
In Areas with Malaria Eradicated																				
Total	292	6	122	-	186,913	111,444	33	7,414	54	1,861	-	93	83	1	8	1	81 a)	2	10	-
Argentina	119	4	30	-	20,485	12,811	4	457	-	-	-	8	8	-	-	-	6	-	2	-
Brazil b)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Venezuela	130	-	-	-	166,428	98,633	29	6,957	54	1,861	-	83	74	-	8	1	73	2	8	-
British Guiana	2	2	11	-	-	-	-	-	-	-	-	2	1	1	-	-	2 a)	-	-	-
Guadeloupe	41	-	81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surinam	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
In Areas Under Surveillance (Consolidation Phase)																				
Total	811	27	684	-	131,816	43,605	21	4,352	56	315	17	121	70	46	3	2	84	8	3	26 c)
Argentina	22	2	51	-	40,495	5,194	12	4	-	...	2	16	13	-	3	-	12	-	3	1
Venezuela	71	-	-	-	91,321	38,087	9	4,348	56	315	-	65	56	7	-	2	65	-	-	-
French Guiana	...	...	...	...	...	...	...	...	...	...	15	15	-	15	-	-	7	8	-	-
Guadeloupe	84	-	633	-	-	324	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trinidad and Tobago	634	25	-	-	-	-	-	-	-	-	-	25	1	24	-	-	...	...	...	25 c)
In Areas with Malaria not yet Eradicated but Sprayed Regularly																	Not Specified*			
Total	38,182	6,392	93,504	8,203	552,616	446,862	9,332	31,423	2,760	21,552	5,964	32,651	20,779	10,715	181	337	639			
Argentina	494	110	518	121	11,351	11,686	338	560	146	5,957	46	761	706	53	-	2	-			
Bolivia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Brazil b)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Costa Rica	-	473	-	-	18,583	17,825	590	311	90	-	-	1,153	1,033	92	18	10	-			
Dominican Republic	6,601	1,533	-	-	-	-	-	-	-	-	-	1,533	890	630	12	1	-			
Ecuador	4,225	196	11,132	587	...	17,802	730	656	99	4,816	63	1,675	808	835	3	29	-			
El Salvador	2,296	452	9,671	1,042	62,516	7,596	2,036	4,104	1,581	5,504	1,544	6,655	3,649	2,949	5	52	-			
Guatemala	8,842	2,206	6,096	1,794	49,424	5,759	384	318	22	4,217	1,247	5,653	3,812	1,792	4	45	-			
Honduras	-	-	1,276	125	6,464	721	65	-	-	-	-	190	103	87	-	-	-			
Mexico	4,950	664	11,565	896	...	142,992	2,246	15,564	581	-	-	4,387	3,856	453	17	61	-			
Nicaragua	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Panama	-	-	48,738	3,328	5,067	18,181	1,162	-	-	...	3,060	7,550	4,796	2,565	61	128	-			
Paraguay	3,698	154	316	11	2,140	562	38	62	1	12	2	206	204	2	-	-	-			
Peru	512	21	-	-	-	37,287	618	-	-	-	-	639	-	-	-	-	639			
Venezuela	359	10	-	-	382,139	160,856	499	9,848	240	1,004	2	751	663	77	4	7	-			
British Guiana	1	1	236	-	107	107	-	-	-	-	-	1	1	-	-	-	-			
British Honduras	319	-	2,132	212	-	-	-	-	-	-	-	212	53	121	38	-	-			
Grenada	-	-	773	21	8,115	2,270	113	-	-	-	-	134	-	134	-	-	-			
Guadeloupe	76	-	284	1	6,710	1,145	-	-	-	-	-	1	-	1	-	-	-			
Jamaica	3,224	-	767	65	...	8,056	200	-	-	42	-	265	1	251	13	-	-			
Panama Canal Zone	77	77	-	-	...	804	32	-	-	-	-	109	72	37	-	-	-			
St. Lucia	441	9	-	-	-	3,446	10	-	-	-	-	19	-	16	3	-	-			
Surinam	288	87	-	-	-	-	-	-	-	-	-	87	44	43	-	-	-			
Trinidad and Tobago	1,770	399	-	-	...	9,767	271	-	-	-	-	670	88	577	3	2	-			
In Areas with Malaria not yet Eradicated and Total-Coverage Spraying not Started																				
Total	131,979	9,792	14,210	393	3,925,591	690,790	23,043	57	23	8,170	3,731	36,982	26,895	9,333	228	502	24			
Brazil b)	58,077	9,756	-	-	3,730,427	399,991	18,411	-	-	-	-	28,167	21,216	6,454	29	468	-			
São Paulo	-	-	-	-	-	-	-	-	-	...	3,545	3,545	3,525	16	1	3	-			
Colombia	73,056	-	-	-	169,597	266,239	2,497	-	-	614	39	2,536	1,700	739	58	15	24			
Cuba	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**			
Haiti	-	-	-	-	-	23,084	1,964	57	23	-	-	1,987	8	1,829	136	14	-			
Nicaragua	666	36	14,210	393	25,567	1,476	171	-	-	7,156	146	746	446	294	4	2	-			
British Guiana	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Dominica	130	-	-	-	-	-	-	-	-	400	1	1	-	1	-	-	-			

a) One case not classified.
b) Not including the State of São Paulo.
c) Twenty-five cases not classified.

- Nil.
... Data not available.
* Not specified by form of infection.
** Report not received.

Of these 11 indigenous cases, six were found in California and one in Indiana, that is, outside the traditional malarious area and not within the area covered by the national eradication program (1949-1951). The four remaining cases appeared in Oklahoma, two of them in Cherokee County. A more careful investigation made recently (April 1958) led to the discovery of four additional confirmed cases and two highly suspect cases in the same county, all of them in two small neighboring rural localities inhabited by Cherokee Indians. It was not possible to find any recent trace of the possible reintroduction of the parasite, and it was therefore necessary to assume that these were two small residual foci of endemic malaria. Reintroduction of the parasite many years back remains a possibility, though no evidence of this was found. Adequate measures have been taken for the elimination of these residual foci.

From areas under surveillance, Argentina, Venezuela, French Guiana, and Trinidad and Tobago reported 121 cases. Trinidad and Tobago did not give information of the nature of the 25 cases reported in these islands. Of the remaining 96 cases, 84 were "imported", eight "sporadic", three "induced", and one case in Argentina was considered "indigenous."

Emphasis should be laid on the very effective service being rendered by voluntary collaborators. In this respect, the data from Venezuela are particularly significant. In areas where malaria has been eradicated (Table 19), out of a total of 83 positive cases, 54 were found by the collaborators, as compared to 29 found by service personnel in 166,428 house-to-house visits. The same was true of areas under surveillance, where of 65 positive cases, 56 were found by voluntary collaborators, as opposed to 9 discovered in 91,321 house visits. This gain is not only quantitative but also qualitative, as is shown by the ratio of positive slides to slides taken: 0.78 and 1.29 per cent for voluntary collaborators, as compared to 0.03 and 0.02 per cent for service personnel, in areas where malaria had been eradicated and in areas under surveillance, respectively.

From those areas in which malaria transmission is known to occur and in which regular spraying has commenced, 12 countries and 9 other political units reported a total of 32,651 positive cases. Of this total, 9,332 (28.6 per cent) were the result of house-to-house visiting, 8,203 (25.1 per cent) were the result of routine investigation of fever patients in hospitals, clinics, etc., 6,392 (19.6 per cent) were notified by physicians, hospitals, clinics, etc., 5,964 (18.3 per cent) came from other sources and the remaining 2,760 (8.5 per cent) were cases reported from work of voluntary collaborators. Attention must again be drawn to the work of the voluntary collaborators. Of the 31,423 blood smears collected by them, 2,760, or 8.8 per cent, were positive whereas of the 446,862 smears examined as a result of house-to-house visits 9,332, or only 2.1 per cent, were positive. This is one of the reasons why the implementation of voluntary collaboration is being strongly supported throughout the Americas.

Four countries and two other political units gave information on cases reported from areas in which malaria transmission occurs but in which total-coverage spraying has not begun. In all, there were 36,982 confirmed cases, of which reports 23,043 (62.3 per cent) were the result of house-to-house visiting.

Comparison of the cases reported for 1957 with those of the years included in the V Report would have no meaning because of the improvement in the quality and extent of the case notification systems now developing in relation to malaria eradication programs. Furthermore, as stated earlier, interest lies only in zero malaria cases based on an adequate notification and case-finding system and not on achievement of partial reduction of transmission and its comparison with past figures.

Mortality from malaria has not been mentioned because, as stated in the V Report, it is perhaps the least valuable of all malariometric information. Its consideration is beset with the problems of the degree of accuracy of certification and registration. It is important, however, that those concerned with the evaluation operations of the eradication program have the opportunity to investigate every death attributed to malaria with the aim of restricting such notification to those deaths confirmed by laboratory examination. The Summary of Four-year Reports on Health Conditions in the Americas presented to the XV Conference includes the available information relating to malaria mortality for the year 1956, so that these data need not be discussed further in this report.

Entomological operations

In a malaria eradication program, sound entomological studies are a necessary ancillary activity throughout the campaign, although not to the same extent as in former times, when a knowledge of the natural history of anophelines was an essential prerequisite. The identification of the vector species and the study of its distribution and feeding habits are straightforward responsibilities of the entomological service. There is also the additional important task of studying the relationship of vector species to the insecticide used in the program. This work involves a determination of the susceptibility of the vector to the insecticide prior to the commencement of spraying and studies throughout the period of spraying to detect any change which may occur in this initial susceptibility.

In the Americas there are entomological laboratories in which such studies relating to the vector are being made. The existing laboratories and the results of base-line susceptibility tests which have been carried out are shown in Table 20.

There is a partial explanation for the fact that this information has been obtained from only six countries and four other political units.

Table 20

ENTOMOLOGICAL OPERATIONS IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1957

Country or Other Political Unit	Organized and functioning laboratories		Determination of the base-line susceptibility of local vectors						
	No.	Location	Species	Result	Species	Result	Species	Result	Type of test used in the laboratory
Total	39								
Argentina	...	...	pseudo-punctipennis	Susceptible	...	...	...	...	Busvine-Nash
Bolivia	...	...	...	...	...	...	...	...	...
Brazil a)	...	...	cruzii	Susceptible	darlingi	Susceptible	aquasalis	Susceptible	Busvine-Nash
São Paulo	6	Various	...	...	...	...	...	...	...
Colombia	1	Bogotá	...	...	...	...	...	...	...
Costa Rica	...	San Jose	...	...	...	...	...	...	...
Cuba	**	**	**	**	**	**	**	**	**
Dominican Republic	1	Cdad. Trujillo	...	...	...	...	...	...	...
Ecuador	1	Guayaquil	...	...	...	...	...	...	...
El Salvador	1	San Salvador	albimanus	b)	pseudo-punctipennis	...	...	...	Busvine-Nash
Guatemala	...	...	...	...	...	...	...	...	...
Haiti	...	...	...	...	...	...	...	...	...
Honduras	...	...	...	...	...	...	...	...	...
Mexico	15	c)	pseudo-punctipennis	Susceptible	albimanus	Susceptible	aztecus	Susceptible	Fay
Nicaragua	1	Managua	...	...	...	...	...	...	...
Panama	1	Panama	albimanus	...	...	...	...	...	Busvine-Nash
Paraguay	...	...	...	...	...	...	...	...	...
Peru	5	...	pseudo-punctipennis	Susceptible	...	...	...	...	WHO
Venezuela	1	Maracay	albimanus	Susceptible	aquasalis	Susceptible	albitarsis	Susceptible	Busvine-Nash
Other Political Units									
British Guiana	1	Georgetown	...	...	...	...	...	...	...
British Honduras	...	...	albimanus	Susceptible	...	...	...	...	...
Dominica	...	...	...	...	...	...	...	...	...
French Guiana	1	Cayenne	aquasalis	Susceptible	darlingi	Susceptible	...	...	Busvine-Nash
Grenada	...	...	...	...	...	...	...	...	...
Guadeloupe	1	...	albimanus	Susceptible	aquasalis	Susceptible	...	...	Busvine-Nash
Jamaica	1	Kingston	...	...	...	...	...	...	...
Panama Canal Zone	...	...	albimanus	Susceptible	...	...	...	...	...
St. Lucia	...	...	...	...	...	...	...	...	...
Surinam	...	...	...	...	...	...	...	...	...
Trinidad and Tobago	1	Port-of-Spain	...	...	...	...	...	...	...

a) Not including State of São Paulo.
b) See reference in the text.
c) One in Mexico City and one in each of the 14 zones.

... Data not available.
** Report not received.

The techniques for determining the degree of susceptibility had been under discussion and review until the adoption of the WHO test, which began to be used in 1957. Further improvements should still be made to permit the appraisal of minor modifications to distinguish them from the susceptibility variations that normally occur.

The interest shown in the training of specialized personnel and in the renovation of entomological laboratories is also very recent, for when each program was initiated all attention had been concentrated on the proper organization of spraying operations.

Up to early 1958, no physiological resistance to the insecticides had been confirmed in any of the anopheline vectors in the Americas, except A. quadrimaculatus in a small area of the United States of America where fortunately malaria had disappeared in previous years. An investigation to determine the persistence of transmission in some localities in El Salvador revealed in the local vector, A. albimanus, a high physiological resistance to dieldrin and a moderate resistance to DDT. With one exception, all these localities are situated in the cotton area, where large amounts of chlorinated insecticides have been used for several years to combat agricultural pests. Though this episode is to date but a small and isolated one, it confirms the urgent reasons that led to Resolution XLII of the XIV Pan American Sanitary Conference, and it is a clear and somber warning for the future if the programs do not continue to be developed according to established procedures and within the set time limits.

Use of drugs

The eradication of malaria from the Americas is dependent primarily on the effective usage of the residual insecticides, which is the basic and fundamental measure in eradication programs. The importance of the use of the new antimalarial drugs, properly applied, both therapeutically and prophylactically, must not however be overlooked. Drugs can be a valuable adjuvant, facilitating the collection of blood smears as a routine part of the case-finding process, and cutting short the infective period of the cases found; but in addition there are situations in which a sound program of drug administration may complement or substitute residual insecticides where the latter are inapplicable or inefficient, as in the cases of:

(1) nomadic or migratory populations;

(2) extradomiciliary transmission;

(3) sorption of insecticides by certain types of muds and adobes; or

(4) behavioristic or physiological resistance of the vector to residual insecticides.

Most countries and other political units continued to use drugs in 1957 as a part of their antimalaria activities. The patterns of this usage are not comparable one with another, but an indication of the different drugs used, the quantity employed, whether they were used prophylactically or therapeutically, and the number of persons receiving drugs is shown in Table 21.

To give assistance in this matter, the Organization prepared a technical document (PASB/ME Nº 16, 12 November 1957) setting standards for the use of antimalarial drugs as a routine procedure in normal eradication programs, with the basic aim of stimulating a greater degree of collaboration in the general population and facilitating the follow-up of positive cases and preventing their persistence beyond the date of discontinuation of spray operations. Most countries and other political units have adopted these standards as part of their eradication programs.

In several areas of Brazil, the Pinotti method (administration of chloroquine by its addition to common salt) continues to be used, but figures giving an indication of the population believed to be protected in this way are not given for the year 1957. In the actual plan for malaria eradication, this method will be used in the whole Amazon Basin.

Pyrimethamine has been used prophylactically in Venezuela, Grenada, and Trinidad and Tobago.

Table 21

DRUG USAGE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1957

Name of Drug and Basic Type		Countries Using Drug	Use of Drug	Quantity in Kg.	Number of persons
4 - AMINOQUINOLINES					
Camoquin		Brazil (a)	Therapeutic	...	...
		British Honduras	Therapeutic	10.40	...
		Colombia	Therapeutic	21.40	53,465
		Costa Rica	Therapeutic	0.40	677
			Prophylactic	5.30	14,982
		Ecuador	Therapeutic	3.74	6,227
		El Salvador	Therapeutic	18.00 b)	...
		Paraguay	Therapeutic	1.80	3,056
		São Paulo	Therapeutic & Prophylactic	...	...
		St. Lucia	Therapeutic & Prophylactic	...	...
		Trinidad and Tobago	Therapeutic	2.48	5,643
Chloroquine		Brazil (a)	Therapeutic	...	1,200,000
		Colombia	Therapeutic	35.80	79,684
		Grenada	Therapeutic	0.69	797
		Guatemala	Therapeutic	19.99	23,548
		Mexico	Therapeutic	37.24	71,161
		Panama Canal Zone	Therapeutic	...	...
		Venezuela	Therapeutic	1,418.00	...
Aralen	(synonym of chloroquine)	Argentina	Prophylactic	0.76	635
		British Honduras	Therapeutic	...	...
	(by injection)	Costa Rica	Therapeutic	0.06	476
		El Salvador	Therapeutic	28.99	...
	(by injection)	El Salvador	Therapeutic	1.93	...
		São Paulo	Therapeutic & Prophylactic	...	...
Nivaquine	(synonym of chloroquine)	French Guiana	Therapeutic	...	250
			Prophylactic	...	...
		Panama	Therapeutic	2.30	1,310
		St. Lucia	Therapeutic & Prophylactic	...	...
		São Paulo	Therapeutic & Prophylactic	...	...
Resochin	(synonym of chloroquine)	Panama	Therapeutic	3.78	2,646
8 - AMINOQUINOLINES					
Primaquine		Ecuador	Therapeutic	0.01	50
		El Salvador	Therapeutic	0.03	157
		Guatemala	Therapeutic	0.27	1,279
		Mexico	Therapeutic	1.01	...
		Panama Canal Zone	Therapeutic	...	...
(Neo) Quipenyl	(synonym of primaquine)	Argentina	Therapeutic	0.06	205
		São Paulo	Therapeutic & Prophylactic	...	...
Rodopréquine		French Guiana	Prophylactic	...	3,126
Pamaquine		Guatemala	Therapeutic	0.02	126
Plasmoquine	(synonym of pamaquine)	British Honduras	Therapeutic	...	...
DIAMINOPYRIMIDINES					
Pyrimethamine		Grenada	Therapeutic	0.13	797
		Mexico	Therapeutic	2.52	37,468
		Trinidad and Tobago	Therapeutic	0.30	5,643
		Venezuela	Prophylactic	106.00	105,943
Daraprim	(synonym of pyrimethamine)	Guatemala	Prophylactic	0.03	250
		St. Lucia	Prophylactic	...	...
BIGUANIDES					
Paludrine		St. Lucia	Therapeutic & Prophylactic	...	...
9 - AMINOACRIDINES					
Atebrin	(synonym of mepacrine)	St. Lucia	Therapeutic	...	...
Metoquina	(synonym of mepacrine)	Argentina	Therapeutic	0.22	150
		Paraguay	Therapeutic	...	...
		Venezuela	Therapeutic	12.00	...
Chinacrine	(synonym of mepacrine)	Guatemala	Therapeutic	0.79	282
CINCHONA ALKALOIDS					
Quinine		British Honduras	Therapeutic	10.00	...

a) Not including State of São Paulo.
b) Drugs distributed.
... Data not available.

ROLE OF INTERNATIONAL ORGANIZATIONS IN MALARIA ERADICATION IN THE AMERICAS

Historical Background

The Americas are privileged to have given the initial impetus to the eradication of malaria in the world. The first declaration was made in 1950 in Ciudad Trujillo during the XIII Pan American Sanitary Conference[1/], and the second, four years later, in 1954, during the XIV Pan American Sanitary Conference in Sanitago, Chile[2/]. Both resolutions were based on studies on the status of the antimalaria campaign in the Americas, sponsored by the Pan American Sanitary Bureau[3/].

The resolution of Santiago was the beginning of a chain reaction in the international organizations. Five months later, in March 1955, the Executive Board of UNICEF decided to revise its policy of assistance to antimalaria programs and in this matter sought the advice of the WHO/UNICEF Joint Committee on Health Policy. At a meeting in New York early in May 1955, the Joint Committee recommended that UNICEF give the highest priority to the eradication programs, and set forth the basic conditions under which those programs would be eligible for financial support from UNICEF[4/]. A few days later, the Eighth World Health Assembly (Mexico City, May 1955) called for the implementation of a program having as its ultimate objective the world-wide eradication of malaria[5/].

In the Americas, the Governing Bodies of the Pan American Sanitary Organization have continued to reinforce the previous resolutions in new recommendations adopted. Thus, at the IX Meeting of the Directing Council (Antigua, Guatemala, September 1956) it was resolved that malaria eradication should be given first priority among the programs sponsored by the Organization[6/]. The X Meeting (Washington, D.C., September 1957) drew up recommended procedures for the international reporting of malaria cases[7/].

1/ See Annex, (1), page 57.
2/ See Annex, (2), page 57.
3/ PASB/WHO Publication Nº 261, Annex B. Situación de la Lucha Antimalárica en el Continente Americano, IV Informe, C. A. Alvarado; and PASB/WHO Scientific Publication Nº 27, Status of the Antimalaria Campaign in the Americas, V Report, C. A. Alvarado.
4/ See Annex, (3), page 58.
5/ See Annex, (4), page 60.
6/ See Annex, (5), page 62.
7/ See Annex, (6), page 63.

The interest aroused in malaria eradication has already extended beyond the specialists in this field and the responsible public health authorities. The Inter-American Committee of Presidential Representatives of the American Republics, at a meeting in Washington in May 1957, also formulated a recommendation giving top priority to this program and to its financing[1].

But the declarations and recommendations in themselves do not make history. The first positive step was taken by the XIV Pan American Sanitary Conference (October 1954) when it made a budgetary provision of $100,000 yearly for the intensification of the Bureau's antimalaria activities[2], funds that made possible the establishment of a specialized unit to handle the problem.

The second step was the decision of UNICEF, adopted by its Executive Board in September 1955, to support the malaria eradication program in Mexico and, subsequently, to support the majority of the programs in the countries of the Americas, for which purpose UNICEF has committed itself, in principle, to the sum of $19,000,000 for the duration of the campaign.

The third step was taken in 1957, when several countries of the Americas (the Dominican Republic, the United States, and Venezuela) decided to make substantial contributions to the Special Malaria Fund of PASO, thereby providing the Bureau with the necessary means to carry out properly all the functions incumbent upon it as an advisory and coordinating agency.

Finally, the most decisive steps were those taken by all the governments of the Americas, which one after the other, after overcoming all sorts of difficulties, joined in the eradication effort, so that four years after the resolution of Santiago, practically the entire Western Hemisphere is covered by malaria eradication programs.

Moreover, the decision of the countries of the Americas was not limited to the organization of their own programs; all of them expended the greatest effort to ensure the coordination of activities for the continent-wide campaign. For that purpose they offered all possible facilities for the training of personnel from other countries and from the international service, as well as for the trial of methods and techniques designed to improve the operations. They have, in addition, reported frankly and openly on their own achievements, showing willingness at all times to accept any observations or suggestions that could improve the quality of their programs.

1/ See Annex, (7), page 64.

2/ See Annex, (8), page 65.

Role of the Organization

In compliance with resolutions XLII and XLIII of the XIV Pan American Sanitary Conference, the Organization established a specialized unit engaged exclusively in promoting and coordinating the continent-wide activities. That unit was set up in Mexico City in March 1955. One of its principal tasks was the preparation of technical standards for the development of the various eradication operations. These standards, issued in the documents series "PASB/COMEP" and reviewed and approved by the PASB Advisory Committee on Malaria Eradication, constituted the foundation for the planning and execution of the programs.

For two years the main activity consisted of assistance to the countries in preparing their plans of operation and in organizing the training of personnel required for the programs. The preparation of the plans of operation produced the documents shown in Figure 2, references that contain not only the background data on malaria in each country but also the most complete details expected in each operation.

In November 1956, following the announcement of the first contribution to the PASO Special Malaria Fund by the Government of the United States of America, it was deemed advisable to transfer the special malaria unit to Washington, since experience had shown the need for closer contact and coordination with the central office. The transfer was made in January 1957, and within the organizational structure of headquarters, the special unit was set up, with the necessary functions and authority and with direct access to the Director, to deal exclusively with this single important problem. This step thus created a pattern equivalent to that suggested to the countries for the management of their own malaria eradication programs. At the same time, measures were taken so that all the branches in the Bureau would give the malaria program first priority and provide the specialized unit with all the support necessary to obtain the quickest and most effective action possible.

Of the original technical staff members of the unit in Mexico, consisting of a chief malariologist, a sanitary engineer, an epidemiologist, a parasitologist, and an entomologist, the first three were transferred to Washington because of their greater responsibility in the preparation of standards and in administration. The last two were transferred to Panama because of its strategic geographic location. The cooperative training programs, which we shall refer to subsequently, and the evaluation team were placed under the technical direction of the malaria unit at headquarters. Later, it was necessary to reinforce the group in Washington by adding two new staff members: one in charge of follow-up of day-to-day technical operations, and the other responsible for administrative operations. Three additional technical advisers were assigned to the Panama group, one specialized in transport management and vehicle maintenance, and the other two in administrative procedures. Figure 4

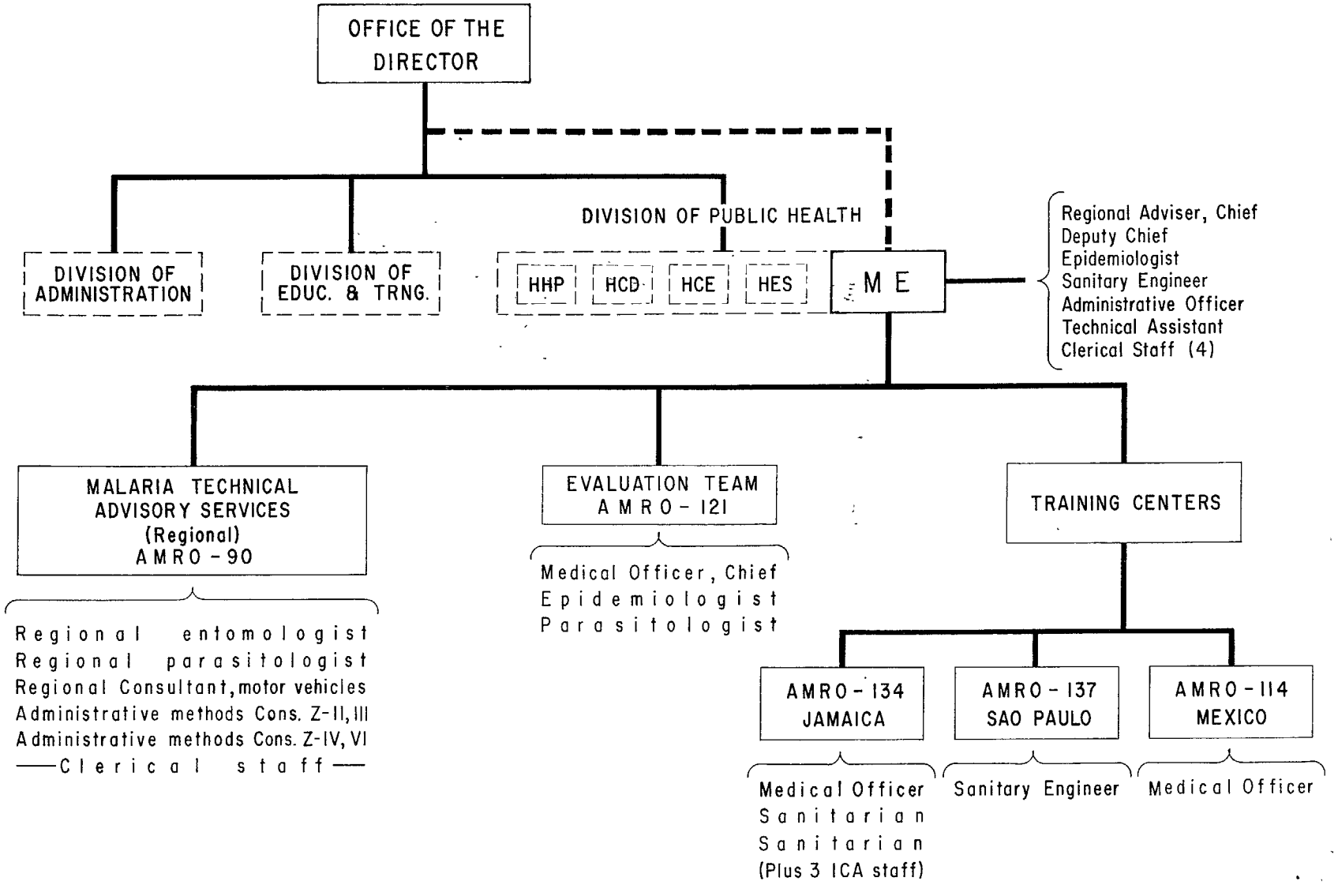

FIGURE 4. ORGANIZATIONAL PATTERN, MALARIA ERADICATION REGIONAL UNIT – PASB.

JLV.

shows the structure of the malaria unit, its place within the Organization, and the technical services under it.

A program as extensive, ambitious, and dynamic as that of malaria eradication in the Western Hemisphere has required great and varied efforts on the part of the international organization responsible for its promotion and coordination. The most important efforts are referred to in this report.

Technical advisory services

A malaria eradication program is essentially an aggressive operation based on techniques that are well-known but whose application must be planned in detail and carried out with precision. Technical advice had to be organized under a structure that would respond to this requirement. A system was therefore established that functions at three levels.

At the country project level, a team of international consultants, composed generally of a malariologist as team leader, an engineer specialized in spraying operations, and one or more sanitary inspectors, is responsible for giving day-to-day operational assistance.

The second level is represented by the zone office, whose chief is responsible for assistance in political and administrative aspects, and which has, in addition, a technical unit composed of a highly experienced malariologist, a sanitary engineer, an entomologist, and, in certain cases, a consultant in administrative methods and another in statistics. This zone technical unit is responsible for supervising the activities of project consultants, and for giving technical assistance at a higher level.

The third level is represented by the central unit in Washington, which is responsible for establishing technical standards, for maintaining general technical supervision and coordination at the continental level, and for maintaining technical contact with Geneva headquarters (Division of Malaria Eradication), with UNICEF, and ICA.

Figure 5 shows graphically these three levels of international advisory services as well as their functional organization. In reality, a fourth level should be mentioned, that of the Director of the Bureau, where the responsibility lies for the major political and administrative decisions of regional scope.

The technical advisory services provided to the countries employ nine different categories of professional staff: (1) malariologists, for the preparation of plans, general technical aspects, and particularly for epidemiological operations; (2) sanitary engineers, for spraying operations and related activities:

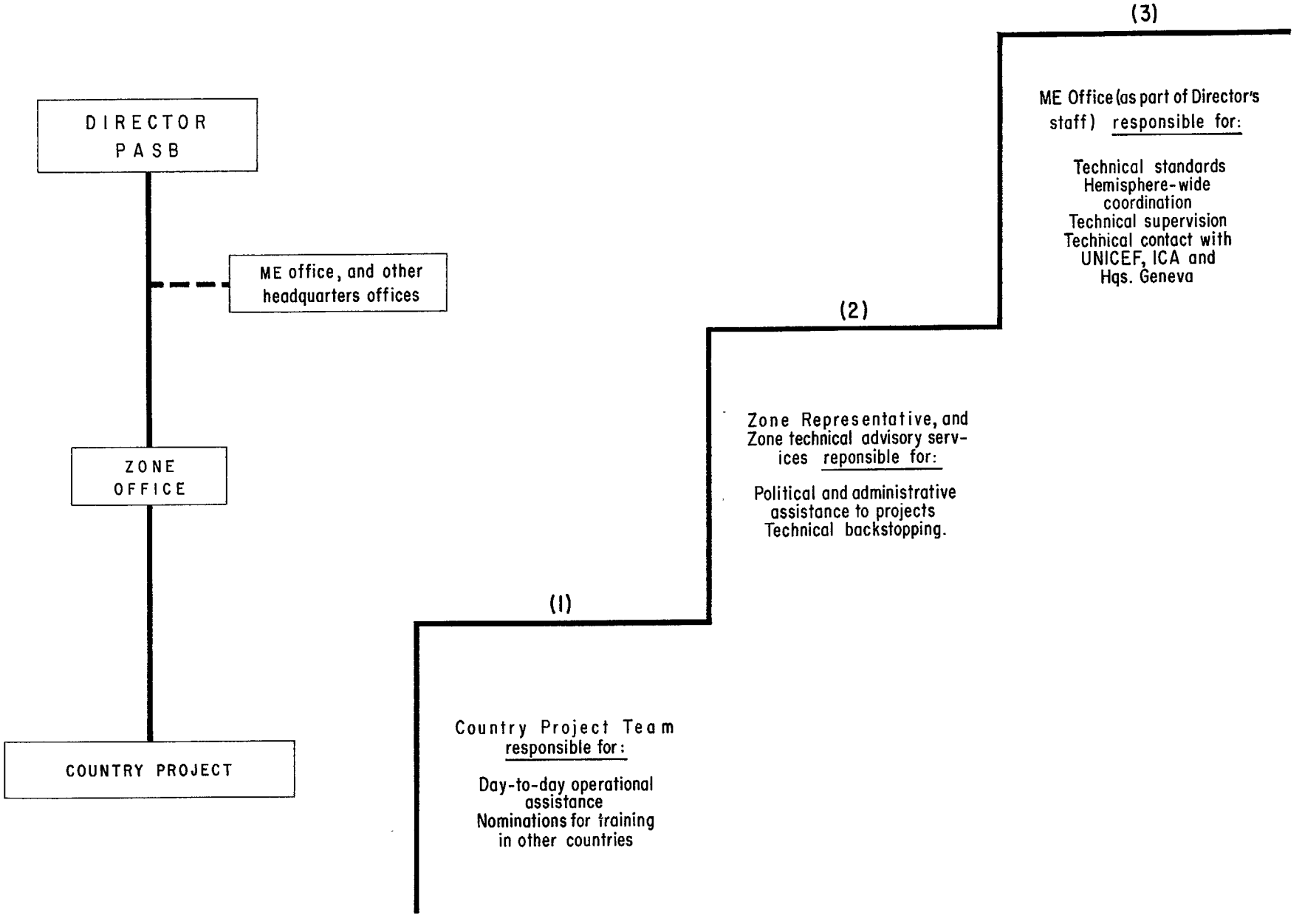

FIGURE 5. ORGANIZATION AND RESPONSIBILITY OF INTERNATIONAL STAFF IN RELATION TO COUNTRY MALARIA ERADICATION PROJECTS IN THE AMERICAS

transportation and supplies; (3) entomologists, for allied operations, especially susceptibility tests; (4) parasitologists, for the organization of laboratories responsible for parasitological verifications and related techniques; (5) statisticians, for all matters related to statistical information, particularly case reporting and registration; (6) consultants in administrative methods, for the organization of the central and peripheral administrative offices and for advising on the most efficient and expeditious administrative methods within the framework of legislation and standards in force in each country; (7) specialists in transport management and vehicle maintenance, for all matters related to the proper operation of the transport system; (8) health educators, for the specific phases of education and information on the eradication program; and (9) sanitary inspectors, responsible for cooperating in the peripheral organization of spraying and evaluation operations and for advising on techniques for supervision of these operations. The above personnel are also responsible for local training at the corresponding level and for the development and application of techniques for supervision and appraisal of the work, particularly of that still to be done. To these permanent activities should be added those assigned to short-term consultants in special cases, such as the use of drugs by the Pinotti method, and the maintenance of spraying equipment.

As can be seen, malaria eradication has demanded the mobilization of a wide variety of professionals. Among them, special mention should be made of the consultants in administrative methods, because of their unique functions. These posts were established as a result of the experience which showed that the most common problems in malaria eradication programs and those most frequently hindering the development of operations are related to administrative matters.

The number of international personnel engaged in the malaria eradication program in the Americas as of 31 August 1958 is shown in Table 22, classified in six groups: medical officers, 32; engineers, 20; entomologists, 4; sanitarians, 41; administrative consultants, 4; and others, 4, including advisers in health education, parasitology, transport, and statistics. Of the total of 105, 95 are in active service and ten are in training. A volume of personnel such as this has made it necessary to devise means for filling vacancies that occur for numerous reasons. A pool has been created for this purpose, that is, a reserve force that permits rapid replacements as vacancies occur, without going through the time-consuming procedures involved in normal recruitment and training.

TABLE 22

International Staff for Malaria Eradication in the Americas
31 August 1958

Level	Medical Officers	Engineers	Entomologists	Sanitarians	Adm. Cons.	Others
Projects	19	13	-	32	-	1 Health Educ.
Zones (Tech. Adv. Services)	2	3	3	-	-	1 Lab. Adv.
Inter-Zone	-	-	-	-	1	
Regional:						
(a) ME Wash. Office	2	2	-	-	1	
(b) ME-Panama	2	-	1	3	1	1 Motor Veh. Cons.
(c) Evaluation Team	3	-	-	1	-	
(d) Training Centers	2	-	-	1	-	
Total - in service	30	18	4	37	3	3
Total - in training	2	2	-	4	1	1 Statistician
GRAND TOTAL	32	20	4	41	4	4

Training

Among the Organization's most important activities have been those designed to furnish means for the training of personnel required for the national services; prepare the staff of advisers referred to above, and maintain a high standard of operational efficiency. For this purpose, new international training centers have been established and regular and special courses, as well as seminars and workshops, have been organized.

The number of personnel trained has been considerable, but data can be given only on the technical professional personnel trained in the international centers through fellowships granted by the Organization. Unfortunately, the information is incomplete on personnel in other categories trained at the local level. These figures would have indicated the considerable effort expended by the individual countries to improve the quality of their own staff. From 1 January 1955 to 31 July 1958, the Organization has awarded 141 fellowships for regular courses, special studies, and study and orientation visits.

The training of personnel for the international service also deserves special mention, since it represents a rather new aspect of the Organization's activities in this field.

The traditional procedure for recruiting international consultants has been to seek them among leading professionals of the national services. However, as has been seen, the rapid expansion of the malaria eradication program demanded such a considerable number of specialized personnel to reinforce the national staff that it practically cancelled out the possibility of obtaining consultant personnel by the usual method; there was no alternative but to train them. In the international field this was an unprecedented experience, imposed by circumstances. A program was therefore established to recruit professionals (medical officers and engineers) who have a master's degree in public health or sanitary engineering, excellent references, and at least two years' experience in public health work, and then to have them take a short but intensive period of training consisting of: (a) a 12-week basic course in malariology and malaria eradication techniques at one of the four centers mentioned below; (b) four weeks' work as assistant to the national director of a malaria eradication program, or to a zone chief, in order to acquire executive experience and judge the problems from the national viewpoint; (c) a minimum of 4 weeks' work as junior consultant to a senior consultant, in order to appraise the problems from the international viewpoint and gain experience in methods of advising on their solution.

At first, there was understandable resistance on the part of the countries in accepting the advice of international consultants thus trained. But once the first misgivings about these consultants' proficiency and competence were overcome, the countries showed satisfaction with their services and it can now be affirmed that the greater part of the newly trained advisers have proved as competent as the best among those recruited by the traditional method. This fact has demonstrated: (a) the advantage of basic academic training and practical experience; (b) the usefulness of the new methodology of the courses in malaria eradication techniques, in which equal attention is given to theoretical-technical knowledge, administrative matters, and field practice; (c) the great advantage of learning tc appreciate the problems from all points of view. There are good grounds for suggesting that this experience could profitably be applied in any other program of broad and rapid development, such as that of malaria eradication.

In addition to utilizing the facilities of the School of Malariology in Maracay, Venezuela, which has trained so many distinguished malariologists in the past, it was necessary to develop cooperative programs with the respective national authorities for the establishment of other training centers in Brazil (at the School of Hygiene and Public Health, São Paulo), Jamaica (in cooperation with ICA), and Mexico. These centers now serve to train professionals not only from the Americas but from all parts of the world, particularly

the Jamaica center, where the courses are conducted in English. Up to 30 June 1958, 15 courses for professionals had been given at the Maracay School (since 1944). In Mexico, since early 1957, three courses have been given for professionals and three for sanitary inspectors (sector chiefs). The centers in Jamaica and São Paulo began to function early in 1958 and have already given the following courses: in Jamaica, one for professionals and two for sanitarians; in São Paulo, one for professionals and one for entomologists (the latter as an extension of the regular entomology course).

In addition to the regular courses at the above centers, special courses for professionals have also been organized. The first, given in Guatemala, in English, started in October 1957, with the cooperation of ICA; it was attended by 30 participants from eleven countries and five other political units in the Americas, Europe, Asia, and Africa. The second course was held in Colombia and the third in Haiti, in French, both held during 1958, for professional personnel of these programs. These special courses conformed to the same teaching plan as that followed at the regular courses.

Seminars and workshops constitute another important phase of the training. Two seminars have been held: one in Cali, Colombia, in July 1957, on laboratory techniques applicable to malaria eradication, and the other in Panama (with the collaboration of the Environmental Sanitation Division of WHO) in June 1958, on susceptibility and resistance of anophelines. Collaboration was also given in two seminars organized by ICA that selected malaria eradication as a principal topic. The first of these, held in May 1957 in Lima, Peru, was on health education, and the second, in March-June 1958 in Belo Horizonte, Brazil, was on audiovisual aids.

Three workshops on vehicle management and maintenance were organized with the collaboration of UNICEF: the first in April 1958 in Lima, Peru, for the countries of South America; the second at the end of the same month in Tegucigalpa, Honduras, for the countries of Central America; and the third in August 1958 in Trinidad (in English), for the Caribbean area.

Coordination

In addition to the coordination functions carried out by the Organization's governing bodies, and as part of the regular activities of the Office of the Director and of the malaria eradication unit, the most effective coordination in this field was developed through the meetings of Directors of National Malaria Eradication Services. Six of these meetings have already been held for the countries of Central America, two for the countries of South America, and one for English-speaking areas of the Caribbean. At these meetings the Directors of NMES, accompanied by their chiefs of operation, openly and frankly discuss their problems and achievements in an unusually

cordial and friendly atmosphere. This has helped bring about standardization of techniques, operating procedures, and terminology. These meetings have in addition helped develop an "espirit de corps" which has done much to make for harmony in the malaria eradication programs in the Americas.

The final acts of the meetings of Directors of NMES include recommendations for coordination among their countries, but in addition some of these countries, such as Venezuela and Colombia, El Salvador and Honduras have concluded bilateral agreements to permit reciprocity in the work along their frontiers. For example, squads of one country may spray the border areas of another when these areas are more accessible from their side of the border.

Another highly important form of coordination is that carried out with other international agencies cooperating in the program: UNICEF and ICA. Such cooperation is maintained at all levels, from the preparatory phase of the plans of operation, through the execution of programs in which all three international agencies participate as members of an advisory and coordinating committee or council, to the organization and development of training centers, seminars, and workshops; and at the central office level, through the working groups that make recommendations on ways of improving both technical and financial cooperation. Indeed, this coordination has been so effective that, in the Americas, UNICEF, ICA, and PASO constitute a triad with one common objective: the eradication of malaria from the Western Hemisphere.

Supplies

The Organization has undertaken to provide certain materials necessary to eradication programs that are not produced in the countries or other political units or provided by UNICEF or ICA, i.e., drugs, protective equipment for spraymen, and some laboratory supplies.

Drugs are provided for the express purpose of facilitating epidemiological evaluation and surveillance operations. A careful plan of operations for the use of these drugs is set forth in Document PASB/ME Nº 16, which has been adopted by the majority of the countries and incorporated in their plans of operation.

The protective equipment for spraymen has been the subject of study by specialists and has been furnished in sufficient quantities to protect the spraymen working with dieldrin. Only field experience, however, will show final proof of the effectiveness of this equipment, which is being kept under constant study with a view to its improvement.

Epidemiological operations require considerable amounts of laboratory material. UNICEF has provided the microscopes and the Organization has furnished slides, stains, and other accessories which

the governments themselves are not able to acquire in the necessary amounts. An effort has thus been made to ensure that there will be no gaps in malaria case-finding and case-verification for lack of such materials.

Direct assistance

In many cases ICA has helped meet the local costs when a country's financial situation did not permit it to carry alone the burden of a malaria eradication program. In one instance the Organization was asked to help defray local costs and at the same time to assume more active responsibility in the direction of operations.

Collaboration of Other Organizations

In this report many references have been made to the collaboration of national and international organizations, but we could not conclude without specifically acknowledging the contribution of UNICEF and ICA to a task which could not have been accomplished without their firm and generous support. It is expected that UNICEF will allocate an amount of up to $20,000,000 for assistance to the programs in the Americas, basically in the form of insecticides, vehicles and accessories, and laboratory equipment. In cases in which UNICEF has not been in a position to offer collaboration, ICA has made possible the development of the programs or, in some other countries, has supplemented UNICEF's support. But, above all, it is its generous and substantial contribution to the PASO Special Malaria Fund that has made possible the significant expansion of the Organization's activities in the fields of training, technical advice, coordination, and financial assistance.

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In closing, it is fitting to recall the last words of the IV Report presented eight years ago at the XIII Pan American Sanitary Conference in Ciudad Trujillo, which, in summarizing the possibilities of achieving malaria eradication in the Western Hemisphere, stated: "The Americas have the answer." This present report, in setting forth the facts, spells out the answer of the Americas, where eradication is no longer a mere possibility but a job being done. However, to say that we are wholly satisfied would be both premature and dangerous. In an eradication program there can be but one of two alternatives: success or failure. While the decision to undertake eradication was firm and unanimous and is justly a source of pride to the countries of the Americas, we must not forget that this is only the beginning and that we must not let up until the job is done.

ANNEX

Included here are the pertinent resolutions and recommendations related to malaria eradication, adopted by the governing bodies of international organizations.

(1) Resolution XVIII

MALARIA CONTROL

WHEREAS:

Efforts towards the solution of the malaria problem have been undertaken to a greater or lesser extent by all countries in the Western Hemisphere, some having solved the problem completely while others have made remarkable progress in the control of the disease; and

It is certain that, due to the adoption of new techniques of malaria control and to sufficiently intensive and coordinated efforts on the part of Member Countries and territories, total eradication of the disease from the Americas can be achieved,

THE XIII PAN AMERICAN SANITARY CONFERENCE
RESOLVES:

To recommend to the Pan American Sanitary Bureau to include henceforth in its operating programs the development of such activities as are necessary to provide for greatest intensification and coordination of anti-malaria 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.

(2) Resolution XLII

ERADICATION OF MALARIA IN THE AMERICAS

THE XIV PAN AMERICAN SANITARY CONFERENCE,

CONSIDERING:

That in the course of the technical discussions on the topic "Eradication of Malaria in the Americas" it was made evident that:

(a) The experience of those countries that have achieved eradication of malaria shows that, once transmission is intercepted, the infection in human beings disappears

within a few years, as the result of the natural death of the parasite;

(b) Recent observations indicate the development of resistance by some anopheline species to certain insecticides, a phenomenon that, in time, may cause serious difficulties and even failures in antimalaria campaigns; and

(c) The eradication of malaria in some countries calls attention to the international problem of preventing the importation of new cases into areas already free from infection,

RESOLVES:

(1) To declare that it is of the utmost urgency to carry out the terms of Resolution XVIII of the XIII Pan American Sanitary Conference, which recommends that the Pan American Sanitary Bureau promote the intensification and coordination of antimalaria work, with a view to achieving the eradication of this disease in the Western Hemisphere; and that the Member Governments should convert all control programs into eradication campaigns within the shortest possible time, so as to achieve eradication before the appearance of anopheline resistance to insecticides.

(2) To instruct the Pan American Sanitary Bureau to take steps to implement the aforesaid resolution and to study international measures to ensure the protection of those countries or territories that have achieved the eradication of the disease.

(3) To authorize the Director of the Pan American Sanitary Bureau to secure the financial participation of public or private organizations, national or international, in order to further the aims set forth in this resolution.

(3) Recommendations of the UNICEF/WHO Joint Committee on Health Policy

MALARIA ERADICATION

The Comittee recognized two outstanding recent developments in the fight against malaria. In the first place, it has been shown that it is technically and financially feasible to eradicate malaria in large areas, regardless of latitude, primarily by using residual insecticides. In the second place, it has now become apparent that there may be a time-limit beyond which the insecticides no longer kill the mosquitoes that carry malaria, owing to the development of resistance in the mosquito vector or to changes in its behaviour.

Resistance to chlorinated hydrocarbon insecticides has appeared in several species of anopheline malaria vectors after some six years

of residual spraying programmes. As the Committee believes that it is possible in most circumstances, with proper planning and organization of the programme, to eradicate malaria before the time-limit, it recommends that nationwide and regional malaria eradication projects be encouraged and that present malaria control plans be converted into eradication plans as soon as possible.

The Committee recognizes the advantage of discontinuing residual insecticide spraying while the insecticide is still fully active against the mosquitoes. Such discontinuation is not possible in the usual malaria control programmes where no end of the spraying can be visualized, and it is only feasible in eradication plans.

The Committee understands by "malaria eradication" the elimination of malaria from a given area as an endemic disease. By definition, malaria is no longer endemic when there has been no new autochthonous case for three consecutive years (unless contracted from an imported case), provided that there is an adequate search for such cases. The term "Malaria Eradication Programme", as currently used by WHO, means: (a) the systematic elimination of malaria from an entire country or group of countries within a given number of years; and (b) provision for preventing reinfestation. The achievement of malaria eradication requires total control in all areas where transmission of malaria occurs. In some countries, a Malaria Eradication Programme may be so planned as to achieve eradication in successive stages, area by area, and eventually to cover the entire country.

The Committee understands that, while the objective of malaria eradication schemes is the elimination of malaria as an endemic disease, the objective of malaria control is only an amelioration of the endemic situation with the hope that, in time, the maintenance of effective measures might result in the disappearance of malaria -- a hope that has been rarely fulfilled.

The Committee believes that new anti-malaria projects should aim at eradication and that the requesting countries should be expected to have, or to establish, for such period as may be necessary, an adequate central anti-malaria organization for the implementation, coordination and guidance of the national programme; should promote the necessary supporting legislation; and should pledge their financial support for the duration of the programme. UNICEF, on the other hand, should endeavour to continue its assistance till the termination of the programme.

The Committee recommends that UNICEF give highest priority to the support of malaria eradication programmes.

The Committee recommends that in special areas in which, for technical reasons, eradication programmes would be premature, support to control programmes could be considered.

The Committee recommends that UNICEF and WHO use their full influence to convert presently supported malaria control programmes into eradication programmes as rapidly as possible.

(4) Resolution WHA8.30

MALARIA ERADICATION

The Eighth World Health Assembly,

Having considered the comprehensive report and proposal on malaria eradication submitted by the Director-General;

Having examined the recommendations of the XIV Pan American Sanitary Conference in Santiago, Chile, in October 1954 and of the Malaria Conference for the Western Pacific and South-East Asia Regions in Baguio, Philippines, in November 1954, concerning the danger constituted by the potential development of anopheline resistance to insecticides and concerning measures to obviate that danger;

Considering resolution EB15.R67 adopted by the Executive Board at its fifteenth session after a study of the reports available up to that time;

Considering that the ultimate goal of malaria-control programmes should be the eradication of the disease,

I. 1. REQUESTS governments to intensify plans of nation-wide malaria control so that malaria eradication may be achieved and the regular insecticide-spraying campaigns safely terminated before the potential danger of a development of resistance to insecticides in anopheline vector species materializes;

2. AUTHORIZES the Director-General to request those governments in whose countries malaria still exists to give priority to malaria eradication projects in their requests for assistance under the United Nations Expanded Programme of Technical Assistance, and to provide the locally available resources which are required to achieve malaria eradication;

II. DECIDES that the World Health Organization should take the initiative, provide technical advice, and encourage research and co-ordination of resources in the implementation of a programme having as its ultimate objective the world-wide eradication of malaria;

III. 1. AUTHORIZES the Director-General to obtain financial contributions for malaria eradication from governmental and private sources;

2. ESTABLISHES, under Financial Regulations 6.6 and 6.7, a

Malaria Eradication Special Account, which shall be subject to the following rules:

(1) The Special Account shall be credited with voluntary contributions received in any usable currency and shall also be credited with the value of contributions in kind, whether in the form of services or supplies and equipment.

(2) The resources in the Special Account shall be available for incurring obligations for the purposes set out in (3) below, the unexpended balances of the Account being carried forward from one financial year to the next.

(3) The Special Account shall be used for the purpose of meeting the costs of:

(a) research;

(b) such supplies and equipment, apart from minimal requirements to be provided from regular and Technical Assistance funds, as are necessary for the effective implementation of the programme in individual countries; and

(c) such services as may be required in individual countries and as cannot be made available by the governments of such countries.

(4) The operations planned to be financed from the Special Account shall be presented separately in the annual programme and budget estimates, this presentation to include an indication as to whether the resources required are known to be available in the Special Account or from another source.

(5) In accordance with Financial Regulations 6.6 and 11.3, the Special Account shall be maintained as a separate account, and its operations shall be presented separately in the Director-General's annual financial report.

IV. AUTHORIZES the Executive Board or a committee of the Board to which it may delegate authority to act between sessions of the Board to carry out the following functions:

(1) to accept contributions to the Special Account as provided under Article 57 of the Constitution; and

(2) to advise the Director-General from time to time on any questions of policy relating to the administration of the Special Account or to the implementation of the programme.

Ninth plenary meeting, 26 May 1955
(section 1 of the third report of the Committee on Programme and Budget)

(5) Resolution XXI

MALARIA ERADICATION PROGRAM IN THE AMERICAS

THE DIRECTING COUNCIL,

Considering Resolution XVIII of the XIII Pan American Sanitary Conference, which instructed the Pan American Sanitary Bureau to promote the intensification and coordination of antimalaria work with a view to achieving the eradication of malaria in the Western Hemisphere;

Considering Resolution XLII of the XIV Pan American Sanitary Conference, which provided that the Pan American Sanitary Bureau should carry out the terms of the above-mentioned resolution and study international measures to ensure the protection of those countries or territories that have achieved eradication of malaria, and which authorized the Director to secure the financial participation of public or private organizations, national or international, in order to further the aims set forth in that resolution; and

Considering the results obtained in the countries of the Americas in the fight against malaria, particularly the progress made since the XIV Pan American Sanitary Conference,

RESOLVES:

1. To record the consensus of all countries of the Hemisphere that malaria should be given first priority among public health problems.

2. To reaffirm its faith in the possibility of eradicating malaria in the Western Hemisphere.

3. To acknowledge the great efforts that the countries of the Americas have made and are making to bring to completion their antimalaria programs.

4. To acknowledge and express its great appreciation for the collaboration provided by the Government of the United States of America in assigning the amount of $1,500,000 to increase the special fund of the Pan American Sanitary Bureau for antimalaria activities in the Hemisphere.

5. To recognize the importance of international collaboration for the success of the malaria eradication program in the Americas, and to declare that the financial participation of UNICEF and of the United Nations Technical Assistance has been of special significance in the plan of activities that the Pan American Sanitary Bureau and the various Member Governments are jointly carrying out in this field.

6. To recommend to the Member Governments that, owing to the urgency of the malaria eradication programs, they assign to the national malaria services the necessary rank and authority to expedite the handling of funds and of personnel problems, as one of

the means of assuring the success of the eradication program.

7. To encourage the Member Governments to exert every possible effort, to the extent necessary, to convert their malaria control programs into eradication programs and to assure the provision of the necessary resources so that the eradication programs under way will continue uninterrupted until their completion.

8. To recommend to those Member Governments that have carried eradication activities to an advanced stage or that consider eradication to have been achieved, that, in their reports on the status of the program, they follow the criteria established by the World Health Organization and the Pan American Sanitary Bureau, enlisting for that purpose the collaboration of experts of those organizations.

(Approved at the twelfth plenary session, 25 September 1956)

(6) Resolution XIII

INTERNATIONAL REPORTING OF MALARIA CASES

THE DIRECTING COUNCIL,

Considering that Resolution XLII of the XIV Pan American Sanitary Conference declared that the eradication of malaria in some countries calls attention to the international problem of preventing the importation of new cases into areas already free from infection; and

Considering that for the transmittal of accurate data on malaria, particularly for eradication programs, concerted efforts must be directed to the discovery of cases and to the improvement of reporting by physicians, hospitals, clinics, and public health services,

RESOLVES:

1. To recommend to the Member States that malaria be declared a notifiable disease and that the reporting requirement extend to all areas of the country.

2. To recommend that reports be transmitted routinely to the Pan American Sanitary Bureau, weekly if possible, for the information of all the health authorities.

3. To recommend the intensification of case-finding methods so as to ensure accurate reporting of malaria cases, for the protection of areas and countries where eradication has already been achieved.

(Approved at the tenth plenary session, 23 September 1957)

(7) Recommendation No. 15 of the Inter-American Committee of Presidential Representatives of the American Republics

ERADICATION OF MALARIA IN THE AMERICAS

1. Statement of the Problem

The Committee considers, in accordance with the conclusions of the Pan American Sanitary Organization, that the eradication of malaria is the most important health problem of the Americas, not only from the point of view of public health, but also because of its severe repercussions on the economic development and social welfare of the peoples of the Hemisphere.

The studies made in this field make it possible to state that, if an adquate hemispheric program is adopted, it will be possible to eradicate malaria in the Americas in a relatively short time, estimated at five years.

2. Recommendations

The Committee recommends:

a. That support be given to the implementation of the program for the complete eradication of malaria in the Americas prepared by the Pan American Sanitary Organization, to which the United Nations Children's Fund is contributing necessary equipment and materials.

b. That the government representatives in the various international agencies concerned with this problem be instructed to obtain the maximum assistance of those agencies in carrying out the aforesaid hemispheric program.

c. That in accordance with their respective internal procedures, the governments of the American Republics endeavor to make available or increase the funds needed to cover the deficit in the total cost of the program for the eradication of malaria in the Americas.

3. Estimate of Cost

The total cost of the eradication of malaria in the Americas is estimated at $144,406,370 of which $6,591,367 is for territories still dependent on countries outside the Hemisphere.

Subtracting the funds already allotted for this campaign, including the contributions of the Governments of the United States, the Dominican Republic and Venezuela, leaves a deficit of $43,890,005. The deficit of $43,890,005 is broken down as follows: $23,275,000 applicable to national budgets, and $20,615,005 to international sources. The Pan American Sanitary

Bureau and the countries with deficits in their national programs for the eradication of malaria will have to study the means of financing this deficit.

(8) Resolution XLIII

UTILIZATION OF FUNDS FOR THE INTENSIFICATION OF ANTIMALARIA ACTIVITIES

THE XIV PAN AMERICAN SANITARY CONFERENCE,

Bearing in mind the resolution on eradication of malaria in the Americas, approved at the present meeting; and

Considering that it is necessary to provide the Pan American Sanitary Bureau with the financial resources that will enable it to carry out the functions assigned to it by the aforesaid resolution,

RESOLVES:

(1) To authorize the Director of the Pan American Sanitary Bureau to obligate up to $100,000 of the surplus funds available as of 31 December 1954 for the intensification of the antimalaria activities of the Bureau designed to eradicate this disease in the Wester Hemisphere.

(2) To approve the preparation by the Executive Committee of a proposed budget for 1956, for consideration by the Directing Council, to include an increase of $100,000 over the present budgetary level, this increase to be allotted specifically for the intensification of the antimalaria activities of the Bureau.