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REPORT ON THE STATUS OF MALARIA ERADICATION IN THE AMERICAS

XI REPORT

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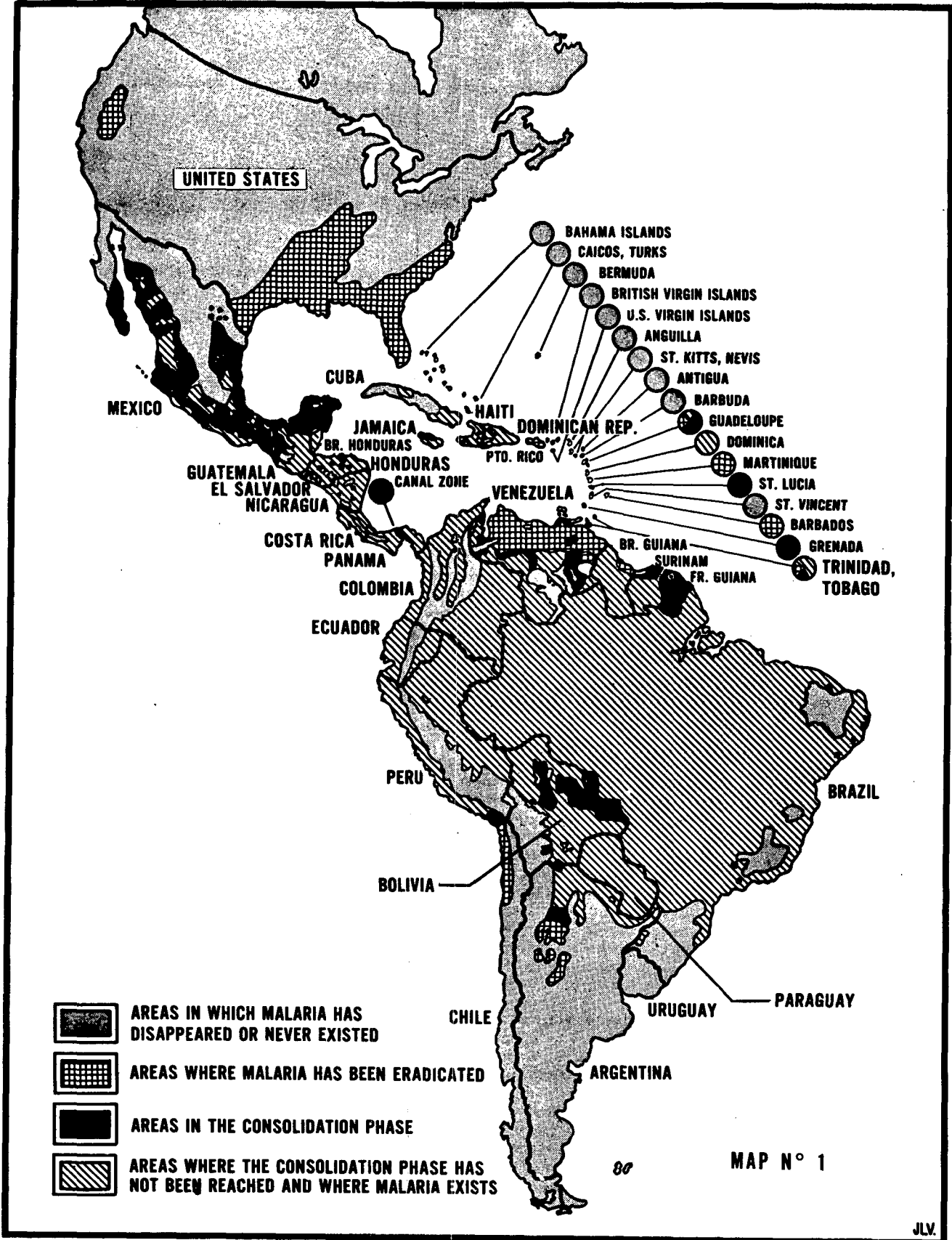
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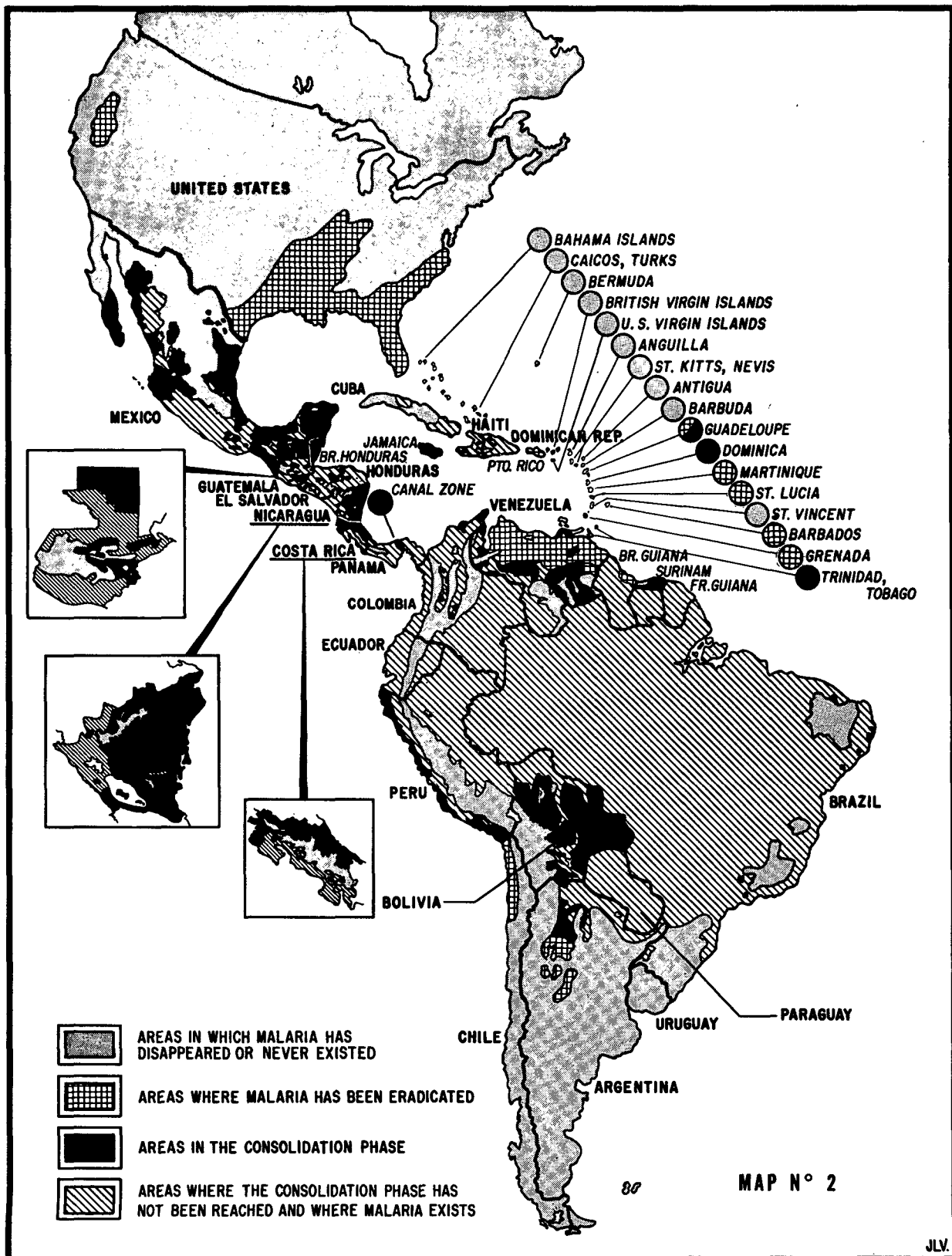
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**STATUS OF THE MALARIA ERADICATION PROGRAM IN THE AMERICAS, 31 DECEMBER 1981**



STATUS OF THE MALARIA ERADICATION PROGRAM IN THE AMERICAS, 31 DECEMBER 1962.

REPORT OF THE STATUS OF MALARIA ERADICATION IN THE AMERICAS

XI REPORT

Introduction

The Director of the Pan American Sanitary Bureau has the honor to present to the XIV Meeting of the Directing Council the XI Report on the status of malaria eradication in the Americas.

This report follows the same pattern as the previous ones, and is divided in four chapters: the status of the program in general; the special technical problems that have been found; the field research projects; and the international cooperation in the malaria eradication program.

The data have been taken from the response to a detailed annual questionnaire regarding malaria eradication activities in each country, as well as the statistical report which the majority of the programs submit each month to the Pan American Sanitary Bureau. In addition special technical reports regarding research projects are also presented by the countries when appropriate.

I. STATUS OF THE MALARIA ERADICATION PROGRAM

A. General picture

Further progress towards malaria eradication was achieved in the Americas during 1962. The attack phase was completed in British Honduras, Jamaica and in Trinidad and Tobago. These areas are now entirely in the consolidation phase. Both Jamaica and Trinidad have been without autochthonous cases for two years or more.

Additional areas placed in the consolidation phase during 1962 were reported by Argentina, Bolivia, Brazil, Colombia, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Peru, Venezuela, Dominica, Guadeloupe, Panama Canal Zone and Surinam. While the population living in areas under consolidation in 1961 was 17.9 millions, in 1962 it went up to 30.4 millions.

In more advanced stages, Grenada and Carriacou, and St. Lucia terminated their consolidation phase activities, while Venezuela and Guadeloupe claimed to have new areas where malaria has been eradicated. The islands of Grenada and Carriacou and of Saint Lucia were registered during 1962, by the Pan American Sanitary Bureau as having achieved malaria eradication.

In order to give a rapid over-all picture of the changes between 1961 and 1962, Table No. I is presented, indicating not only the population and area in each phase of eradication but the percentages of increase or decrease for 1962 in comparison with the same figures for 1961.

It can be observed that while the areas and population claimed or registered as having malaria eradication increased, there was a reduction in areas under attack and in population under the preparatory phase. The increase of population under attack concomitantly with a decrease of the area under the same condition can be explained by the fact that more densely populated areas a) remained in, or b) entered this phase during 1962. a) In Central America, for example, the densely populated areas remained in the attack phase while sparsely settled ones left it to enter the consolidation phase. The same phenomenon has been observed in other countries. b) In Brazil, on the other hand, the Amazon Valley, a large but thinly populated area, reverted from attack to preparatory phase when the chloroquinized salt program ended, and the area is being gradually put under conventional attack, the more densely populated areas first, as a rule.

The table shows the effect of the above trend in respect of consolidation phase activities. While there was a 70.0% increase in population under consolidation, there occurred an increase of 40.6% in the area under this phase.

Table 1

COMPARISON OF POPULATION AND AREAS IN VARIOUS PHASES OF THE MALARIA ERADICATION PROGRAMS IN THE AMERICAS, IN 1961 AND 1962, AND PERCENTAGES OF CHANGE IN EACH PHASE

Originally malarious areas	1961	1962	Percentage change
A. Population by thousands:			
1. Malaria eradication claimed or registered . . . .	56 979	59 299	+ 3.9
2. Consolidation phase . . . . .	17 379	30 424	+ 70.0
3. Attack phase . . . . .	39 021	49 276	+ 26.3
4. Preparatory phase or not yet started . . . . .	33 413	14 743	- 55.7
B. Area in km <sup>2</sup>			
1. Malaria eradication claimed or registered . . . .	2 838 501	3 248 027	+ 14.4
2. Consolidation phase . . . . .	1 465 681	2 061 162	+ 40.6
3. Attack phase . . . . .	7 710 194	5 633 761	- 27.0
4. Preparatory phase or not yet started . . . . .	3 853 835	5 167 795	+ 34.1

Various setbacks either continued or developed during 1962. In Paraguay the attack phase has been paralyzed since late 1960. In Argentina the attack phase could not be extended to the Provinces of El Chaco and Formosa as had been scheduled. In Dominican Republic a new drive to total coverage started in October, but could not be extended to the whole malarious area until the end of the year. The same occurrence was reported in Cuba where very large areas have been under attack phase since May 1962, but total coverage with regular 6 month cycles of spraying of all houses in the recognized malarious area has not yet been achieved.

Most of the problems faced by these countries are classified as administrative. The primary and most important one was the lack of economic resources to cover the local costs and/or to obtain materials and equipment to fulfill the requirements as planned.

The further evolution of the attack phase and some improvements in epidemiological operations have made it possible to delimit, with more precision, the areas with definite persistence of transmission due to technical problems. Such areas are considered to be those where a well administered program of DDT or dieldrin spraying of the houses alone has not interrupted transmission of malaria in a reasonable period. In some of these areas DDT definitely has shown some capacity to reduce transmission but not enough to halt it completely.

Every year it is becoming clearer that campaigns to eradicate malaria require not only an organization of highly skilled workers armed with administrative techniques of great flexibility but also with sufficient priority in the allocation of available funds in spite of the demands of other agencies of the government.

The experience of 1962 has shown again that progress is seriously hampered in countries with poor administrative set up. Only in the light of such experience is it conceivable that very large areas without technical problems are not yet free of transmission after four years of reported regular spraying.

In April 1963, a meeting of Ministers of Health, Task Force for Health of the Alliance for Progress, took place in Washington, D. C. They recommended that malaria eradication should be given the highest, the very first priority among the programs of health for the Americas. It is hoped that the Ministers and Delegates present and their respective Ministers of Finance will follow the same policy in the allocation of funds for health in the future.

Technical problems also were a serious obstacle to success in parts of several countries. The problems of insecticide resistance, irritability, sorption of insecticide into mud walls, and outdoor biting habits of some species or strains of vectors, singly or in combination have remained a major factor in failure to halt transmission in certain parts of Mexico, Guatemala, El Salvador,



Honduras, and Nicaragua, and in a few very small foci in Costa Rica, but these are amenable to supplementary or alternative methods of attack which have been expanded considerably during 1962 - (see Special Technical Problems). In South America, DDT resistance has not been observed on any significant level, but outdoor biting and resting appear to be part of the problem in Western Venezuela and in parts of Colombia, together with new houses, houses with poor or missing walls, and considerable migration from poorly controlled to well controlled areas. Brazil also has some areas where various species of the sub-genus *Kerteszia* maintain transmission by biting and resting out of doors. These are relatively small, and transmission is not intense, but mass drug treatment programs are being started in the expectation of perfecting a method of cleaning them up completely.

Chloroquine-tolerant strains of *P. falciparum* have been identified in additional localities in Brazil, Colombia, and now British Guiana, and a Screening Center has been established by PAHO and the Brazilian Government in Brazil to identify new strains and measure their tolerance. So far, drug-tolerant strains have not shown much tendency to spread, and the number of cases is small, even in Venezuela, where chloroquine-tolerant strains have been known since 1959.

While waiting for a perfect new insecticide, or a perfect long-lasting antimalarial drug, these technical problems demand a careful selection and usage of all classical anti-malaria methods and a higher degree of sophistication in planning and execution than routine operations in the areas where these problems are lacking. Solutions already exist, but better insecticides, and better methods of using existing insecticides are being intensively sought.

#### B. Extent of the Problem

At the present stage, many programs in the Americas should be in the process of moving from attack into consolidation phase, and relatively few into the maintenance phase. Table No. 2 that follows briefly recapitulates the progress during the last 3 years:

Table 2

Year	Population			
	Malaria eradication claimed or achieved	Consolidation phase	Annual % of Increase	
			Malaria eradication claimed	Consolidation phase
1959	53 251 000	2 156 000	-	-
1960	54 365 000	10 010 000	2.1	364.
1961	56 279 000	17 879 000	3.5	78.6
1962	59 299 000	30 424 000	5.5	70.2

Thus 90 million out of a population of 153,919,000 in the originally malarious area are past the attack phase, while 49,276,000 are in it and 14,743,000 are still in the preparatory phase.<sup>1</sup>

Tables 3 and 4 show the status of the program in each country by population and by area, as to totals, and as to the portions of the originally malarious areas which are in the various stages of the campaign.

Table 5 summarizes this breakdown into stages showing percentages of the total population and area in each stage or condition.

Map No. 1 visually presents the situation as it existed on December 31, 1961 in all formerly and presently malarious countries, and Map No. 2 the situation one year later.

<sup>1/</sup> Figures very slightly revised from document A16/P+B/3, Part I, 12 March 1963, of WHO.

Table 3

## STATUS OF MALARIA ERADICATION IN THE AMERICAS, BY POPULATION, 1962

(Population in thousands)

Country or other political unit	Total population <sup>a</sup>	Population of originally malarious areas				
		Total	Malaria eradication claimed (maintenance phase)	Consolidation phase	Attack phase	Prep. phase or program not yet started
Argentina .....	20 716	2 645	987	555 <sup>b</sup>	367	736
Bolivia .....	3 556	1 287	-	759	528	-
Brazil .....	75 996	39 896	3 902	5 597	18 156	12 241
Canada .....	18 600	-	-	-	-	-
Chile .....	7 917 <sup>c</sup>	127	127	-	-	-
Colombia .....	14 768	9 304	-	3 027	6 027	250 <sup>d</sup>
Costa Rica .....	1 274	412	-	230	182	-
Cuba .....	7 022	1 874	-	-	1 874	-
Dominican Republic .....	3 228	2 647	-	-	2 647	-
Ecuador .....	4 359	2 376	-	-	2 376	-
El Salvador .....	2 600	1 820	-	-	1 820	-
Guatemala .....	3 953	1 782	-	581	1 201	-
Haiti .....	4 134	3 080	-	-	3 080	-
Honduras .....	1 950	1 561	-	46	1 515	-
Jamaica .....	1 650	1 282	-	1 282	-	-
Mexico .....	37 170	20 219	-	15 592	4 627	-
Nicaragua .....	1 637	1 571	-	515	1 056	-
Panama .....	1 118	1 091	-	-	1 091	-
Paraguay .....	1 817	1 512	-	-	-	1 512
Peru .....	10 742	3 189	-	864	2 325	-
Trinidad and Tobago .....	877	877	-	877	-	-
United States .....	187 400	45 400	45 400	-	-	-
Uruguay .....	2 846 <sup>e</sup>	-	-	-	-	-
Venezuela .....	7 604	5 696	5 269 <sup>f</sup>	150	277	-
Antigua .....	63 <sup>e</sup>	-	-	-	-	-
Bahamas .....	110 <sup>c</sup>	-	-	-	-	-
Barbados .....	242 <sup>c</sup>	238	238	-	-	-
Bermuda .....	44	-	-	-	-	-
British Guiana .....	592	592	556	-	36	-
British Honduras .....	100	100	-	100	-	-
Dominica .....	60	14	-	14	-	-
Falkland Islands .....	2 <sup>e</sup>	-	-	-	-	-
French Guiana .....	34	34	-	(g)	30 <sup>g</sup>	4
Grenada .....	89	37	37 <sup>h</sup>	-	-	-
Guadeloupe .....	281	253	187	66	-	-
Martinique .....	277 <sup>i</sup>	176	176	-	-	-
Montserrat .....	13 <sup>c</sup>	-	-	-	-	-
Netherlands Antilles .....	194 <sup>i</sup>	-	-	-	-	-
Panama Canal Zone .....	45	45	-	44	1	-
Puerto Rico .....	2 353	2 338	2 338	-	-	-
St. Kitts-Nevis-Anguilla .....	59 <sup>c</sup>	-	-	-	-	-
St. Lucia .....	97 <sup>c</sup>	82	82	-	-	-
St. Pierre-Miquelon .....	5 <sup>i</sup>	-	-	-	-	-
St. Vincent .....	81 <sup>e</sup>	-	-	-	-	-
Surinam .....	300	185	-	125	60	-
Virgin Islands (U. K.) .....	7 <sup>j</sup>	-	-	-	-	-
Virgin Islands (U. S.) .....	34 <sup>i</sup>	-	-	-	-	-
Total .....	427 919	153 742	59 299	30 424	49 276	14 743

- None

(a) Population estimated as of mid 1962, unless otherwise indicated. (b) An area with 205 723 inhabitants is included in which no antimalaria work was done and no positive cases occurred during the last three years.

(c) December 1961 estimated. (d) Inhabitants living in an area where spraying is partially done or not done.

(e) December 1960 estimated. (f) Of which 4 325 177 (est.) living in areas of malaria eradicated registered by PAHO. (g) Spraying is continued in the area referred as in consolidation phase in the previous report.

(h) The entire area of malaria eradicated has been registered by PAHO. (i) July 1961 estimated. (j) July 1960 estimated.

Table 4

STATUS OF MALARIA ERADICATION IN THE AMERICAS, BY AREA, 1962  
(Area in km<sup>2</sup>)

Country or other political unit	Total area	Originally malarious area				
		Total	Malaria eradication claimed (maintenance phase)	Consolidation phase	Attack phase	Prep. phase or program not yet started
Argentina .....	4 024 458 <sup>a</sup>	349 051	40 100	51 896 <sup>b</sup>	100 989	156 066
Bolivia .....	1 098 581	824 260	-	297 489	526 771	-
Brazil .....	8 513 844	7 338 759	437 059	482 727	1 853 996	4 564 977
Canada .....	9 974 375	-	-	-	-	-
Chile .....	741 767	55 287	55 287	-	-	-
Colombia .....	1 138 338	1 026 433	-	37 418	949 015	40 000 <sup>c</sup>
Costa Rica .....	51 011	31 526	-	21 979	9 547	-
Cuba .....	114 524	37 376	-	-	37 376	-
Dominican Republic .....	48 442	39 000	-	-	39 000	-
Ecuador .....	291 906	152 862	-	-	152 862	-
El Salvador .....	21 146	19 300	-	-	19 300	-
Guatemala .....	108 889	80 364	-	33 113	47 251	-
Haiti .....	27 698	18 984	-	-	18 984	-
Honduras .....	112 088	87 389	-	5 489	81 900	-
Jamaica .....	11 293	9 919	-	9 919	-	-
Mexico .....	1 969 367	1 147 564	-	855 979	291 585	-
Nicaragua .....	148 000	132 385	-	102 556	29 829	-
Panama .....	74 470	68 497	-	-	68 497	-
Paraguay .....	406 752	406 752	-	-	-	406 752
Peru .....	1 381 800	943 200	-	74 200	869 000	-
Trinidad and Tobago .....	5 080	5 080	-	5 080	-	-
United States .....	9 339 900	2 255 890	2 255 890	-	-	-
Uruguay .....	186 926	-	-	-	-	-
Venezuela .....	912 050	600 000	432 440 <sup>d</sup>	54 103	113 457	-
Antigua .....	280	-	-	-	-	-
Bahamas .....	11 396	-	-	-	-	-
Barbados .....	431	430	430	-	-	-
Bermuda .....	53	-	-	-	-	-
British Guiana .....	215 800	215 800	15 800	-	200 000	-
British Honduras .....	22 965	22 965	-	22 965	-	-
Dominica .....	790	152	-	152	-	-
Falkland Islands .....	11 961	-	-	-	-	-
French Guiana .....	86 000	86 000	-	-	86 000 <sup>e</sup>	(e)
Grenada .....	344	104	104	-	-	-
Guadeloupe .....	1 179	1 136	821	315	-	-
Martinique .....	1 102	300	300	-	-	-
Montserrat .....	84	-	-	-	-	-
Netherlands Antilles .....	961	-	-	-	-	-
Panama Canal Zone .....	1 432	1 432	-	1 432 <sup>f</sup>	(f)	-
Puerto Rico .....	9 216	9 216	9 216	-	-	-
St. Kitts-Nevis-Anguila .....	396	-	-	-	-	-
St. Lucia .....	603	580	580	-	-	-
St. Pierre-Miquelon .....	240	-	-	-	-	-
St. Vincent .....	389	-	-	-	-	-
Surinam .....	142 822	142 752	-	4 350	138 402	-
Virgin Islands (U. K.) .....	174	-	-	-	-	-
Virgin Islands (U. S.) .....	342	-	-	-	-	-
Total .....	41 212 265	16 110 745	3 248 027	2 061 162	5 633 761	5 167 795

- None

(a) Including the "Antarctica". (b) Includes an area of 22 000 km<sup>2</sup>, in which, with no attack measures no malaria transmission is confirmed during the last three years. (c) Area in which spraying is irregularly done or not done. (d) 407 945 km<sup>2</sup> of this area are registered by PAHO as malaria eradicated. (e) Includes some areas in the Oyapock Zone in preparatory phase and uninhabited areas. (f) Spraying is continued in a limited part of the area showed as in consolidation phase.

Table 5  
PERCENTAGE DISTRIBUTION OF POPULATION AND AREA IN THE AMERICAS, 1962  
BY STATUS OF MALARIA ERADICATION

Status	Percentage distribution	
	Population	Area
Total .....	100.0	100.0
Non malarious areas .....	64.1	60.9
Originally malarious areas .....	35.9	39.1
Preparatory phase .....	3.4	12.5
Attack phase.....	11.5	13.6
Consolidation phase . . . . .	7.1	5.1
Maintenance phase .....	13.9	7.9

C. Field Operations

Statistics on the personnel employed in malaria eradication programs are presented in Tables 6 to 10. Table 6 shows the personnel employed in broad categories of spraying operations, epidemiological operations, administrative and others, and transport during the last 2 years. The increase in personnel in spraying operations is a reflection of the 27% increase in population in the attack phase, plus some intensification of spraying effort, and the increase in personnel working in epidemiological evaluation is also due to larger population in the consolidation phase plus intensified efforts. Reductions have been made in administrative and transport personnel.

Tables 7 through 10 show the personnel employed in each country for the year 1962 in the 4 broad categories listed, and in each sub-class of workers.

The types of vehicles and numbers of each are shown by country for the year 1962 in Table 11. There has not been much change from year to year, but with increasing epidemiological evaluation and drug distribution activity, there is increasing need for single passenger transport, and increasing use of motorcycles and bicycles is foreseen for these types of personnel. The experimental use of motorcycles in Guatemala has shown their utility and economy, and proved that in the hands of responsible and well-trained personnel they can carry the evaluator or inspector through difficult terrain on the average as effectively though less comfortably than 4-wheel vehicles. Transportation remains an absolute essential in all programs, and the Organization continues its advisory service in this field.

The work done in spraying operations is shown in Tables 12 and 13, by countries, for each cycle since the beginning of the program. Table 12 shows the absolute work performed in total, and per man/day of effort, while Table 13 shows the relative completeness of the spraying operations and reasons for not spraying some of the houses. Again, the Bush Negro population in the interior of Surinam (18,000 persons) presented an exceptional proportion of refusals and absences, (more than 50% in some sectors) but great improvement has already been made through the changing from DDT to dieldrin (the latter is preferred by the people), and intensive health education efforts are in progress to win their cooperation. Malaria has disappeared wherever good spraying has been achieved.

Case detection data are separated into two parts, data for the attack phase, and data for the consolidation phase.

Table 14 presents data on case detection during the attack phase, for each country, by years of spraying. The percentage of positivity of slides taken tends to present a distorted picture of the trends for the country as a whole, because there is almost invariably a strong tendency to increase greatly the amount of searching for cases in the areas of outbreaks and persistent transmission, as contrasted with areas that are responding well or as expected. This tends to produce an upward

bias in the percentage for the country as a whole. In several countries, sampling of small but highly malarious problem areas was far above that of the rest of the country. For example, in the worst two cantons of Costa Rica, the sampling rate for the Vth year of coverage was 190 and 123% of the population per year, whereas 10% is the usual. In an epidemic area in Honduras, among 5,667 persons, 2,025 slides were taken in the last 3 months of 1962. Of these, 42% were positive. This 143% (per year) sampling rate in a bad area has a profound effect on the average positivity rate for the country as a whole when these figures are mixed with the vast majority of the country which has few or no cases, but which is sampled at 10% or less per year.

The current attack phase in Ecuador is considered to have begun in January 1961, and is much more complete than previous cycles.

There are several countries where sizeable groups of population have been removed from the attack phase and placed under consolidation. This has the net effect of reducing the apparent speed of improvement seen in parasite rates in Table 14 by taking away from the total population measured, those groups who have the least malaria. In Guatemala and Mexico, for example, the deletion of the population that went into consolidation would more than account for the reversal of the downward trend. In Mexico, this apparent upward trend in the attack area has continued for 2 years, each year more positive slides obtained from fewer slides taken. But in each year the group from which the slides were drawn has grown smaller, and the search for cases more intense among those "more malarious" persons remaining in the attack phase. These two factors constitute the major elements in the trend seen, a stabilizing in the problem areas, no further advance, but at the same time, no evidence of slipping back, even in the face of the data presented.

In Honduras and British Guiana, however, there were major outbreaks in quite limited areas which accounted for the large majority of the cases in the whole country, and the general trend in the rest of the attack areas remained very favorable. In the second semester of 1962, 62% of the cases in Honduras occurred in 2 departments, highly concentrated in 2 municipios. Eliminating these two municipios would practically wipe out the rise noted in 62-63, although there was another force artificially pushing rates upward, i. e. 1/3 of the healthiest groups of population were in fact taken out of calculation for the 9 months July 62-March 63, and put into consolidation.

The analysis of Table 15 is considerably simpler. The reductions in population in the consolidation phase in Venezuela, and Guadeloupe are due to passage of large sections into the maintenance phase. One significant column is the percentage of population sampled, which was generally adequate or improving. In this respect, areas with unstable malaria or seasonal transmission are not required to have 10% sampling. The number of cases was properly low in most instances and the indigenous cases very low or absent. Mexico and Guatemala have difficult problems with extensive migration from the cleared areas to the problem areas and back again. In Mexico, this more often results in secondary transmission, so some of the areas have been put back under attack. In Guatemala, the consolidation areas so far are at altitudes with relatively low transmission potential. As consolidation areas expand, the risk of indigenous cases following imported cases will rise, and requires a more vigorous surveillance organization.

Table 16 presents the comparative results of active vs. passive case detection. The latter, as frequently noted in the past, is more productive of positives per slide examined, and requires much less paid personnel to maintain it. Passive notification posts have been seen to be most effective and most valuable when they consist of or exist in hospitals, health centers and clinics. Not only is it important that sick persons be given a test for malaria at the time when they are sick, but in the maintenance phase, all detection activity will have to be done by the health department. Plans have been made for further stimulation of cooperation between these two agencies in every country.

The steady growth in size of case-finding activity in malaria eradication is seen in the hemispheric figures of Table 17, and its importance will increase in the future as more and more areas enter into consolidation.

Table 18 presents the expenditures made by each country during the years of 1961 and 1962, and the commitments for 1963. It should be noted that in programs which are going well, these figures may be considered adequate, but in many countries, and especially in those with serious problems needing supplementary attack measures, additional funds are urgently needed now, and

Table 6

PERSONNEL EMPLOYED IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS  
31 DECEMBER 1961 AND 1962 BY CATEGORY

(Part-time personnel in parenthesis)

	Title	1961	1962
SPRAYING OPERATIONS	Engineers .....	123 (2)	129 (1)
	Spraying Chiefs (non-professionals) .....	/a	142 (2)
	Sector Chiefs .....	377 (2)	516 (6)
	Squad Chiefs .....	1 268 (2)	1 933 (2)
	Spraymen .....	5 847 (40)	8 773 (55)
	Draftsmen .....	99	104
	SUB-TOTAL .....	7 714 (46)	11 597 (66)
EPIDEMIOLOGICAL OPERATIONS	Physicians .....	290 (15)	274 (19)
	Entomologists .....	21 (2)	25 (1)
	Entomologists Assistants .....	166 (14)	224 (14)
	Statisticians and Statisticians Assistants .....	91	80
	Evaluation Inspectors .....	355 (2)	612 (2)
	Evaluators .....	2 813 (8)	3 982 (7)
	Microscopists .....	503 (12)	683 (12)
SUB-TOTAL .....	4 239 (53)	5 880 (55)	
ADMINISTRATION AND OTHERS	Administrators .....	82 (2)	87 (1)
	Administrative Assistants .....	460	485
	Accountants .....	8	13
	Disbursing Officers .....	65	54
	Storekeepers .....	90	91
	Assistant Storekeepers .....	95	101 (1)
	Secretaries .....	427 (1)	444 (1)
	Others .....	1 922 (2)	1 457 (8)
SUB-TOTAL .....	3 149 (5)	2 732 (11)	
TRANSPORT	Mechanics and Assistant Mechanics .....	286	333
	Drivers .....	967 (3)	856 (2)
	Motorboat Operators .....	204	198 (2)
	Boatmen .....	37	45
	SUB-TOTAL .....	1 494 (3)	1 432 (4)
	GRAND TOTAL .....	16 596 (107)	21 641 (136)

(a) Personnel included in other categories.

Table 7

PERSONNEL EMPLOYED IN SPRAYING OPERATIONS IN MALARIA ERADICATION PROGRAMS  
IN THE AMERICAS - 31 DECEMBER 1962  
(Part-time personnel in parentheses)

Country or other political unit	Total	Engineers	Sanitarians or Spraying Chiefs	Sector Chiefs	Squad Chiefs	Spraymen	Draftsmen
Argentina .....	172	2	6	10	29	121	4
Bolivia .....	47	5	8	-	9	25	-
Brazil (excl. São Paulo)	4 013	23	-	189	679	3 122	...
Brazil (São Paulo) ....	660	8	-	18	111	505	18
Colombia .....	863	7	30	45	59	705	17
Costa Rica .....	61	1	1	6	10	42	1
Cuba .....	458	2	4	19	71	360	2
Dominican Republic ..	455	3	-	18	68	366	...
Ecuador .....	614 (24)	7	1	27 (4)	106	472 (20)	1
El Salvador .....	7	1	-	-	1	4	1
Guatemala .....	444	2	4	15	59	361	3
Haiti .....	777	6	6	23	116	618	8
Honduras .....	196	-	4	9	32	151	-
Jamaica .....	99	-	4	16	43	36	-
Mexico .....	1 156	49	65	51	258	715	18
Nicaragua .....	203	1	3	8	34	156	1
Panama .....	289	1	5	10	47	225	1
Paraguay <sup>a</sup> .....	33	3	-	2	18	4	6
Peru .....	469	7	-	19	81	352	10
Trinidad and Tobago ..	15	-	-	-	1	10	4
Venezuela .....	411	1	-	20	65	317	8
British Guiana .....	16	-	-	1	5	10	-
Dominica .....	1	-	1	-	-	-	-
French Guiana .....	25 (15)	-	-	-	9	16 (15)	-
Guadeloupe .....	37	-	-	1	6	30	-
Panama Canal Zone ...	(27)	(1)	(2)	(2)	(2)	(20)	-
Surinam .....	76	-	-	9	16	50	1
Total .....	11 597 (66)	129 (1)	142 (2)	516 (6)	1 933 (2)	8 773 (55)	104

... No information.

- None.

(a) Program suspended in March 1961, new program being planned.

Table 8  
**PERSONNEL EMPLOYED IN EPIDEMIOLOGICAL EVALUATION IN MALARIA ERADICATION PROGRAMS  
 IN THE AMERICAS, 31 DECEMBER 1962**  
 (Part-time personnel in parentheses)

Country or other political unit	Total	Physicians	Entomologists	Entomologists Assistants	Statisticians and Statisticians Assistants	Evaluation Inspectors	Evaluators	Microscopists and Laboratory Personnel
Argentina .....	156	8	1	3	2	18	99	25
Bolivia .....	208	6	-	6	6	30	138	22
Brazil (excl. São Paulo) ..	1 001	40	8	18	-	155	643	137
Brazil (São Paulo) .....	238	14	1	11	1	31	126	54
Colombia .....	625	32	1	7	5	60	468	52
Costa Rica .....	88	1	-	2	1	4	69	11
Cuba .....	32	8	1	3	3	-	9	8
Dominican Republic .....	29	3	-	2	-	2	15	7
Ecuador .....	150	10	1	9	-	13	87	30
El Salvador .....	110	3	-	2	2	6	78	19
Guatemala .....	108	3	1	11	4	4	62	23
Haiti .....	72	8	1	9	9	6	24	15
Honduras .....	104	2	1	2	2	7	68	22
Jamaica .....	70	2	-	-	-	1	48	19
Mexico .....	1 825	89	1	30	2	194	1 407	102
Nicaragua .....	95	4	1	4	8	3	59	16
Panama .....	47	1	2	3	5	-	25	11
Paraguay <sup>a</sup> .....	60	7	-	7	5	7	25	9
Peru .....	236	14	1	5	20	17	137	42
Trinidad and Tobago ....	152	2	-	60	2	1	75	12
Venezuela .....	366	15	2	25	-	48	244	32
British Guiana .....	25 (1)	(1)	-	-	2	-	20	3
British Honduras .....	14	1	-	-	1	1	9	2
Dominica .....	6 (1)	(1)	-	-	-	-	5	1
French Guiana .....	2 (4)	(4)	-	2	-	-	-	-
Grenada <sup>b</sup> .....	8 (1)	(1)	-	-	-	1	6	1
Guadeloupe .....	11 (4)	1	1	1	-	-	5 (4)	3
Panama Canal Zone .....	(42)	(10)	(1)	(14)	-	(2)	(3)	(12)
St. Lucia <sup>c</sup> .....	4 (1)	(1)	-	-	-	-	3	1
Surinam .....	38 (1)	(1)	1	2	-	3	28	4
Total .....	5 880 (55)	274 (19)	25 (1)	224 (14)	80	612 (2)	3 982 (7)	683 (12)

- None.

(a) Program suspended in March 1961. New program being planned. (b) In maintenance phase since March 1962. (c) In maintenance phase since January 1963.



Table 9  
PERSONNEL EMPLOYED IN ADMINISTRATIVE SERVICES AND OTHERS IN MALARIA ERADICATION PROGRAMS  
IN THE AMERICAS, 31 DECEMBER 1962  
(Part-time personnel in parentheses)

Country or other political unit	Total	Adminis- trators	Adminis- trative Assistants	Accountants	Disbursing Officers	Storekeepers	Storekeepers Assistants	Secretaries	Others
Argentina .....	132	4	64	-	-	5	7	3	49
Bolivia .....	35	6	8	-	-	-	-	7	14
Brazil (excl. São Paulo) ..	...	...	...	...	...	...	...	...	...
Brazil (São Paulo) .....	426	15	83	-	9	7	13	-	299 <sup>a</sup>
Colombia .....	350	1	8	-	20	19	9	88	205
Costa Rica .....	17	1	6	-	-	1	1	1	7
Cuba .....	24	2	1	-	-	2	-	4	15
Dominican Republic .....	7	1	3	-	-	1	1	1	...
Ecuador .....	72	8	6	4	6	7	2	8	31
El Salvador .....	100	1	2	-	1	1	1	7	87
Guatemala .....	135	-	11	-	-	2	1	6	115
Haiti .....	120	3	3	2	1	1	-	22	88
Honduras .....	33	1	8	1	-	-	-	8	15
Jamaica .....	32	2	-	-	-	1	3	3	23
Mexico .....	478	13	201	-	15	14	24	120	91
Nicaragua .....	79	-	2	-	-	-	9	5	63
Panama .....	34	1	5	-	-	1	10	4	13
Paraguay <sup>b</sup> .....	53	1	28	-	-	1	2	5	16
Peru .....	135	-	39	6	1	7	6	18	58
Trinidad and Tobago .....	13	1	2	-	-	2	3	5	...
Venezuela .....	404	21	3	-	1	16	5	125	233
British Guiana .....	19	1	-	-	-	1	1	-	16
British Honduras .....	4	1	-	-	-	1	-	-	2
Dominica .....	1 (1)	(1)	-	-	-	-	-	1	-
French Guiana .....	1	-	-	-	-	-	-	1	-
Grenada <sup>c</sup> .....	1 (1)	1	-	-	-	-	(1)	-	-
Guadeloupe .....	6 (6)	1	-	-	-	-	-	1	4 (6)
Panama Canal Zone .....	(2)	-	-	-	-	-	-	-	(2)
St. Lucia <sup>d</sup> .....	1 (1)	-	-	-	-	-	-	(1)	1
Surinam .....	20	1	2	-	-	1	3	1	12
Total .....	2732 (11)	87 (1)	485	13	54	91	101 (1)	444 (1)	1457 (8)

... No information.

- None

- (a) Some personnel of Chagas disease control, included. (b) Program suspended in March 1961. New program being planned.  
(c) In maintenance phase since March 1962. (d) In maintenance phase since January 1963.

Table 10

PERSONNEL EMPLOYED IN TRANSPORT SERVICES IN MALARIA ERADICATION PROGRAMS  
IN THE AMERICAS - 31 DECEMBER 1962

(Part-time personnel in parentheses)

Country or other political unit	Total	Mechanics and assistant Mechanics	Drivers	Motorboat operators	Boatmen
Argentina .....	61	25	36	-	-
Bolivia .....	19	6	13	-	-
Brazil (excl. São Paulo) .....	...	...	...	...	...
Brazil (São Paulo) .....	238	36	199	3	-
Colombia .....	347	67	119	121	40
Costa Rica .....	11	2	9	-	-
Cuba .....	13	3	10	-	-
Dominican Republic .....	40	...	40 <sup>a</sup>	/a	...
Ecuador .....	58	9	40	9	-
El Salvador .....	34	5	28	1	-
Guatemala .....	54	2	51	1	-
Haiti .....	65	16	49	-	-
Honduras .....	53	3	49	1	-
Jamaica .....	36	4	32	-	-
Mexico .....	122	85	26	11	-
Nicaragua .....	60	-	56	4	-
Panama .....	11	6	5	-	-
Paraguay <sup>b</sup> .....	22	-	21	-	1
Peru .....	66	17	31	18	-
Trinidad and Tobago .....	5	4	1	-	-
Venezuela .....	53	32	15	6	-
British Guiana .....	14	-	6	4	4
British Honduras .....	3	2	1	-	-
Dominica .....	1	-	1	-	-
French Guiana .....	3	-	3	-	-
Grenada <sup>c</sup> .....	2	-	2	-	-
Guadeloupe .....	6	2	4	-	-
Panama Canal Zone .....	(4)	-	(2)	(2)	-
Surinam .....	35	7	9	19	-
Total .....	1 432 (4)	333	856 (2)	198 (2)	45

... No information.

- None.

(a) Not specified whether drivers or boatmen. (b) Program suspended in March 1961; new program being planned. (c) In Maintenance phase since March 1962.

Table 11  
MEANS OF TRANSPORT IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1962

Country or other political unit	Trucks (3 tons or more)	Trucks and "Pick-up" (less than 3 tons)	Jeeps	Automobiles and station wagons	Motorcycles	Bicycles	Motor boats	Boats without motor	Saddle and pack animals	Other
Argentina .....	6	83	12	10	1	27	-	-	4	4 <sup>a</sup>
Bolivia .....	3	31	29	1	-	27	22	-	176	-
Brazil (excl. São Paulo) .	44	302	611	28	-	-	34	3	509	1 <sup>b</sup>
Brazil (São Paulo) .....	9	152	46	13	-	1	9	2	-	-
Colombia .....	18	208	96	29	-	74	78	110	1 076	-
Costa Rica .....	1	13	10	4	-	52	19	6	-	-
Cuba .....	16	-	30	41	-	-	-	-	160	-
Dominican Republic .....	3	75	25	2	-	-	-	-	-	-
Ecuador .....	8	56	52	13	-	11	43	5	314	-
El Salvador .....	2	52	16	7	-	1	1	-	-	-
Guatemala .....	1	43	6	20	31	-	15	-	-	-
Haiti .....	4	64	22	20	-	-	-	-	-	4 <sup>c</sup>
Honduras .....	2	38	30	5	-	-	1	-	105	-
Jamaica .....	1	30	23	12	-	-	-	-	-	-
Mexico .....	16	432	349	10	-	-	17	-	1 680 <sup>d</sup>	-
Nicaragua .....	2	26	34	10	-	1	10	1	-	-
Panama .....	1	48	18	9	-	-	14	-	d	-
Paraguay .....	-	10	15	4	3	2	9	2	13	-
Peru .....	7	126	67	1	-	1	64	15	-	-
Trinidad and Tobago .....	3	1	10	1	-	-	-	-	-	-
Venezuela .....	3	69	63	25	6	191	97	-	588	17 <sup>e</sup>
British Guiana .....	1	2	3	-	-	-	4	4	d	-
British Honduras .....	-	5	8	-	-	3	1	1	-	-
Dominica .....	-	1	2	-	3	-	-	-	-	-
French Guiana .....	1	3	-	1	-	-	-	1	-	-
Grenada .....	2	-	1	-	2	-	-	-	-	-
Guadeloupe .....	3	1	4	-	2	-	-	-	-	-
Panama Canal Zone .....	-	2	-	-	-	-	2 <sup>f</sup>	-	-	-
St. Lucia .....	-	1	3	-	2	-	-	-	-	-
Surinam .....	-	4	6	-	2	-	26	-	-	-

- None.

(a) Tank trucks. (b) Airplain. (c) Repair shop trucks. (d) Rented. (e) Foging machines. (f) Part-time.

Table 12

SPRAYING OPERATIONS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS AT THE END OF 1962

Year of total coverage	Date	Houses sprayed				Total number of sprayings in year	Insecticide used per house (grams technical)		Average No. of houses sprayed per sprayman-day
		D. D. T.		Dieldrin			DDT	Dieldrin	
		Cycle	Number sprayed	Cycle	Number sprayed				
<b>ARGENTINA. Total coverage began 1 August 1959</b>									
1st	Aug. 59-Jun. 60	1st	55 849 a 2 146 b	-	-	146 074	263	-	...
		2nd	81 170 a 6 909 b	-	-		255	-	...
2nd	Jul. 60-Jul. 61	3rd	78 487 a 6 442 b	-	-	161 920	305	-	...
		4th	74 188 a 2 803 b	-	-		334	-	...
3rd	Aug. 61-Jun. 62	5th	73 682 a 2 052 b	-	-	148 761	383	-	...
		6th	73 027 a	-	-		349	-	...
4th	Jul. 62-Dec. 62	7th	63 967	-	-	63 967	353	-	...
<b>BOLIVIA. Total coverage began 1 September 1958</b>									
1st	Sep. 58-Aug. 59	1st	116 572	1st	10 910	256 601	362	115	8.3
		2nd	129 119				331		7.0
2nd	Sep. 59-Aug. 60	3rd	136 601	2nd	12 268	291 405	319	118	7.6
		4th	142 536				309		7.2
3rd	Sep. 60-Aug. 61	5th	159 952	-	-	294 125	331	-	7.6
		6th	134 173	-	-		329	-	7.5
4th	Sep. 61-Sep. 62	7th	124 623	-	-	253 521	353	-	7.9
		8th	128 898	-	-		359	-	8.6
<b>BRAZIL. Total coverage in some areas began August 1959</b>									
(c)	Jan. 61-Nov. 61 <sup>d</sup>		814 475 e	-	-	814 475	...	-	...
(c)	Jan. 62-Sep. 62		2 327 498 e	-	-	2 327 498	424	-	...
<b>BRAZIL . (SÃO PAULO STATE) Total coverage began 4 January 1960</b>									
1st	Jan. 60-Jan. 61	1st	455 219	-	-	914 145	433	-	8.4
		2nd	458 926				404		9.8
2nd	Feb. 61-Jan. 62	3rd	436 048	-	-	867 521	416	-	9.4
		4th	431 473				412		9.7
3rd	Feb. 62-Jan. 63	5th	380 623	-	-	764 340	419	-	9.7
		6th	383 717				420		9.8
<b>COLOMBIA. Total coverage began 29 September 1958</b>									
1st	Oct. 58-Sep. 59	1st	1 181 235	-	-	2 357 627	466	-	6.6
		2nd	1 176 392				425		8.9
2nd	Oct. 59-Sep. 60	3rd	1 196 930	-	-	2 358 989	409	-	9.4
		4th	1 162 059				394		9.7
3rd	Oct. 60-Sep. 61	5th	1 181 557	-	-	2 127 058	397	-	9.7
		6th	888 459 a 57 042 b				402		9.3

... No information

- Nada.

(a) Sprayed twice a year. (b) Sprayed once a year. (c) Owing to different spray cycle timing in different regions, these data refers to the calendar year. (d) Data refers only to the States of Ceara, Rio Grande do Norte, Paraíba Sergipe and Alagoas. (e) Sprayings.

Table 12 (Continued)

SPRAYING OPERATIONS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS AT THE END OF 1962

Year of total coverage	Date	Houses sprayed				Total number of sprayings in year	Insecticide used per house (grams technical)		Average No. of houses sprayed per sprayman-day
		D. D. T.		Dieldrin			DDT	Dieldrin	
		Cycle	Number sprayed	Cycle	Number sprayed				
COLOMBIA. (Cont.)									
4th	Oct. 61-Sep. 62	7th	662 352 <sup>a</sup> 76 107 <sup>b</sup>	-	-	1 431 774	408	-	8.9
		8th	654 099 <sup>a</sup> 39 216 <sup>b</sup>	-	-		420	-	8.8
5th	Oct. 62- Feb. 62	9th <sup>c</sup>	388 985 <sup>a</sup> 79 674 <sup>b</sup> 17 939 <sup>d</sup> 5 051 <sup>e</sup>	-	-	491 649	437	-	8.3
COSTA RICA. Total coverage began 15 July 1957									
1st	Jul. 57-Aug. 58	1st	53 297	-	-	111 921	464	-	5.1
		2nd	58 624	-	-		419	-	7.4
2nd	Sep. 58-Sep. 59	3rd	60 800	-	-	123 863	465	-	6.9
		4th	63 063	-	-		531	-	7.1
3rd	Oct. 59-Sep. 60	5th	63 884	-	-	130 845	512	-	8.6
		6th	66 961	-	-		475	-	9.3
4th	Oct. 60-Sep. 61	7th	66 242	-	-	134 519	473	-	9.4
		8th	68 277	-	-		485	-	9.2
5th	Oct. 61-Dic. 62	9th	58 910	-	-	89 594	492	-	8.8
		10th	30 684	-	-		508	-	9.4
CUBA. Total coverage began January 1962									
1st	Jan. 62-Dec. 62	1st 2nd <sup>c</sup>	383 948 101 271	-	-	485 219	435	-	...
DOMINICAN REPUBLIC. Total coverage began 16 June 1958									
1st	Jun. 58- Jun. 59	-	-	1st	395 597	395 597	-	102	11.4
2nd	Jul. 59- Feb. 60	-	-	2nd <sup>f</sup>	236 597	236 597	-	119	10.5
3rd	Mar. 60-Mar. 62	1st	332 944	-	-	537 475	495	-	9.0
		2nd	204 531	-	-		472	-	8.4
4th	Apr. 62-Jan. 63	3rd <sup>g</sup>	72 499	-	-	210 637	424	-	8.4
		4th <sup>c</sup>	138 138	-	-		458	-	8.4
ECUADOR. Total coverage began 28 March 1957									
1st	Mar. 57-Mar. 58	1st+2nd	63 284	1st	257 697	320 981	590	114	8.0
2nd	Apr. 58-Mar. 59	3rd	50 089	2nd	271 417	404 524	490	145	6.9
		4th	83 018	-	-	436	-	8.5	
3rd	Apr. 59- Mar. 60	5th	72 370	3rd <sup>g</sup>	271 729	441 889	399	122	9.3
		6th <sup>g</sup>	97 790	-	-	403	-	8.8	
(h)	Apr. 60-Dec. 60	(h)	227 411	-	-	227 411	424	-	8.9
4th	Jan. 61-Dec. 61	7th	394 246	-	-	806 254	446	-	8.4
		8th	412 008	-	-		502	-	8.5
5th	Jan. 62-Dec. 62	9th	428 269	-	-	856 598	529	-	8.4
		10th	428 329	-	-		585	-	8.0

... No information.

- None.

- (a) Sprayed twice a year. (b) Sprayed once a year. (c) Cycle not yet finished. (d) Sprayed three times a year. (e) Sprayed four times a year. (f) Cycle suspended due to shift of insecticide. (g) Cycle suspended. (h) Emergency spraying.

Table 12 (Continued)

SPRAYING OPERATIONS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS AT THE END OF 1962

Year of total coverage	Date	Houses sprayed				Total number of sprayings in year	Insecticide used per house (grams technical)		Average No. of houses sprayed per sprayman-day
		D. D. T.		Dieldrin			DDT	Dieldrin	
		Cycle	Number sprayed	Cycle	Number sprayed				
EL SALVADOR. Total coverage began 1 July 1956									
1st	Jul. 56-Jul. 57	1st	260 035	1st	128 839	562 411	454	158	8.5
		2nd	173 537				621		8.8
2nd	Aug. 57-Jul. 58	3rd	126 329	2nd	202 728	440 783	469	162	9.4
		4th	111 726				450		9.3
3rd	Aug. 58-Jul. 59	5th	273 788	-	-	544 507	493	-	8.6
		6th	270 719	-	-		527	-	8.9
4th	Aug. 59-Jul. 60	7th	265 361	-	-	541 411	573	-	7.7
		8th	276 050	-	-		545	-	7.7
5th	Aug. 60-Jun. 61	9th	279 481	-	-	651 196	528	-	7.6
		10th	371 715	-	-		526	-	8.9
6th	Jul. 61-Jul. 62	11th	377 551	-	-	763 645	546	-	9.2
		12th	386 094	-	-		562	-	9.5
(a)	Aug. 62-Dec. 62 <sup>a</sup>	(a)	3 816	-	-	3 816	809	-	6.7
GUATEMALA. Total coverage began 1 August 1957									
1st	Aug. 56-Aug. 57	-	-	1st	306 306	306 306	-	117	8.4
2nd	Sep. 57-Sep. 58	-	-	2nd	331 090	331 090	-	117	8.5
3rd	Oct. 58-Oct. 59	1st	301 329	-	-	658 433	427	-	8.8
		2nd	357 104	-	-		542	-	7.5
4th	Nov. 59-Nov. 60	3rd	368 269	-	-	746 905	541	-	7.1
		4th	378 636	-	-		560	-	8.1
5th	Dec. 60-Dec. 61	5th	386 737	-	-	779 827	588	-	7.8
		6th	393 090	-	-		557	-	7.9
6th	Jan. 62-Dec. 62	7th	368 135	-	-	606 853	553	-	7.5
		8th b	238 718	-	-		594	-	7.5
HAITI. Total coverage began 1 January 1962									
1st	Jan. 62-Dec. 62	1st	874 933	1st	10 016	1 791 795	220	61	14.3
		2nd	906 846				196		16.6
HONDURAS. Total coverage began 15 July 1959									
1st	Jul. 59-Jun. 60	1st	236 963	-	-	479 022	406	-	9.8
		2nd	242 059	-	-		368	-	11.4
2nd	Jul. 60-Jun. 61	3rd	254 699	-	-	520 524	369	-	11.8
		4th	265 825	-	-		419	-	10.9
3rd	Jul. 61-Jun. 62	5th	277 941	-	-	563 335	360	-	11.1
		6th	285 394	-	-		362	-	11.3
4th	Jul. 62-Mar. 63	7th	290 056	-	-	394 010	373	-	11.1
		8th b	103 954	-	-		384	-	11.0
JAMAICA. Total coverage began 2 January 1958; ended 15 December 1961									

- None.

(a) Spraying is suspended due to financial reasons, only one locality is sprayed. (b) Cycle not yet finished.

Table 12 (Continued)

SPRAYING OPERATIONS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS AT THE END OF 1962

Year of total coverage	Date	Houses sprayed				Total number of sprayings in year	Insecticide used per house (grams technical)		Average No. of houses sprayed per sprayman-day
		D. D. T.		Dieldrin			DDT	Dieldrin	
		Cycle	Number sprayed	Cycle	Number sprayed				
MEXICO. Total coverage began 1 January 1957									
1st	Jan. 57-Dec. 57	1st	2 143 023	1st	678 726	5 120 701	495	99	9.3
		2nd	2 298 952				417		9.9
2nd	Jan. 58-Dec. 58	3rd	2 103 570	2nd	1 217 556	5 292 683	402	111	10.3
		4th	1 971 557				424		10.5
3rd	Jan. 59-Dec. 59	5th	3 050 952	3rd	292 301	6 562 593	434	114	10.8
		6th	3 219 340				434		10.4
4th	Jan. 60-Dec. 60	7th	3 027 089	4th	22 390	5 918 572	413	93	10.9
		8th	2 869 093				387		11.1
5th	Jan. 61-Dec. 61	9th	1 582 503	-	-	2 434 790	356	-	11.2
		10th	852 287				414		10.5
6th	Jan. 62-Dec. 62	11th	390 351a	-	-	1 608 142	514	-	8.6
			5 963b						
		12th	386 746c				517		8.9
			825 087						
NICARAGUA. Total coverage began 10 November 1958									
1st	Nov. 58-Dec. 59	1st	205 930	-	-	424 575	401	-	9.2
		2nd	218 645				325		10.3
2nd	Jan. 60-Dec. 60	3rd	230 478	-	-	469 554	367	-	9.4
		4th	239 076				396		8.9
3rd	Jan. 61-Dec. 61	5th	239 375	-	-	490 912d	403	-	9.5
		6th	249 068				397		9.1
4th	Jan. 62-Dec. 62	7th	259 743	-	-	435 155e	409	-	9.6
		8th	164 623				440		9.3
PANAMA. Total coverage began 19 August 1957									
1st	Aug. 57-Aug. 58	-	-	1st	155 963	155 963	-	119	6.5
2nd	Sep. 58-Aug. 59	-	-	2nd	154 638	154 638	-	145	6.9
3rd	Sep. 59-Aug. 60	-	-	3rd	131 270	131 270	-	129	7.3
4th	Sep. 60-Apr. 62	-	-	4th	199 265	199 165	-	138	6.8
5th	May 62-Mar. 63	1st	174 779	5th	2 293	337 390	490	77	8.1
		2nd <sup>f</sup>	160 318				510		8.8
PARAGUAY. Total coverage began 30 October 1957									
1st	Nov. 57-Oct. 58	-	-	1st	148 626	148 626	-	105	10.9
2nd	Nov. 58-Oct. 59	-	-	2nd	161 261	161 261	-	111	14.3
3rd	Nov. 59-Oct. 60	-	-	3rd	171 086	171 086	-	118	11.7
4th <sup>g</sup>	Nov. 60-Mar. 61	-	-	4th <sup>g</sup>	56 656	56 656	-	138	8.1

... No information.

- None.

- (a) Sprayed twice a year. (b) Sprayed once a year. (c) Sprayed three times a year. (d) 2 469 houses sprayed with malathion are included. (e) 10 789 houses sprayed with malathion are included. (f) Cycle not yet finished. (g) Program suspended; new program being planned.

Table 12 (Concluded)

SPRAYING OPERATIONS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS AT THE END OF 1962

Year of total coverage	Date	Houses sprayed				Total number of sprayings in year	Insecticide used per house (grams technical)		Average No. of houses sprayed per sprayman-day
		D. D. T.		Dieldrin					
		Cycle	Number sprayed	Cycle	Number sprayed				
PERU. Total coverage began 17 November 1957									
1st	Nov. 57-Oct. 58	1st + 2nd	286 764 <sup>a</sup> 70 266 <sup>b</sup>	1st	121 666	478 696	...	...	7.8
2nd	Jan. 59-Dec. 59	(c)	271 065 <sup>d</sup>	2nd	341 804	612 869	424	118	8.4
3rd	Jan. 60-Dec. 60	(c)	447 848 <sup>d</sup>	3rd	234 643	682 491	468	95	8.4
4th	Jan. 61-Dec. 61	(c)	534 037 <sup>d</sup>	4th	25 005	559 042	410	109	7.9
5th	Jan. 62-Dec. 62	(c)	627 527 <sup>d</sup>	-	-	627 527	465	-	8.7
TRINIDAD AND TOBAGO. Total coverage began 2 January 1958; ended December 1961									
VENEZUELA. Total coverage began 1945									
...	Jan. 62-Dec. 62	...	493 781	...	6 076 23 706 <sup>e</sup>	523 563	366 156 <sup>f</sup>	232	7.0
BRITISH GULANA. Total coverage began April 1946									
...	Jan. 62-Dec. 62	...	13 535 <sup>a</sup> 10 491 <sup>b</sup>	-	-	24 026	183	-	8.3
BRITISH HONDURAS. Total coverage began 4 February 1957; ended 10 August 1962									
DOMINICA. Total coverage began 8 June 1959; ended October 1962									
GRENADA. Total coverage began 12 February 1957; ended January 1960									
ST. LUCIA. Total coverage began 1 January 1956; ended September 1959									
SURINAM. Total coverage began 5 May 1958									
1st	May 58-Apr. 59	1st 2nd	31 299 40 211	1st <sup>g</sup>	7 484	78 994	310 318	53	5.8 6.9
2nd	May 59-Apr. 60	3rd 4th	37 563 37 445	2nd <sup>g</sup>	13 331	88 339	274 250	59	8.0 7.8
3rd	May 60-Jun. 61	5th 6th	36 861 16 298	3rd	5 565	58 724	263 211	56	6.2 6.0
4th	Jul. 61-Jun. 62	7th 8th	15 533 ...	4th	1 320	...	211 ...	54	5.7 ...
5th	Jul. 62-	9th 10th	... ...	5th	...	...	... ...	...	... ...

... No information.

- None.

(a) Sprayed twice a year. (b) Sprayed once a year. (c) Owing to different spray cycle timing in different regions; these data refers to the calendar year. (d) Sprayings. (e) Sprayed with BHC. (f) BHC. (g) Houses sprayed with dieldrin are shown for dates corresponding to DDT cycle, though in 1960 the dieldrin year was July-June from January 1961 DDT and dieldrin cycles are synchronized.



Table 13

SPRAYING ACHIEVEMENTS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS  
AT THE END OF 1962

Year of total coverage	Date	Number of sprayings	Number of houses not sprayed <sup>a</sup>				Per cent of houses not sprayed
			Not sprayable	Refused entry to spraymen	Closed	Total	
<b>ARGENTINA. Total coverage began 1 August 1959</b>							
1st	Aug. 59-Jun. 60	146 074	5 328	22	1 819	7 169	4.7
2nd	Jul. 60-Jul. 61	161 920	5 550	68	2 607	8 225	4.8
3rd	Aug. 61-Jun. 62	148 761	4 295	83	2 531	6 909	4.4
4th	Jul. 62-Dec. 62	63 967	1 547	35	1 686	3 268	4.9
<b>BOLIVIA. Total coverage began 1st September 1958</b>							
1st	Sep. 58-Aug. 59	256 601	12 482	862	19 094	32 438	11.2
2nd	Sep. 59-Aug. 60	291 405	17 039	438	14 322	31 799	9.8
3rd	Sep. 60-Aug. 61	294 125	18 892	463	9 382	28 737	8.9
4th	Sep. 61-Sep. 62	253 521	14 134	420	7 197	21 751	7.9
<b>BRAZIL. Total coverage in some areas began in August 1959</b>							
(b)	Jan. 61-Nov. 61 <sup>c</sup>	814 475	...	...	...	5 620	0.7
(b)	Jan. 62-Sep. 62	2 327 498	...	...	...	290 610	11.1
<b>BRAZIL (SAO PAULO STATE). Total coverage began 4th January 1960</b>							
1st	Jan. 60-Jan. 61	914 145	45 164	8 410	24 379	77 953	7.9
2nd	Feb. 61-Jan. 62	867 521	39 363	5 848	10 991	56 202	6.1
3rd	Feb. 62-Jan. 63	764 340	34 386	2 801	6 111	43 298	5.4
<b>COLOMBIA. Total coverage began 29 September 1958</b>							
1st	Oct. 58-Sep. 59	2 357 627	82 822	85 476	57 804	226 102	8.8
2nd	Oct. 59-Sep. 60	2 358 989	70 006	28 155	88 588	186 749	7.3
3rd	Oct. 60-Sep. 61	2 127 058	43 393	30 737	67 448	144 578	6.4
4th	Oct. 61-Sep. 62	1 431 774	20 833	29 286	51 099	101 218	6.6
5th	Oct. 62-Feb. 63	491 649	5 370	12 168	15 642	33 180	6.3
<b>COSTA RICA. Total coverage began 15 July 1957</b>							
1st	Jul. 57-Aug. 58	111 921	0	0	0	0	0
2nd	Sep. 58-Sep. 59	123 863	0	0	0	0	0
3rd	Oct. 59-Sep. 60	130 845	0	0	0	0	0
4th	Oct. 60-Sep. 61	134 519	0	0	0	0	0
5th	Oct. 61-Dec. 62	89 594	0	0	0	0	0
<b>DOMINICAN REPUBLIC. Total coverage began 16 June 1958</b>							
1st	Jun. 58-Jun. 59	395 597	...	...	...	5 706	1.4
2nd <sup>d</sup>	Jul. 59-Feb. 60	236 579	7 908	916	8 059	16 833	6.6
3rd	Mar. 60-Mar. 62	537 475	16 463	2 780	18 288	37 531	6.5
4th	Apr. 62-Jan. 63	210 637	...	...	...	...	...

... No information.

- (a) When follow-up spraying is done, the figures represent the net number of houses unsprayed at the end of the spraying cycle. (b) Owing to different spray cycle timing in different regions, these data refers to the calendar year. (c) Data refers to the State of Ceara, Rio Grande do Norte, Paraiba, Alagoas and Sergipe. (d) Cycle suspended due to shift of insecticide.

Table 13 (Continued)

SPRAYING ACHIEVEMENTS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS  
AT THE END OF 1962

Year of total coverage	Date	Number of sprayings	Number of houses not sprayed <sup>a</sup>				Per cent of houses not sprayed
			Not sprayable	Refused entry to spraymen	Closed	Total	
<b>ECUADOR.</b> Total coverage began 28 March 1957							
1st	Mar. 57-Mar. 58	320 981	...	...	...	...	...
2nd	Apr. 58-Mar. 59	404 524	3 168	4 112	9 618	16 898	4.0
3rd	Apr. 59-Mar. 60	441 889	2 430	1 587	5 123	9 140	2.0
(b)	Apr. 60-Dec. 60	227 411	753	1 069	2 518	4 340	1.9
4th	Jan. 61-Dec. 61	806 254	3 184	4 394	11 008	18 586	2.3
5th	Jan. 62-Dec. 62	856 598	3 762	8 250	17 833	29 845	3.4
<b>EL SALVADOR.</b> Total coverage began 1 July 1956							
1st	Jul. 56-Jul. 57	562 411	...	...	...	218	0.04
2nd	Aug. 57-Jul. 58	440 783	0	0	0	0	0
3rd	Aug. 58-Jul. 59	544 507	0	101	355	456	0.1
4th	Aug. 59-Jul. 60	541 411	0	510	1 426	1 936	0.4
5th	Aug. 60-Jun. 61	651 196	0	974	1 989	2 963	0.5
6th	Jul. 61-Jul. 62	763 645	0	3 221	4 553	7 774	1.0
(c)	Aug. 62-Dec. 62	3 816	0	52	10	62	1.6
<b>GUATEMALA.</b> Total coverage began 1 August 1956							
1st	Aug. 56-Aug. 57	306 306	...	...	...	758	0.2
2nd	Sep. 57-Sep. 58	331 090	...	...	...	1 518	0.5
3rd	Oct. 58-Oct. 59	658 433	...	...	...	6 541	1.0
4th	Nov. 59-Nov. 60	746 905	0	783	6 379	7 162	0.9
5th	Dec. 60-Dec. 61	779 827	0	6 846	14 928	21 928	2.7
6th	Jan. 62-Dec. 62	606 853	0	12 100	18 508	30 608	4.8
<b>HAITI.</b> Total coverage began 1 January 1962							
1st	Jan. 62-Dec. 62	1 791 795	79 206	1 259	7 145	87 610	4.7
<b>HONDURAS.</b> Total coverage began 15 July 1959							
1st	Jul. 59-Jun. 60	479 022	6 519	391	1 812	8 722	1.8
2nd	Jul. 60-Jun. 61	520 524	436	601	3 132	4 169	0.8
3rd	Jul. 61-Jun. 62	563 335	0	605	3 562	4 167	0.7
4th	Jul. 62-Mar. 63	394 010	0	488	2 231	2 719	0.7
<b>JAMAICA.</b> Total coverage began 2 January 1958; ended 15 December 1961							
<b>MEXICO.</b> Total coverage began 1 January 1957							
1st	Jan. 57-Dec. 57	5 120 701	77 537	71 619 <sup>d</sup>	149 156	2.8	
2nd	Jan. 58-Dec. 58	5 292 683	167 483	154 479 <sup>d</sup>	321 962	5.7	
3rd	Jan. 59-Dec. 59	6 562 593	203 597	215 007 <sup>d</sup>	418 604	6.0	
4th	Jan. 60-Dec. 60	5 918 572	164 492	248 212 <sup>d</sup>	412 704	6.5	
5th	Jan. 61-Dec. 61	2 434 790	45 544	79 763 <sup>d</sup>	125 307	4.9	
6th	Jan. 62-Dec. 62	1 608 142	10 297	50 523 <sup>d</sup>	60 820	3.6	

... No information.

(a) When follow-up spraying is done, the figures represent the net number of houses unsprayed at the end of the spraying year. (b) Emergency spraying. (c) Spraying is suspended, only one locality is sprayed. (d) Including unspecified other reasons.

Table 13 (Continued)

SPRAYING ACHIEVEMENTS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS  
AT THE END OF 1962

Year of total coverage	Date	Number of sprayings	Number of houses not sprayed <sup>a</sup>				Per cent of houses not sprayed
			Not sprayable	Refused entry to spraymen	Closed	Total	
<b>NICARAGUA.</b> Total coverage began 10 November 1958							
1st	Nov. 58-Dec. 59	424 575	6 802	2 099	7 288	16 183	3.7
2nd	Jan. 60-Dec. 60	469 554	12 487	2 102	4 841	19 430	4.0
3rd	Jan. 61-Dec. 61	490 912	13 640	1 417	6 619	21 676	4.2
4th	Jan. 62-Dec. 62	435 155	12 175	1 177	6 093	19 445	4.5
<b>PANAMA.</b> Total coverage began 19 August 1957							
1st	Aug. 57-Aug. 58	155 963	...	...	...	5 047	3.1
2nd	Sep. 58-Aug. 59	154 638	2 247	267	5 857	8 371	5.1
3rd	Sep. 59-Aug. 60	131 270	1 825	530	6 738	9 093	6.5
4th	Sep. 60-Apr. 62	199 265	1 494	2 113	10 172	13 779	6.5
5th	May 62-Mar. 63	337 390	381	1 237	5 905	7 523	2.2
<b>PARAGUAY.</b> Total coverage began 30 October 1957							
1st	Nov. 57-Oct. 58	148 626	0	0	651	651	0.4
2nd	Nov. 58-Oct. 59	161 261	0	90	1 022	1 112	0.7
3rd	Nov. 59-Oct. 60	171 086	0	28	981	1 009	0.6
4thb	Nov. 60-Mar. 61	56 656	0	0	494	494	0.9
<b>PERU.</b> Total coverage began 17 November 1957							
1st	Nov. 59-Oct. 58	478 696	522	72	42 201	42 795	8.2
(c)	Jan. 59-Dec. 59	612 869	16 373	2 163	22 120	40 656	6.2
(c)	Jan. 60-Dec. 60	682 491	12 433	1 479	13 661	27 573	3.8
(c)	Jan. 61-Dec. 61	559 042	7 241	1 138	7 884	16 263	2.8
(c)	Jan. 62-Dec. 62	627 527	6 624	1 419	7 932	15 975	2.5
<b>TRINIDAD AND TOBAGO.</b> Total coverage began 2 January 1958; ended December 1961							
<b>VENEZUELA.</b> Total coverage began in 1945							
...	Jan. 62-Dec. 62	523 563	0	5 132	8 403	13 535	2.5
<b>BRITISH GUIANA.</b> Total coverage began April 1946							
...	Jan. 62-Dec. 62	24 026	571	56	1 755	2 382	9.0
<b>BRITISH HONDURAS.</b> Total coverage began 4 February 1957; ended 10 August 1962							
<b>DOMINICA.</b> Total coverage began 8 June 1959; ended October 1962							

... No information.

(a) When follow-up spraying is done, the figures represent the net number of houses unsprayed at the end of the spraying cycle. (b) Program suspended; new program being planned. (c) Owing to different spray cycle timing in different regions, these data refers to the calendar year.

Table 13 (Concluded)

SPRAYING ACHIEVEMENTS OF MALARIA ERADICATION PROGRAMS IN THE AMERICAS  
AT THE END OF 1962

Year of total coverage	Date	Number of sprayings	Number of houses not sprayed <sup>a</sup>				Per cent of houses not sprayed
			Not sprayable	Refused entry to spraymen	Closed	Total	
GRENADA. Total coverage began 12 February 1957; ended January 1960							
ST. LUCIA. Total coverage began 16 January 1956; ended September 1959							
SURINAM. Total coverage began 5 May 1958							
1st	May 58-Apr. 59	78 994	196	124	4 980	5 300	6.3
2nd	May 59-Apr. 60	88 339	166	1 126	3 838	5 130	5.5
3rd	May 60-Jun. 61	58 724	408	2 083	10 865	13 356	18.5
4th	Jul. 61-Jun. 62	...	...	...	...	...	...
5th	Jul. 62	...	...	...	...	...	...

... No information.

(a) When follow-up spraying is done, the figures represent the net number of houses unsprayed at the end of the spraying year.

Table 14

CASE DETECTION DURING THE ATTACK PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Year of total coverage	Date	No. of inhabitants directly protected by spraying	No. of slides examined	No. of positive slides				Per cent positive
				<u>P. falciparum</u>	<u>P. vivax</u>	<u>P. malariae</u>	Total	
<b>ARGENTINA. Total coverage began 1 August 1959</b>								
1st <sup>a</sup>	Aug. 59-Jun. 60	535 922	70 700	6	2 491	0	2 497	3.53
2nd <sup>b</sup>	Jul. 60-Jul. 61	609 387	96 991	4	3 876	0	3 880	4.00
3rd	Aug. 61-Jun. 62	539 804	107 926	1	5 080	0	5 081	4.71
4th	Jul. 62-Dec. 62	229 437	48 821	0	884	0	884	1.81
<b>BOLIVIA. Total coverage began 1 September 1958</b>								
1st	Sep. 58-Aug. 59	754 635 <sup>c</sup>	50 980	273	1 268	302	1 843	3.62
2nd	Sep. 59-Aug. 60	1 295 044	99 241	124	803	179	1 106	1.12
3rd <sup>a</sup>	Sep. 60-Aug. 61	1 278 038	126 384	90	615	30	735	0.58
4th <sup>a</sup>	Sep. 61-Sep. 62	1 049 991	174 800	214	758	10	982	0.56
5th <sup>a</sup>	Oct. 62-Dec. 62	55 321	54 094	174	185	1	360	0.67
<b>BRAZIL. Total coverage by steps</b>								
(d)	Jan. 62-Dec. 62 <sup>a</sup>		513 767	22 683	45 683	5	68 371	13.31
<b>BRAZIL (SÃO PAULO STATE). Total coverage began 4 January 1960</b>								
1st	Jan. 60-Jan. 61	3 817 084	124 525	72	9 005	1	9 078	7.29
2nd	Feb. 61-Jan. 62	3 638 449	219 841	262	6 817	3	7 082	3.22
3rd	Feb. 62-Jan. 63	3 153 419	381 413	228	3 082	4	3 314	0.87
<b>COLOMBIA. Total coverage began 29 September 1958</b>								
1st	Oct. 58-Sep. 59	13 089 121	205 343	731	1 877	18	2 626	1.28
2nd	Oct. 59-Sep. 60	12 701 683	542 570	3 564	4 923	42	8 529	1.57
3rd	Oct. 60-Sep. 61	11 049 985	515 395	8 730	5 822	39	14 591	2.83
4th	Oct. 61-Sep. 62	7 158 013	640 720	9 873	7 716	34	17 623	2.75
5th <sup>a</sup>	Oct. 62-Jan. 63	1 910 650	229 103	3 013	2 586	11	5 610	2.45
<b>COSTA RICA. Total coverage began 15 July 1957</b>								
1st	Jul. 57-Aug. 58	550 660	24 773	115	1 661	10	1 786	7.21
2nd	Sep. 58-Sep. 59	596 007	52 697	135	2 081	6	2 222	4.22
3rd	Oct. 59-Sep. 60	622 215	66 721	91	1 888	1	1 980	2.96
4th	Oct. 60-Sep. 61	628 204	81 977	32	1 798	0	1 830	2.23
5th	Oct. 61-Dec. 62	423 397	155 909	6	1 772	1	1 779	1.14
6th	Jan. 63-Feb. 63	34 893	17 535	2	116	0	118	0.67
<b>CUBA. Total coverage began 1 January 1962</b>								
1st	Jan. 62-Dec. 62		100 247	31	3 484	0	3 515	3.51
<b>DOMINICAN REPUBLIC. Total coverage began 16 June 1958</b>								
1st	Jun. 58-Jun. 59	2 015 214	29 718	1 522	1 537	1	3 060	10.30
2nd	Jul. 59-Feb. 60	1 202 301	19 362	2 453	1 751	10	4 214	21.76
3rd	Mar. 60-Mar. 62	2 797 071	39 534	3 934	2 899	8	6 841	17.30
4th	Apr. 62-Jan. 63	638 106	20 634	175	226	2	403	1.95

(a) Data for entire country; not separated by attack phase and consolidation phase. (b) Data for both attack and consolidation phases July-Dec. 1960; attack phase only Jan. -July 1961. (c) January-August 1959. (d) Data refers to the calendar year.

Table 14 (Continued)

CASE DETECTION DURING THE ATTACK PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Year of total coverage	Date	No. of inhabitants directly protected by spraying	No. of slides examined	No. of positive slides				Per cent positive
				<u>P. falciparum</u>	<u>P. vivax</u>	<u>P. malariae</u>	Total	
ECUADOR. Total coverage began 28 March 1957								
1st	Mar. 57-Mar. 58	1 777 566	47 993	1 169	1 086	3	2 258	4.70
2nd	Apr. 58-Mar. 59	2 171 079	69 085	2 361	2 437	4	4 802	6.95
3rd	Apr. 59-Mar. 60	2 080 775	108 041	2 454	3 833	4	6 291	5.82
(a)	Apr. 60-Dec. 60	918 151	92 510	2 761	4 912	19	7 692	8.31
4th	Jan. 61-Dec. 61	3 795 248	213 169	1 489	8 243	1	9 733	4.57
5th	Jan. 62-Dec. 62	3 880 000 <sup>b</sup>	269 004	658	4 868	5	5 531	2.06
EL SALVADOR. Total coverage began 1 July 1956								
1st	Jul. 56-Jul. 57	2 845 568	11 829	774	1 510	0	2 284	19.31
2nd	Aug. 57-Jul. 58	2 102 503	42 216	4 212	4 891	5	9 108	21.57
3rd	Aug. 58-Jul. 59	2 570 500 <sup>b</sup>	59 463	4 384	9 136	0	13 520	22.74
4th	Aug. 59-Jul. 60	2 534 965	75 177	3 061	9 566	0	12 627	16.80
5th	Aug. 60-Jul. 61	3 010 514	75 053	3 168	7 620	3	10 791	14.38
6th	Aug. 61-Jun. 62	3 470 797	145 501	2 343	9 655	6	12 004	8.25
(c)	Jul. 62-Dec. 62	1 971 9	139 645	1 997	9 210	0	11 207	8.03
GUATEMALA. Total coverage began 1 August 1956								
1st	Aug. 56-Aug. 57	7 127 88 <sup>d</sup>	22 965	1 255	3 858	3	5 116	22.28
2nd	Sep. 57-Sep. 58	1 501 742	47 945	3 909	6 174	1	10 084	21.03
3rd	Oct. 58-Oct. 59	2 854 461	124 519	3 734	9 300	0	13 034	10.47
4th	Nov. 59-Nov. 60	3 099 988	126 667	400	2 967	0	3 367	2.66
5th	Dec. 60-Dec. 61	3 448 877	230 702	865	3 485	6	4 356	1.89
6th	Jan. 62-Dec. 62	2 503 160	275 003	1 539	4 224	20	5 783	2.10
HAITI. Total coverage began 29 January 1962								
1st	Jan. 62-Dec. 62		111 142	3 441	20	572	4 033	3.63
HONDURAS. Total coverage began 15 July 1959								
1st	Jul. 59-Jun. 60	2 254 385	82 673	2 925	3 649	1	6 575	7.95
2nd	Jul. 60-Jun. 61	2 672 662	137 025	1 506	3 716	1	5 223	3.81
3rd	Jul. 61-Jun. 62	2 820 098	190 209	481	3 198	0	3 679	1.93
4th	Jul. 62-Mar. 63	1 908 510	177 281	825	5 795	0	6 620	3.73
JAMAICA. Total coverage began 2 January 1958; ended December 1961								
1st	Jan. 58-Dec. 58	1 054 894	56 266	199	0	6	205	0.36
2nd	Jan. 59-Sep. 59	1 037 284	27 953	280	0	15	295	1.06
3rd	Oct. 59-Sep. 60	1 964 453	111 039	180	0	14	194	0.17
4th	Oct. 60-Dec. 61	1 176 114	190 094	30	0	8	38	0.02

(a) During emergency spraying. (b) Estimated. (c) Spraying discontinued due to economic reasons.  
(d) Six months only.

Table 14 (Continued)

CASE DETECTION DURING THE ATTACK PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Year of total coverage	Date	No. of inhabitants directly protected by spraying	No. of slides examined	No. of positive slides				Per cent positive
				<u>P. falciparum</u>	<u>P. vivax</u>	<u>P. malariae</u>	Total	
MEXICO. Total coverage began 2 January 1957								
1st	Jan. 57-Dec. 57	23 399 463	175 080	514	3 856	17	4 387	2.51
2nd	Jan. 58-Dec. 58	23 744 095	399 124	487	2 779	24	3 290	0.82
3rd	Jan. 59-Dec. 59	29 119 920	815 038	443	2 705	54	3 202	0.39
4th	Jan. 60-Dec. 60	25 782 965	1 208 712	245	3 251	73	3 569	0.29
5th	Jan. 61-Dec. 61	10 070 335	828 360	337	8 283	115	8 735	1.05
6th	Jan. 62-Dec. 62	6 376 914	727 262	145	9 605	52	9 802	1.35
NICARAGUA. Total coverage began 10 November 1958								
1st	Nov. 58-Dec. 59	2 352 191	38 966	619	1 256	0	1 875	4.81
2nd	Jan. 60-Dec. 60	2 535 535	74 074	4 217	3 311	0	7 528	10.16
3rd	Jan. 61-Dec. 61	2 547 299	109 293	3 001	5 721	0	8 722	7.98
4th	Jan. 62-Dec. 62	2 142 689	162 733	3 428	7 772	0	11 200	6.88
PANAMA. Total coverage began 1 August 1957								
1st	Aug. 57-Aug. 58	670 000 <sup>a</sup>	69 429	1 717	...	...	5 634	8.11
2nd	Sep. 58-Aug. 59	667 095	93 338	720	4 196	5	4 921	5.27
3rd	Sep. 59-Aug. 60	562 514	76 984	751	4 479	2	5 232	6.80
4th	Sep. 60-Apr. 62	836 229	160 620	1 660	4 155	2	5 817	3.62
5th	May 62-Mar. 63	1 343 908	135 627	505	2 446	0	2 951	2.18
PARAGUAY. Total coverage began 30 October 1957								
1st	Nov. 57-Oct. 58	747 541	13 526	3	496	1	500	3.70
2nd	Nov. 58-Oct. 59	805 232	11 963	3	618	0	621	5.19
3rd	Nov. 59-Oct. 60	844 515	42 396	5	1 028	0	1 033	2.44
4th <sup>b</sup>	Nov. 60-Dec. 61	280 982 <sup>b</sup>	34 452	9	1 735	1	1 745	5.07
	Jan. 62-Dec. 62	-	48 184	313	5 443	0	5 756	11.95
PERU. Total coverage began 17 November 1957								
1st	Nov. 57-Oct. 58	1 867 208	...	77	526	27	649 <sup>c</sup>	...
(d)	Jan. 59-Dec. 59	2 775 694	148 413	302	4 265	51	4 658 <sup>c</sup>	3.14
(d)	Jan. 60-Dec. 60	3 345 726	344 507	256	3 559	88	3 903	1.13
(d)	Jan. 61-Dec. 61	2 210 988	410 380	185	2 804	66	3 055	0.74
(d)	Jan. 62-Dec. 62	2 283 960	389 616	78	2 019	80	2 177	0.56
TRINIDAD AND TOBAGO. Total coverage began 2 January 1958; ended December 1961								
1st	Jan. 58-Sep. 58	571 953	26 499	318	58	0	376 <sup>e</sup>	1.41
2nd	Jan. 59-Dec. 59	726 681	101 039	63	28	1	92	0.09
3rd	Jan. 60-Dec. 60	1 176 907	91 388	9	2	0	11	0.01
4th	Jan. 61-Dec. 61	1 192 989	89 569	0	0	0	0	0

... No information.

- None.

(a) Estimated. (b) Spraying operations suspended in March 1961 due to financial and administrative reasons.

(c) Including undifferentiated mixed infections. (d) Owing to different spray cycle timing in different regions, these data refers to the calendar year. (e) Includes 2 positive cases found in the consolidation phase, not classified by species.

Table 14 (Concluded)

CASE DETECTION DURING THE ATTACK PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Year of total coverage	Date	No. of inhabitants directly protected by spraying	No. of slides examined	No. of positive slides				Per cent positive
				<u>P. falciparum</u>	<u>P. vivax</u>	<u>P. malariae</u>	Total	
VENEZUELA. Total coverage began prior to 1958								
(a)	Jan. 58-Dec. 58	...	269 448	60	901	4	975 <sup>b</sup>	0.36
(a)	Jan. 59-Dec. 59	...	232 710	92	646	14	765 <sup>b</sup>	0.33
(a)	Jan. 60-Sep. 60	...	209 232	...	...	...	1 008	0.48
(a)	Jan. 61-Sep. 61	...	230 336	...	...	...	1 174	0.51
(a)	Jan. 62-Dec. 62	2 024 180	172 280	...	...	...	883	0.51
BRITISH GUIANA. Total coverage began prior to 1958								
(a)	Jan. 58-Dec. 58	...	1 520	23	8	20	51	3.34
(a)	Jan. 59-Dec. 59	69 958	3 754	53	100	13	176 <sup>b</sup>	4.68
(a)	Jan. 60-Dec. 60	70 000 <sup>c</sup>	1 275	...	...	...	230	18.04
(a)	Jan. 61-Nov. 61	75 000 <sup>c</sup>	15 515	...	...	...	223	1.44
(a)	Jan. 62-Dec. 62	80 000 <sup>c</sup>	14 358	...	...	...	425	2.96
BRITISH HONDURAS. Total coverage began 4 February 1957; ended August 1962								
1st	Feb. 57-Jan. 58	46 825	2 132	148	56	52	256	12.01
2nd	Feb. 58-Dec. 58	94 937	8 081	321	226	46	593	7.34
3rd	May 59-Jun. 60	167 846	12 985	542	207	70	819	6.31
4th	Jul. 60-Jun. 61	174 487	15 149	11	71	0	82	0.54
5th	Jul. 61-Jul. 62	160 509	12 741	0	12	0	12	0.09
DOMINICA. Total coverage began 8 June 1959; ended October 1962								
1st	Jun. 59-May 60	20 830	5 233	51	0	0	51	0.97
2nd	Aug. 60-Oct. 61	21 445	12 136	2	0	1	3	0.02
3rd	Nov. 61-Dec. 62	21 643	15 069	0	0	1	1	0.01
FRENCH GUIANA. <sup>d</sup> Total coverage began May 1948								
	Jan. 60-Dec. 60	...	3 343	30	6	1	37	1.11
	Jan. 61-Dec. 61	...	1 197	33	0	0	33	2.76
	Jan. 62-Dec. 62	20 000 <sup>c</sup>	2 183	60	10	0	70	3.21
SURINAM. Total coverage began 5 May 1958								
1st	May 58-Apr. 59	343 373	37 292	3 356	71	120	3 547	9.51
2nd	May 59-Apr. 60	330 837	46 158	1 665	7	272	1 944	4.21
3rd	May 60-Jun. 61	204 149	43 012	938	3	66	1 007	2.34
4th	Jul. 61-Jun. 62	113 400 <sup>c</sup>	20 267	515	0	28	543	2.68
5th	Jul. 62-Mar. 63	55 100 <sup>c</sup>	9 318	1 048	1	16	1 065	11.43

... No information.

(a) Owing to different spray cycle timing in different regions, these data refers to the calendar year. (b) Including undifferentiated mixed infections. (c) Estimated. (d) Spraying is continued in the area reported as in consolidation phase in previous reports.



Table 15  
CASE DETECTION DURING THE CONSOLIDATION PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Date	Estimated population in the area (in thousands)	No. of slides examined	% of population sampled (a)	Total No. of positive cases found	Origin of infections							Species of parasite		
					Indigenous	Relapsing	Imported		Induced	Introduced	Unclassified	<u>P. vivax</u>	<u>P. falciparum</u>	<u>P. malariae</u>
							from abroad	from attack phase areas within country						
<b>ARGENTINA. Consolidation phase in some areas began prior to August 1959</b>														
Aug. 59-Jun. 60 <sup>b</sup>	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jul. 60-Jul. 61 <sup>c</sup>	750	27 480	6.3	16	-	1	-	5	-	10	-	16	-	-
Aug. 61-Jun. 62	555	33 960	6.7	13	-	3	-	3	1	6	-	11	-	2
Jul. 62-Dec. 62	555	22 630	8.2	11	-	8	-	2	-	1	-	10	-	1
<b>BOLIVIA. Consolidation phase in some areas began during 1961</b>														
Jan. 61-Dec. 61	461	11 975	2.6	14	1	1	5	7	-	-	-	14	-	-
Jan. 62-Sep. 62	759	18 131	3.2	21	-	-	2	19	-	-	-	21	-	-
<b>COLOMBIA. Consolidation phase in some areas began in April 1962</b>														
Apr. 62-Sep. 62	3 027	33 981	2.2	50	2	2	-	39	1	-	6	26	24	-
<b>COSTA RICA. Consolidation phase began in some areas in July 1962</b>														
Jul. 62-Feb. 63	255	72 688	42.7	138	15	22	4	12	-	59	26	138	-	-
<b>GUATEMALA. Consolidation phase in some areas began in January 1962</b>														
Jan. 62-Jul. 62	175	7 856	9.0	3	-	-	-	3	-	-	-	1	2	-
Jul. 62-Dec. 62	498	40 514	16.3	210	2	-	-	97	-	-	111	150	60	-
Jan. 63-Mar. 63	890	20 834	9.4	297	-	2	-	144	-	-	151	229	68	-

... No information.

- None.

(a) Annual rates calculated when less than 12 months reported. (b) No discrimination between consolidation and attack phase was made.

(c) Only for the 4th spraying cycle January-July 1961.

Table 15 (Continued)

## CASE DETECTION DURING THE CONSOLIDATION PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Date	Estimated population in the area (in thousands)	No. of slides examined	% of population sampled (a)	Total No. of positive cases found	Origin of infections							Species of parasite		
					Indigenous	Relapsing	Imported		Induced	Introduced	Unclassified	<u>P. vivax</u>	<u>P. falciparum</u>	<u>P. malariae</u>
							from abroad	from attack phase areas within country						
HONDURAS. Consolidation phase in some areas began in July 1962														
Jul. 62-Dec. 62	46	9 989	43.4	3	-	1	-	2	-	-	-	3	-	-
Jan. 63-Mar. 63	526	19 133	14.5	69	23	-	-	36	-	-	10	58	11	-
JAMAICA. Consolidation phase in some areas began in July 1960; and in the entire island in January 1962														
Jul. 60-Jun. 61	313	90 908	29.0	2	-	2	-	-	-	-	-	-	-	2
Jul. 61-Dec. 61	761	97 167	25.5	8	1	7	-	-	-	-	-	-	-	8
Jan. 62-Dec. 62	1 282	246 592	19.2	2	-	-	1	-	-	-	1	1	-	1
MEXICO. Consolidation phase in some areas began during 1958														
Jan. 58-Dec. 58	59	4 449	7.5	-	-	-	-	-	-	-	-	-	-	-
Jan. 59-Dec. 59	59	6 560	11.1	-	-	-	-	-	-	-	-	-	-	-
Jan. 60-Sep. 60	70	4 058	7.7	-	-	-	-	-	-	-	-	-	-	-
Jan. 61-Dec. 61	11 721	745 907	6.4	3 114	1 248	446	3	384	12	90	931	3 004	91	19
Jan. 62-Dec. 62	15 592	1 240 130	7.9	4 477	1 185	510	3	632	2	637	1 508	4 422	37	18
NICARAGUA. Consolidation phase in some areas began in July 1962														
Jul. 62-Dec. 62	515	18 994	7.4	159	57	13	50	-	-	1	38	132	26	1
PERU. Consolidation phase in some areas began during 1958														
Jan. 58-Dec. 58	14	669	4.7	3	-	-	1	-	2	-	-	1	-	2
Jan. 59-Dec. 59	14	1 378	9.8	-	-	-	-	-	-	-	-	-	-	-
Jan. 60-Dec. 60	15	5 273	42.2	3	-	-	1	-	2	-	-	1	-	2
Jan. 61-Dec. 61	47	13 088	27.8	1	-	-	-	1	-	-	-	1	-	1
Jan. 62-Dec. 62	864	80 750	9.3	20	2	-	1	12	5	-	-	16	1	3

- None.

(a) Annual rates calculated when less than 12 months reported.

Table 15 (Continued)  
CASE DETECTION DURING THE CONSOLIDATION PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Date	Estimated population in the area (in thousands)	No. of slides examined	% of population sampled (a)	Total No. of positive cases found	Origin of infections						Species of parasite			
					Indigenous	Relapsing	Imported		Induced	Introduced	Unclassified	<i>P. vivax</i>	<i>P. falciparum</i>	<i>P. malariae</i>
							from abroad	from attack phase areas within country						
<b>TRINIDAD AND TOBAGO.</b> Consolidation phase in some areas began in 1958; the entire islands in January 1962														
Jan. 58-Dec. 58	160	2	0.0	2	...	...	...	...	...	...	...	...	...	...
Jan. 59-Dec. 59	160	361	0.2	5	-	-	5	-	-	-	-	1	4	-
Jan. 60-Dec. 60	185	17 612	12.7	2	-	-	2	-	-	-	-	1	1	-
Jan. 61-Dec. 61	197	11 602	5.9	1	-	-	1	-	-	-	-	-	1	-
Jan. 62-Dec. 62	877	120 967	13.8	1	-	-	1	-	-	-	-	1	-	-
<b>VENEZUELA.</b> Consolidation phase in some areas began prior to 1958														
Jan. 58-Dec. 58	469	69 614	14.8	50	-	-	-	-	27	23	-	46	2	2
Jan. 59-Dec. 59	685	101 878	14.9	45	37	7	1	-	-	-	-	43	2	-
Jan. 60-Dec. 60	242	58 417	24.1	47	-	-	34	-	1	12	-	46	-	1
Jan. 61-Dec. 61	173	64 522	37.3	57	-	4	15	9	-	29	-	57	-	-
Jan. 62-Dec. 62	150	93 646	62.4	69 <sup>b</sup>	-	1	29	-	-	39	-	45	24	-
<b>BRITISH HONDURAS.</b> Consolidation phase in the whole country began in August 1962														
Aug. 62-Mar. 63	100	9 945	9.9	20	12	7	1	-	-	-	-	20	-	-
<b>DOMINICA.</b> Consolidation phase in the whole country began in January 1963														
Jan. 63-Mar. 63	14	4 093	116.9	-	-	-	-	-	-	-	-	-	-	-
<b>GRENADA.</b> Consolidation phase began in February 1960, ended in March 1962. The whole island is under maintenance phase from this date on.														

... No information.

- None.

(a) Annual rates calculated when less than 12 months reported. (b) 5 positive cases found by passive collaboration not included.

Table 15 (Concluded)

## CASE DETECTION DURING THE CONSOLIDATION PHASE IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS

Date	Estimated population in the area (in thousands)	No. of slides examined	% of population sampled (a)	Total No. of positive cases found	Origin of infections							Species of parasite		
					Indigenous	Relapsing	Imported		Induced	Introduced	Unclassified	<u>P. vivax</u>	<u>P. falciparum</u>	<u>P. malariae</u>
							from abroad	from attack phase areas within country						
GUADELOUPE. Consolidation phase in some areas began prior to 1958														
Jan. 58-Dec. 58	129	4 877	3.8	-	-	-	-	-	-	-	-	-	-	-
Jan. 59-Dec. 59	133	6 391	4.8	-	-	-	-	-	-	-	-	-	-	-
Jan. 60-Dec. 60	145	7 080	4.9	-	-	-	-	-	-	-	-	-	-	-
Jan. 61-Dec. 61	186	11 857	6.4	-	-	-	-	-	-	-	-	-	-	-
Jan. 62-Dec. 62	66	11 196	17.0	-	-	-	-	-	-	-	-	-	-	-
PANAMA CANAL ZONE. Consolidation phase began during 1960														
Jan. 60-Dec. 60	41	2 656	6.5	27	27	-	-	-	-	-	-	24	3	-
Jan. 61-Dec. 61	41	5 984	14.6	25	25	-	-	-	-	-	-	23	2	-
Jan. 62-Dec. 62	44	677	1.5	18	18	-	-	-	-	-	-	18	-	-
ST. LUCIA. Consolidation phase began in October 1959; ended in October 1962. The whole island is under maintenance phase from January 1963 on														
SURINAM. Consolidation phase in some areas began in January 1961														
Jan. 61-Dec. 61	115	14 894b	13.0	26b	-	-	-	26	-	-	-	-	23	3
Jan. 62-Dec. 62	125	19 025b	15.2	22b	-	1	-	21	-	-	-	-	17	5
Jan. 63-Mar. 63	125	8 899b	28.5	9b	-	-	-	9	-	-	-	-	9	-

- None.

(a) Annual rates calculated when less than 12 months reported. (b) Includes slides taken and positives found in Paramaribo, originally non-malarious area.

Table 16  
COMPARATIVE RESULTS OF ACTIVE AND PASSIVE CASE DETECTION IN MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1962<sup>a</sup>

Country or other political unit	Active case detection				Passive case detection				
	Average number of evaluators	Blood slides		Average production per Eval. per month	Average number of notification post	Average of notification post producing slides per month	Blood slides		Average of slides per month per productive notification post
		Number examined	Per cent positive				Number examined	Per cent positive	
Argentina .....	92	126 379	0.3	114.4	1 241	275	25 773	16.9	7.8
Bolivia .....	127	155 487	0.5	102.0	1 868	444	22 041	1.9	4.1
Brazil (excl. São Paulo)	643	284 191	7.2	37.0	12 178	2 663	229 576	20.9	7.2
Brazil (São Paulo).....	110	274 839	0.1	208.3	4 047	1 534	95 828	3.5	5.2
Colombia .....	393	392 480	2.6	83.2	8 479	5 561	304 765	2.3	4.6
Costa Rica .....	42	155 923	0.5	309.3	656	154	27 729	3.2	15.0
Cuba .....	9	5 043	0.5	46.6	1 196	367	95 204	3.7	21.6
Dominican Republic ...	8	10 791	0.3	112.3	538	104	8 951	5.8	7.2
Ecuador.....	74	102 623	0.5	115.6	3 303	1 449	166 381	3.0	9.6
El Salvador .....	57	41 397	1.7	60.5	910	783	152 672	9.6	16.2
Guatemala .....	93	202 251	1.3	181.3	2 231	1 045	121 122	2.8	9.7
Haiti .....	24	83 082	4.1	288.4	449	321	28 060	2.2	7.3
Honduras .....	46	64 199	2.3	116.3	1 908	1 124	175 456	2.4	13.0
Jamaica .....	106	119 479	0	93.9	711	123	127 115	0.001	86.1
Mexico .....	1 423	1 556 672	0.6	91.2	32 111	4 567	410 720	1.2	7.5
Nicaragua .....	52	92 296	5.5	147.9	1 135	703	89 431	7.0	10.6
Panama .....	21	75 441	1.2	299.4	1 063	397	69 571	3.3	14.6
Paraguay .....	24	6 517	5.2	22.6	1 611	546	41 667	13.0	6.4
Peru .....	136 <sup>b</sup>	346 384	0.4	212.3	9 015 <sup>b</sup>	1 354	123 982	0.8	7.6
Trinidad and Tobago ..	75	120 674	0	134.1	82	9	293	0.3	2.7
Venezuela.....	240	398 606	0.2	138.4	2 262	363	149 433	0.2	34.3
British Guiana .....	21	29 307	1.2	116.3	71	29	6 139	1.7	17.6
British Honduras .....	6	5 390	0.2	74.9	130	94	9 166	0.1	8.1
Dominica .....	4	7 603	0	158.3	26	13	5 770	0	36.9
French Guiana .....	-	475	7.7	-	...	...	1 708	1.9	...
Grenada <sup>c</sup> .....	6	1 750	0	97.2	29	13	246	0	6.3
Guadeloupe .....	9 <sup>d</sup>	16 395	0	195.1 <sup>d</sup>	...	...	40	0	...
Panama Canal Zone ...	3 <sup>e</sup>	-	-	-	...	...	677	2.6	...
St. Lucia .....	5	6 476	0.03	107.9	88	36	11 882	0.02	27.5
Surinam .....	27	35 502	0.7	112.1	44	4	2 317	20.8	48.3

... No information.  
- None.

(a) Data for entire country not separated by attack, consolidation or other areas. (b) December. (c) In maintenance phase, data refers to January-March only. (d) 4 part-time, average calculated in base of 4 part-time evaluators equal 2 full time. (e) Part-time.

in some of these additional commitments have been made, and outside sources of financial assistance are in process of being sought.

Table 17  
SUMMARY OF CASE DETECTION IN THE AMERICAS, 1958-1962

Year	Number of slides examined	Number of slides found positive	Percent positive
1958	1 716 103	56 705	3.3
1959	2 749 117	75 612	2.8
1960	3 955 149	79 998	2.0
1961	5 341 004	99 539	1.9
1962	7 221 367	177 089	2.4

## II. SPECIAL TECHNICAL PROBLEMS

### A. General

In most countries resistance to DDT in *Anopheles albimanus* has not changed appreciably in degree or in area involved. Even where resistance has been found, DDT usually appears to exert considerable suppression of transmission, although not sufficient to halt it entirely. This partial effect may be due to irritability and repellency of DDT, as well as to merely a low or moderate level of resistance which is seen in many places. Many other factors in the persistence of transmission of malaria in the hard core problem areas are found to play varying roles, and much effort has been placed on scientific analysis and practical efforts to overcome these factors. The chief elements in problem areas usually include several of the following conditions:

- a) resistance of the vector to insecticide,
- b) irritability of the vector toward DDT. This is detrimental if it causes the vector to leave treated surfaces before receiving a lethal exposure, but beneficial if the vector leaves before biting, as often occurs, or if it is driven out of the house into more adverse environments,
- c) incomplete or highly perforated walls,
- d) mud walls which rapidly absorb, or inactivate many residual insecticides,
- e) agricultural redevelopment areas often located in low, poorly drained terrain, with high mosquito density and much building of new houses between cycles,
- f) movement of the people in pursuit of work, resulting in their living in temporary shelters of poor construction, without walls, and often not sprayed,
- g) in certain areas, a predominantly outdoor biting and resting behavior of the vector.

While technical problems have caused delays in achievement of eradication, and increased the financial burden for a number of countries, they should be viewed in their true proportions. They have constituted a serious obstacle only in certain parts of the Pacific coastal plains and foothills of Mexico and Central America, in Western Venezuela, and in limited areas of Brazil and Colombia.

Table 18

NATIONAL BUDGETS FOR MALARIA ERADICATION IN THE AMERICAS, 1961-1963  
(in thousands of U. S. dollars)

Country or other political unit	National Budget 1961	National Budget 1962	National Commitments 1963
Argentina .....	548	603	709
Bolivia .....	504	532	...
Brazil (excl. Sao Paulo) .....	1 986	7 773	8 333
Brazil (Sao Paulo) .....	485	685	1 613
Colombia .....	3 126	3 100	3 134
Costa Rica .....	255	315	272
Cuba .....	943	1 454	1 702
Dominican Republic .....	...	...	...
Ecuador .....	1 128	1 042	561
El Salvador .....	560	464	366
Guatemala .....	456	286	485
Haiti .....	(a)	35	35
Honduras .....	300	300	300
Jamaica .....	567	441	351
Mexico .....	5 656	5 130	5 200
Nicaragua <sup>b</sup> .....	340	488	484
Panama .....	419	545	644
Paraguay .....	182	258	262
Peru .....	778	877	877
Trinidad and Tobago .....	500	518	573
Venezuela .....	3 406	3 406	3 406
British Guiana .....	25	41	48
British Honduras .....	41	37	33
Dominica .....	9	12	10
French Guiana .....	67	...	...
Grenada .....	10	9	2
Guadeloupe .....	130	136	122
Panama Canal Zone .....	50	50	50
St. Lucia .....	19	23	27
Surinam .....	186	...	...

... No information.

(a) Preparatory phase.

(b) Government budget from July to June.

Considering the proportion of the population of the country involved in it, the problem is most severe in Nicaragua and El Salvador, less so in Mexico, Guatemala, Honduras, Venezuela and Colombia. There are some areas in Venezuela, Brazil and Colombia, where biting occurs to a large extent out of doors, and for this reason is not completely controllable by spraying, but until spraying is applied at maximum efficiency, it is not possible to predict the size of the area nor the amount of supplementary attack that will be needed.

The present status of knowledge and work on these problems will be briefly reviewed.

#### B. Physiological resistance of anophelines to insecticides

In line with the trend of recent years and the recommendations of PAHO, most countries further shifted the emphasis of entomological work away from routine insecticide susceptibility testing, due to the now considerable accumulation of knowledge and the very slight changes that occur from year to year. Up to mid April 1963, there had been reported to PAHO headquarters 305 tests of locality-species performed during 1962, in 16 out of 17 countries with active attack programs. This corresponds to 442 for the previous year. The political units not reporting tests have for the most part already completed the attack phase of their programs. Consequently, resistance of the vector has no practical significance, and no further tests were done in these units.

Of the 305 locality-species tested, the vast majority of tests (304) were done with DDT, usually alone but 24 tests included dieldrin, and 4 malathion. Only one country showed a new finding of resistance: In Venezuela, A. rangeli was found to be highly resistant to dieldrin in Tachira. This anopheline is not a vector, and is susceptible to DDT, the insecticide currently in use.

There has been very little change in the levels of resistance shown or in areas showing DDT resistance from year to year, except for a few small localities in El Salvador, Guatemala, and Nicaragua, where land was recently converted to cultivation of cotton or rice. Here resistance increased in degree, from 5 or 10% to 25 or 35%, and in a few localities in Guatemala, to about 50%. There is a small isolated valley in central Honduras where very high DDT resistance has been discovered for the first time, while the rest of the Department remained negative. Cotton had been grown here in 1957. A sharp outbreak late in 1962 drew attention to this valley. One other small new focus was discovered, but without antecedent use of insecticide in agriculture. The rest of the country remains as it was, predominantly susceptible. In the south, a few areas in the cotton growing section continue to show high DDT resistance, but the majority show intermediate levels. The latter may fluctuate from season to season, but have not increased in the course of time.

Substitute insecticides have been found which are highly effective against DDT- and dieldrin-resistant mosquitoes, and two are now ready for field trial. Unfortunately, they are rapidly lost on sorptive muds (see Sect. D).

#### C. Irritability

A disturbing observation has been made in Nicaragua with increasing frequency. Resistant A. albimanus are sometimes found on surfaces freshly sprayed with DDT, resting quietly for many hours. This property, non-irritability, seems likely to reduce or nullify the former utility of DDT against resistant strains, and is the subject of study by means of the new test device, the Excito-Repellency Test Box. It is feared that non-irritable strains are beginning to appear in nearby southern Honduras and eastern El Salvador as well.

The willingness of a mosquito to sit for a long time on DDT deposits is advantageous if the vector is susceptible. In the northern part of El Salvador, where DDT has produced a satisfactory reduction in transmission, the Excito-Repellency test (E-R test) has showed that strains of A. albimanus which are there susceptible, will rest on DDT until they receive a lethal dose, and a very high percentage of this strain dies when permitted a choice of resting or escaping. The opposite occurs with strains of the same species in the southern coastal regions, where the response to spraying has been poor, even in areas where the vector is susceptible. Here most of them become irritated in a few minutes, and more than half escape before receiving a fatal exposure.

On the other hand, when vectors are resistant to DDT, there are two possible advantages to the malaria eradication program if they are either excited or repelled by DDT on the walls. A



certain percentage become excited and leave the house before biting, while others are repelled and do not even enter. Both these effects have been demonstrated in window-trapped houses. Moreover, mosquitoes which are driven out from houses may find themselves exposed to predators and more adverse environments than if they had stayed inside house, thus having their life expectancy shortened. The last result is of great importance in stopping transmission. Probably through the working of these factors, DDT has been used successfully in a number of programs, notable Greece, even after resistance occurred. In Southern Iran, failure of DDT was complete when resistance developed. One cannot say without a trial whether resistance per se will prevent a useful effect from DDT spraying.

The testing of irritability and repellency of DDT thus becomes important, and is rapidly being expanded since the development and testing of the Excito-Repellency Test Box by AMRO-220 in 1962. *A. pseudopunctipennis*, the vector in many regions of South America, appears to be both susceptible to and not irritated by DDT. The response to proper DDT spray programs has been very satisfactory in these regions. *A. pseudopunctipennis* is also not irritated at all in El Salvador, but in problem areas of Mexico, the irritability response of this species was considered to be one important factor in the failure of DDT to halt transmission. Dieldrin has been found to be non-irritating, and a change to this insecticide is under trial where vectors are irritated by DDT and susceptible to dieldrin.

#### D. Sorption of Insecticides

The remaining technical problem which is causing some difficulty with DDT, and much more with malathion and other newer insecticides proposed as replacements for DDT where vectors show high levels of double resistance, is the problem of sorption presented by certain types of mud walls. It was demonstrated by AMRO-196 that on non-sorptive surfaces DDT at 1 gm./m<sup>2</sup> may last much longer than 6 months, but on many mud walls, DDT at 2 gm./m<sup>2</sup> may scarcely last 6 months, even after several applications, while 1 gm. fails completely in less than 6 months.

Studies of malathion at 1 gm./m<sup>2</sup> show very rapid loss on sorptive muds, while at 2 gm./m<sup>2</sup> residues become very attenuated in 6-10 weeks as determined by bio-assay. In a small study in El Salvador, new cases of malaria appeared about 8 weeks after 2 gm. applications, indicating only 4 or 5 weeks of effectiveness of malathion in sprayed villages whose houses are predominantly of mud. In Nicaragua, field trials of malathion were conducted in 3 sugar states with 35%, 57%, and 75% of the houses of wood. The results were best in the estate with the highest percentage of wood houses, but even there some transmission occurred during cycles of spraying at 4 month intervals. This trial is continuing. Because most of the other substitutes for DDT also are rapidly lost on sorptive mud walls, WHO and PAHO are now studying the possibility of applying an inexpensive sealer to such walls before spraying.

#### E. Types of construction of houses

There is no expectation that malaria programs can directly improve housing construction, where walls are incomplete or full of gaps. Also, it is not possible to delay building of new houses in projects of rural housing or redevelopment. All that is feasible is to try to install continuous spraying schedules where there are continuous building programs, as is done in problem areas in Guatemala. People can sometimes be induced not to wash, repaint, or reconstruct, newly sprayed surfaces.

#### F. Migration

Movement of people is a serious problem in many areas with persistent transmission. This is more properly considered a complication of the failure to halt transmission in one area, rather than a basic cause of failure. It does account for some continuance of malaria in many areas that would have been clean except for continuous re-importation from still infected areas. Total eradication in the whole region under the influence of migration is the best answer. In Central America, this involves several countries simultaneously, and steps are being taken to treat Central America as one unit for purposes of eradication.

## G. Solutions to problems of continuing transmission

One solution to the problem of persistence of transmission has been mentioned, i. e. the change to an alternate insecticide where insecticide resistance is the cause. Two other methods of attack are being applied in problem areas as rapidly as funds and personnel allow. Because of their high cost and the difficulty of achieving 100% coverage, they are used only as a supplementary attack methods as long as DDT continues to exert a profitable degree of reduction of transmission. These supplementary attack methods are mass drug treatment and anti-larval measures. They could be used alone, but it is advantageous to lower the transmission rate as much as possible by spraying before and while using them. Their duration and the areas that must be treated can thus be reduced considerably.

### 1. Mass drug administration

Mass drug administration programs using the combined tablet of chloroquine (or amodiaquine) plus primaquine, were expanded during 1962 after the orienting field trial in El Salvador in 1961.

In El Salvador, a simplified type of organization was field tested during 1962. Each drug distributor had to live in the locality for which he was responsible, and work without transport. This program was employed in the most highly infected localities of the 1961 study area, in a total of 2,500 permanent residents and an average of 300 workers in a hacienda. The percentage treated averaged 77% but many of those absent probably were treated in the workers treatment line in the hacienda. The cost per person including the drug but excluding supervisors, administrative costs, laboratory services and transportation of supervisors, would have reached \$1.26 per year on a 26 cycle basis.

The incidence of malaria was reduced from 110 per 1,000 persons in a 2 week period in July 1961, to 4 per 1,000 for the corresponding period of 1962, and to 0 per 1,000 in October and November 1962.

The experience in this type of work is being applied in an expanded program among 70,000 persons, April to December 1963, in the problem area of the western 1/4 of the country. It is anticipated that it will be applied to the rest of the problem area as soon as funds permit.

Pilot drug projects were also initiated in 1962 in Mexico (80,000 persons), Guatemala (14,000 persons) and Nicaragua (6,000 persons), and much valuable experience was gained. The Mexican program was entirely supported by PAHO, and was intended to determine feasibility and costs in one of the most difficult problem areas in the country. In Guatemala, drug administration was not pressed with sufficient determination, and acceptance fell to about 60%, with a consequent persistence of new cases at a low level. The Nicaraguan campaign will be expanded to about 30,000 persons in an area of very high resistance in 1963.

In Costa Rica, PAHO is joining in a mass drug treatment campaign being undertaken to clean up the final foci in 6 problem areas of the Pacific Coastal region, with about 30,000 people. Because this effort covers all the remaining foci of the country, it is believed to stand a much better chance of permanent success than those programs where it is not financially possible as yet to attack all the problem areas at the same time.

Venezuela has had extensive experience with various mass drug treatment programs since 1957 in the western states bordering on Colombia. It appears that these have been transiently successful, but re-importation of malaria from Colombia has usually prevented lasting benefits.

### 2. Chloroquinized Salt Programs

These are a special form of mass drug administration, not often usable. The Amazon Valley chloroquinized salt program was terminated in December 1961. An evaluation of this program was undertaken in the field during the last 4 months of that year and the data subjected to analysis during 1962. It is clear that several factors contributed to its failure, a high percentage of "leaching" of chloroquine resulted after the salt was delivered, and possibly there was some chemical deterioration caused by impurities in the salt. It has since been proved that in several

areas, a significant proportion of cases of P. falciparum either fail to clear up, or else relapse very soon after taking 1,500 mg. of chloroquine base, and some after 2,500 mg. or more. It is believed that under these conditions, chloroquinized salt is doomed to fail.

In British Guiana, malaria had been eradicated from the coastal area for more than 10 years, the results of 3 years of house spraying with DDT, but this measure was not considered feasible among the Indians of the interior. In January 1961, the government began adding 0.4% chloroquine to all salt destined for the interior. The results were excellent in 2 districts and very poor in a third one. In 3 months after the start of the program, among 28,000 persons, cases dropped from about 500 a year (mixed falciparum and vivax) to 0, and have remained there for the 2 years since that time. But in a third district, the Lethem sector of the Rupununi District, among 4,000 persons, cases dropped to 1 or 2 per month in the first year, but rose to 236 during the second year, all but one due to P. falciparum. This sector was close to the Brazilian border, and received much non-medicated salt from Brazil, as well as importation of chloroquine-tolerant strains of P. falciparum. Chloroquine tolerant strains have been found in this sector, but the situation is being brought under control by house spraying.

### 3. Anti-larval work

Larviciding operations have proved a very valuable adjunct in the city of Guayaquil, Ecuador, and constitute the only anti-mosquito operation in the center of that city. Transmission has been halted and the program is about to be terminated. Larviciding by various means has been tried in Managua, Nicaragua with good but not completely successful results as yet, due to dependence on hand methods in terrain of very difficult access. It is considered that aircraft dispersal of larvicides will be more effective, and economical, based on studies of Insecticide Testing Team, AMRO-196. (see Research). In Guatemala one focal area of high level doubly resistant A. albimanus has been completely cleaned up, and a larger semi-rural and rural area has been placed under a pilot program of anti-larval work, both spraying and drainage. The costs are high in respect of the number of persons protected, but the area is one of agricultural re-development, and good drainage enhances the value of the land. In addition, the experience shows the value and importance of planning proper drainage at the time road building is done. Much of the present problem has been created by road makers who ignored the gradient of ditches, and much better drainage of the land would have been possible with better planning and construction of roadside ditches.

In overcoming problem areas, the malariologist must be ready to use any combination of means of attack that promises the most rapid reduction of transmission for the least money, using supplementary attack methods only to the extent necessary in place and time to achieve eradication. This selection requires more epidemiological knowledge of individual localities and sound judgment than does routine spraying operations. Fortunately, problem areas involve smaller areas and smaller numbers of people than those areas which respond reasonably well to simple spraying.

## III. RESEARCH ON MALARIA

As is entirely logical, the research activities of PAHO/ME tend to be limited to "applied" research that is carried out in the field, but a new project for 1963 involves laboratory studies.

### A. Screening Center for Drug-resistant Malaria Parasites

A Screening Center for Drug-resistant Malaria Parasites has been set up in Ribeirão Preto, São Paulo, Brazil. With financial support from PAHO/ME the work is being done in cooperation with the national malaria eradication service of Brazil and the Psychiatric Department of the São Paulo State Health Service.

Specimens of whole blood from patients believed to be infected with chloroquine-resistant strains of plasmodia, especially Plasmodium falciparum, are screened at the Center by observing their response to drugs after they have been inoculated into other subjects. The first such inoculation was made on April 22, 1963 and 18 were made by July 15.

If evidence is obtained of chloroquine tolerance, the strain will be shipped to the WHO Strain Reference Laboratory at the National Institute for Allergy and Infectious Diseases, Bethesda,

Maryland. It is hoped that the new Center will soon be able to confirm or refute the existence of chloroquine tolerance in most of the localities in which it is now suspected to be present often on somewhat dubious evidence.

B. Epidemiological Field Studies - AMRO-220

The PAHO/ME Epidemiology Team in El Salvador has made intensive studies to determine the causes for the failure of residual spraying to eradicate malaria from sizeable parts of the Pacific coastal plain of Central America. These studies have elucidated a variety and combination of causes for the failure of residual spraying with DDT as the sole eradication measures to interrupt the transmission of malaria in problem areas. In El Salvador the vector, *Anopheles albimanus*, is not only highly resistant to both DDT and dieldrin, but is intensely irritated by DDT. In addition it frequently bites humans outside their houses. The basic quantitative studies were completed in July 1962 in a resistant and a susceptible area.

As a result of the intensive epidemiological studies, a procedure has been developed for making two-week synoptic studies of a group of typical localities in a country. There are 15 items in this procedure, about half of them entomological. They include a special Excito-Repellency Test devised by the Team in the course of its work, by which the reaction of local populations of wild female anophelines to DDT-sprayed surfaces is studied experimentally and quantitated. By the use of specially trained sub-professional aides, working under the direct supervision of professional epidemiologists and entomologists, the productivity of the latter is greatly multiplied without sacrifice of quality.

It is believed that the procedure that has been perfected will have ready application in other problem areas, not only in the American Tropics but elsewhere as well. The procedure is not new, it is, in essence, a return to old-fashioned malariology. At present (July 1963) the Team is in the midst of a year-long series of "synoptic" studies in eight representative localities in El Salvador. These have shown great variations in malaria transmission in time, as well as from locality to locality in relatively short distances, and underscore the selective attack that will be needed in problem areas.

In Central America at least, problem areas will require the use of new or additional measures suited to each separate locality in the problem area, as either primary or supplementary methods of attack. For this purposes, the choice of methods remains basically three: The first is the continuation of residual spraying, on an intensified and more efficient basis, while hoping for discovery of a better insecticide. The other two are mass drug administration, and anti-larval measures.

The increased complexity involved in the application of selective eradication measures justifies some "operational research" in order to ascertain the cheapest and best way to select, plan and execute the relatively expensive "selective" measures, and requires training of new and old malariologists in these methods. The principles and practices developed by the PAHO/ME Epidemiological Study Team go a long way to meet this pressing need.

C. Insecticide Testing Program - AMRO-196

In 1962 the PAHO/ME Insecticide Testing Team in El Salvador completed a year-long study of the fate of DDT-residues on representative wall surfaces. The results showed clearly that on impervious surfaces like wood the residues were highly active for very long periods, much longer than had previously been thought of as normal. But the results showed failure in 6 or 7 months with 2 gm./m<sup>2</sup> applications on sorptive mud surfaces, and sooner with 1 gm./m<sup>2</sup> applications. These are muds prevalent in many areas, and they have the capacity to remove the DDT from the wall surface by sorbing it into the depth of the mud, rendering the DDT just as ineffective as if it were destroyed.

Very limited trials of malathion begun in 1961, were completed early in 1962. They revealed that it would probably not be a satisfactory substitute for DDT in El Salvador.

The Insecticide Testing Team in the second half of 1962 devoted most of its time to an evaluation of larviciding as an "additional" measure of eradication. This evaluation must comprise not only the cost of applying the larvicide, but also the efficiency and ease of administering the larviciding operations.

The new organophosphate larvicide fenthion (= Baytex (R)) applied with hand equipment in a water emulsion, was investigated. Major attention was given to Paris green dust as a larvicide. The Paris green was diluted to 25 per cent in finely ground inorganic dust and applied from airplanes, which are available for hire by the flight from commercial crop dusters in El Salvador. On an area basis in such places as river beds, swamps and coastal lagoons, anopheline larvicides can be applied by airplane much more cheaply and effectively than by hand, in El Salvador, as elsewhere. It seems probable that larviciding from airplanes will have an important, but limited place as an additional malaria eradication measure, but the final decision as to what larvicide to use, and how to formulate the larvicide, are matters that are still under study.

Not forgotten are the potentialities of the elimination of anopheline breeding places by engineering work. When a major breeding place can be eliminated by a minor engineering operation, the per capita cost of the operation is gratifyingly small.

A Manual of Operations for larviciding work has been prepared and should be of great assistance to all programs which need to consider this method as an additional measure of eradication.

#### D. Economics of Malaria Eradication - AMRO-250

A special project agreement was entered into with the University of Michigan for a study of methods for evaluation of the economic impact of malaria eradication. Active work began on this project in 1962 with a short-term consultant (9 weeks). In this period were developed the demographic and economic models which can be applied to actual malaria eradication programs that have been rapidly successful in the past. The chief investigator began full time work in February 1963 and expected to have improved the models and completed a report on British Guiana and Ceylon by August, to be followed by Venezuela. Unfortunately, the chief investigator transferred to another university and the project is temporarily suspended.

### IV. INTERNATIONAL COOPERATION

Table 19 shows the distribution of various types of professional and technical staff personnel of PAHO assigned to the various countries.

Table 20 shows the numbers of personnel of various government and international malaria programs who have been trained in the various training centers in the Americas, showing separately those trained during the first half of 1963. Brazil is the only country in the Americas with expanding needs for personnel, and the country is training them in its own School of Public Health in São Paulo.

Table 21 shows the number of fellowships granted by PAHO for study travel in other malaria eradication programs. This continued at a fairly high level (47) for the year 1962.

Table 22 shows the accumulated amount of miscellaneous types of equipment and supplies which have been furnished by PAHO to the various countries since 1958. These items were those which the programs could not obtain from local or other sources, and without which they would have experienced serious handicaps.

Table 23 shows the types and quantities of drugs provided by PAHO through the years 1958-1961, and 1962. The provision of combined tablets of chloroquine-primaquine increased 16 fold owing to the necessity of establishing mass drug administration in a number of problem areas in 1962-1963. It is expected that the need will increase in the years immediately ahead.

Table 24 shows the amount and the source of international contributions to each malaria eradication program during 1962, and the projected contributions for 1963. It will be seen that these comprise a sizeable and sometimes a major part of the cost of many of the programs. In 1962 the Agency for International Development directly provided \$4.78 million toward the cost of malaria program in the Americas and in 1963 (fiscal year ends June 1963) this contribution reached 7.07 million. These sums are in addition to \$2 million annually contributed to the PAHO Special Malaria

Fund by AID. UNICEF contributed insecticides, transportation equipment, and certain laboratory supplies to the extent of \$3.45 million in 1962, and an estimated figure of \$3.87 million in 1963. The value of PAHO's services to the programs totalled \$2.84 million in 1962, and is estimated to reach \$3.27 million in 1963. The cooperation of international agencies in furnishing supplies, technical advice and financial assistance has been an absolute essential to the progress achieved to date.

Table 19  
PASB/WHO FULL-TIME PROFESSIONAL AND TECHNICAL STAFF ASSIGNED TO COUNTRY, INTER-COUNTRY  
AND INTER-ZONE MALARIA ERADICATION PROJECTS IN THE AMERICAS, 1960 TO APRIL 1963

Country or other political unit	Medical Officers				Sanitary Engineers				Sanitary Inspectors				Entomologists				Other			
	1960	1961	1962	1963	1960	1961	1962	1963	1960	1961	1962	1963	1960	1961	1962	1963	1960	1961	1962	1963
Argentina .....	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bolivia .....	1	2	1	1	1	1	1	1	4	4	2	2	-	-	-	-	-	-	-	-
Brazil (excl. São Paulo)	-	-	3	2	1	1	3	3	-	-	2	2	-	-	-	-	-	-	1 <sup>a</sup>	1 <sup>a</sup>
Brazil (São Paulo) ....	-	-	-	-	1	1	1	1	3	3	2	2	-	-	-	-	-	-	-	-
Colombia .....	2	2	2	2	1	1	1	1	6	5	4	4	-	1	-	-	1 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>	1 <sup>b</sup>
Costa Rica .....	1	1	1	-	-	-	-	-	1	2	3	3	-	-	1	-	-	-	-	-
Cuba .....	1	1	1	1	-	1	1	1	-	1	1	1	-	-	-	-	-	-	-	-
Dominican Republic ...	1	1	1	1	1	1	1	1	3	3	3	3	-	-	1	-	-	-	-	-
Ecuador .....	1	2	1	1	1	1	1	1	4	4	4	4	-	-	1	1	-	-	-	-
El Salvador .....	1	1	1	2	1	1	1	1	2	2	2	1	-	-	1	1	-	1 <sup>c</sup>	1 <sup>c</sup>	1 <sup>c</sup>
Guatemala .....	1	1	1	2	1	1	1	1	2	3	3	3	-	-	-	-	-	-	-	-
Haiti .....	-	1	1	1	-	1	1	1	2	2	3	3	-	-	-	-	1 <sup>c</sup>	-	1 <sup>d</sup>	1 <sup>d</sup>
Honduras .....	1	1	1	1	1	1	1	1	2	2	2	2	-	-	1	1	-	-	-	-
Jamaica .....	1	1	1	1	1	-	-	-	2	2	1	1	-	-	-	-	-	-	-	-
Mexico .....	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1 <sup>e</sup>	2 <sup>f</sup>	2 <sup>f</sup>	2 <sup>f</sup>
Nicaragua .....	1	1	2	2	1	1	1	1	2	2	2	2	-	-	-	1	-	1 <sup>c</sup>	1 <sup>c</sup>	1 <sup>c</sup>
Panama .....	1	1	1	1	1	-	1	1	2	2	3	3	-	1	-	-	-	-	-	-
Paraguay .....	1	1	-	-	1	1	-	-	2	2	1	1	-	-	1	1	-	-	-	-
Peru .....	1	1	1	1	1	1	1	1	5	5	5	5	-	-	-	-	-	-	-	-
British Guiana .....	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-
British Honduras .....	1	1	1	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Surinam .....	1	1	1	1	-	-	-	-	2	2	3	3	-	-	1	1	1 <sup>d</sup>	1 <sup>d</sup>	1 <sup>d</sup>	1 <sup>d</sup>
Windward Islands .....	-	-	-	-	-	-	-	-	2	2	1	1	-	-	-	-	-	-	-	-
Inter-zone or inter-country projects.....	9	9	9	8	3	3	2	2	1	1	-	-	6	7	5	4	14 <sup>g</sup>	13 <sup>h</sup>	13 <sup>i</sup>	14 <sup>j</sup>
Total .....	27	31	33	32	18	18	19	19	49	51	50	49	7	10	13	11	18	19	21	22

- None.  
 (a) Administrative officer. (b) Malaria statistician. (c) Entomological aide. (d) Health educator. (e) Assistant engineer. (f) Health educator and assistant engineer. (g) Six administrative officers, two parasitologists, two entomologist assistants, and four entomologist aides. (h) Six administrative officers, two parasitologists, one entomologist assistant, two entomologist aides, one laboratory technician, and one statistician. (i) Five administrative officers, one entomological assistant, three entomological aides, one laboratory technician, one operations analyst, one parasitologist assistant and one translator. (j) Six administrative officers, one laboratory technician, three entomological aide, one entomological assistant, one operations analyst, one parasitologist assistant, and one translator.

Table 20

PERSONNEL TRAINED IN MALARIA ERADICATION TECHNIQUES AT INTERNATIONAL CENTERS, 1949-1962 AND FIRST SEMESTER OF 1963 <sup>a</sup>

Country or other political unit	Total	Venezuela				Mexico			Jamaica							Brazil						
		1949-1962		1963		1957-1960			1958-1962 <sup>b</sup>				1963 <sup>c</sup>			1958-1962						
		Physicians	Sanitary Engineers	Physicians	Sanitary Engineers	Physicians	Sanitary Engineers	Sanitary Inspectors	Physicians	Sanitary Engineers	Sanitary Inspectors	Entomologists	Others	Physicians	Sanitary Engineers	Sanitary Inspectors	Entomologists	Other	Physicians	Sanitary Engineers	Entomologists	Others
Argentina .....	24	4	1	-	-	4	3	7	1	-	-	-	-	-	-	-	-	-	1	-	1	2
Bolivia.....	37	9	7	-	-	3	6	5	1	-	-	-	1	-	-	-	-	-	-	-	5	-
Brazil .....	62	12	1	-	-	19	16	13	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chile .....	7	1	-	-	-	1	1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
Colombia .....	74	29	5	2	-	11	7	5	-	-	-	-	-	-	-	-	-	-	4	3	6	2
Costa Rica .....	11	3	1	-	-	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Cuba .....	14	3	1	-	-	5	1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Dominican Rep. .	8	2	-	1	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Ecuador.....	19	6	1	-	1	1	-	4	1	-	-	-	-	-	-	-	-	-	-	2	2	1
El Salvador .....	14	1	-	1	-	2	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Guatemala .....	23	3	1	-	-	2	3	12	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Haiti .....	26	5	2	1	-	-	-	16	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Honduras .....	15	-	2	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Mexico .....	33	14	10	-	1	-	2	1	-	-	-	-	-	-	-	-	-	-	1	-	4	-
Nicaragua .....	14	2	1	1	-	2	-	6	-	-	-	-	-	-	-	-	-	-	1	-	1	-
Panama.....	13	1	-	-	-	1	1	9	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Paraguay .....	21	5	2	-	-	2	-	9	-	-	-	-	-	-	-	-	-	-	-	1	2	-
Peru .....	42	3	2	2	-	9	7	12	1	-	1	-	-	-	-	-	-	-	-	-	4	1
Puerto Rico .....	14	-	1	-	-	-	-	1	-	-	12	-	-	-	-	-	-	-	-	-	-	-
United States ...	40	-	-	-	-	-	2	1	2	7	9	9	8	-	-	-	1	1	-	-	-	-
Uruguay .....	3	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trinidad .....	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Venezuela .....	4	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	1
British Guiana..	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
British Honduras	6	-	-	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
Dominica.....	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
French Guiana..	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Surinam .....	11	-	-	-	-	-	-	-	-	6	-	5	-	-	-	-	-	-	-	-	-	-
Other Regions ..	267	2	-	-	-	1	-	-	104	47	26	29	31	5	2	10	3	4	1	-	-	2
Total .....	806	106	38	9	2	66	51	137	113	55	60	38	46	6	2	11	4	5	10	7	31	9

- None.

(a) Excluding nationals of the host country.

(b) 129 sponsored by AID and 108 by WHO.

(c) 7 sponsored by AID and 20 by WHO.



Table 21  
FELLOWSHIPS FOR STUDY TRAVEL IN MALARIA ERADICATION, 1961 AND 1962

Country or other political unit	Total		Physicians		Engineers		Entomologists		Others	
	1961	1962	1961	1962	1961	1962	1961	1962	1961	1962
Argentina .....	1	2	-	1	1	-	-	1	-	-
Bolivia .....	2	3	-	1	-	-	1	2	1 a	-
Brazil .....	1	2	1	2	-	-	-	-	-	-
Colombia .....	3	4	1	2	-	-	2	2	-	-
Costa Rica .....	2	-	-	-	1	-	1	-	-	-
Cuba .....	4	-	1	-	-	-	1	-	2 b	-
Dominican Republic .....	1	-	-	-	1	-	-	-	-	-
Ecuador .....	3	3	1	-	2	1	-	2	-	-
El Salvador .....	2	-	2	-	-	-	-	-	-	-
Guatemala .....	-	1	-	1	-	-	-	-	-	-
Haiti .....	2	4	2	3	-	1	-	-	-	-
Honduras .....	2	-	2	-	-	-	-	-	-	-
Jamaica .....	6	9	-	1	-	-	-	-	6 b	8 c
Mexico .....	2	4	-	2	-	1	2	1	-	-
Nicaragua.....	4	1	3	1	-	-	-	-	1 b	-
Panama .....	1	1	1	-	-	-	-	-	-	1 c
Paraguay .....	3	3	-	2	-	1	3	-	-	-
Peru .....	1	2	-	1	-	-	1	1	-	-
Venezuela .....	1	1	-	-	-	-	-	-	1 b	1 c
British Guiana.....	1	2	-	-	-	-	-	-	1 b	2 d
British Honduras .....	1	-	-	-	-	-	-	-	1 d	-
Dominica .....	1	-	-	-	-	-	-	-	1 b	-
St. Lucia .....	1	-	-	-	-	-	-	-	1 d	-
Surinam .....	6	5	-	-	-	-	-	-	6 b	5 c
Total .....	51	47	14	17	5	4	11	9	21	17

- None.
- (a) Health Educator.
- (b) Sanitarian.
- (c) Non professionals.
- (d) Laboratory Technicians.

Table 22

## EQUIPMENT AND SUPPLIES, EXCLUDING DRUGS, CONTRIBUTED BY PAHO TO MALARIA ERADICATION PROGRAMS IN THE AMERICAS, 1958 TO DECEMBER 1962

Country or other political unit	Protective equipment						Laboratory supplies						Others				
	Helmets	Bands	Visors	Gloves	Ponchos	Live-jackets	Mailing tubes	"Surgi-tube" (rolls)	Plastic tubes	Microscopes	Microscopes accessories	Slides (gross)	Vehicles and motors (a)	Insecticides (lbs.)	Kardex files	Test kits adults	Test kits larvae
Argentina .....	-	-	-	-	-	-	6 000	10	20	-	20	-	-	-	-	1	-
Bolivia .....	50	180	160	40	80	55	10 000	10	70	-	-	-	3	-	-	5	-
Brazil <sup>b</sup> .....	-	-	-	-	-	65	283 000	30	40	71	1	-	2	-	-	37	8
Colombia .....	-	-	-	-	-	450	100 000	10	20	2	-	-	-	-	-	17	2
Costa Rica .....	-	-	-	-	-	35	500	40	52	-	-	-	-	-	40	1	-
Cuba .....	-	-	-	-	-	-	10 000	20	20	10	1	-	1	-	-	-	3
Dominican Republic ..	366	332	664	166	166	-	9 000	12	20	2	-	-	-	-	-	2	1
Ecuador .....	431	412	824	206	206	151	50 000	30	20	-	10	-	1	-	-	4	-
El Salvador .....	230	476	952	238	238	30	15 000	100	56	-	-	-	1	2 900	12	4	1
Guatemala .....	541	500	1 000	250	255	24	25 000	40	52	1	-	1 340	1	-	7	2	1
Haiti .....	341	682	1 364	341	341	-	9 000	11	-	-	6	-	2	-	-	1	2
Honduras .....	165	330	660	165	165	10	20 000	40	52	-	-	70	-	-	1	2	-
Jamaica <sup>c</sup> .....	25	200	400	194	209	-	22 500	10	20	-	-	-	1	-	-	8	12
Mexico <sup>d</sup> .....	-	-	-	-	-	75	400 040	43	-	-	-	-	-	-	-	37	1
Nicaragua .....	117	234	468	117	117	-	21 000	70	64	-	-	157	1	-	65	4	1
Panama .....	137	274	548	137	137	50	14 000	50	52	2	-	35	1	-	25	3	-
Paraguay .....	174	808	408	102	773	40	30 000	18	20	-	-	-	2	-	-	6	1
Peru .....	618	1 236	3 672	368	668	200	75 000	10	20	-	-	-	(1)	46 410	24	3	-
Trinidad and Tobago	-	-	-	-	-	-	1 150	10	20	-	-	-	-	-	-	3	1
British Guiana .....	36	72	144	96	36	-	2 000	-	-	-	3	-	-	-	-	-	-
British Honduras ...	61	38	76	19	19	10	1 900	10	20	-	-	-	2	-	-	1	-
Dominica .....	-	-	-	-	-	-	630	-	-	-	-	-	1 <sup>e</sup>	-	-	-	-
Grenada .....	-	-	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-
St. Lucia .....	-	-	-	-	-	-	110	10	20	-	-	-	3 <sup>f</sup>	-	-	-	-
Surinam <sup>g</sup> .....	55	10	20	5	5	-	2 550	26	20	2	8	-	(4) 1	-	-	2	1
Total <sup>h</sup> .....	3 347	5 784	11 360	2 444	3 415	1 195	1 108 500	610	678	90	49	1 602	(5) 23	49 310	174	143 <sup>i</sup>	35 <sup>j</sup>

- None.

- (a) Station wagons unless otherwise indicated; marine motors in parentheses. (b) Plus 20 tons calcium arseniate. (c) 210 000 imperial gallons of kerosene also provided. (d) Plus 8 500 lancets for taking blood samples. (e) Motorcycles. (f) One station wagon and 2 motorcycles. (g) Plus U.S.\$1 842. 60 in miscellaneous items. (h) Plus U. S. \$10, 800.00 in miscellaneous items. (i) Plus 50 delivered to the Zone Offices for emergency distribution and inter-country projects. (j) Plus 10 delivered to the Zone Offices for emergency distribution and inter-country projects.

Table 23  
DRUGS PROVIDED FOR MALARIA ERADICATION PROGRAMS IN THE AMERICAS BY PAHO, 1958-1962  
(in thousands of tablets)

Country or other political unit	1958-1961					1962					Total				
	Chloro- quine 150 mg.	Primaquine		Pyrime- thamine 25 mg.	Chloro- quine Prima- quine combined	Chloro- quine 150 mg.	Primaquine		Pyrime- thamine 25 mg.	Chloro- quine Prima- quine combined	Chloro- quine 150 mg.	Primaquine		Pyrime- thamine 25 mg.	Chloro- quine Prima- quine combined
		15 mg.	5 mg.				15 mg.	5 mg.				15 mg.	5 mg.		
Argentina .....	1 144	55	35	297	-	-	-	-	-	-	1 144	55	35	297	-
Bolivia .....	1 619	25	20	21	-	46	10	-	-	10	1 665	35	20	21	10
Brazil (excl. São Paulo)	18 853	270.5	130	-	200	-	(10)	-	-	-	18 853	260.5	130	-	200
Brazil (São Paulo) ...	2 143	37.5	-	184	-	-	10	7	-	-	2 143	47.5	7	184	-
Colombia .....	6 876	137.5	-	664	-	3 200	42	4.5	-	-	10 076	179.5	4.5	664	-
Costa Rica .....	913	90	19	213	30	13	-	-	-	1 280	926	90	19	213	1 310
Cuba .....	830	30	9	80	-	-	-	-	-	-	830	30	9	80	-
Dominican Republic ..	2 234	39	164	10	-	-	-	-	-	-	2 234	39	164	10	-
Ecuador .....	2 590	148.5	120	195	-	-	10	5	-	-	2 590	158.5	125	195	-
El Salvador .....	1 520	112.5	50	118	300	520	(25)	-	-	1 770	2 040	87.5	50	118	2 070
Guatemala .....	2 536	333	38	27	160	669	50	25	-	1 080	3 205	383	63	27	1 240
Haiti .....	3 627	57.5	-	280	-	-	-	-	-	-	3 627	57.5	-	280	-
Honduras .....	1 542	48	32	88	30	1 276	48.6	32	-	160	2 818	96.6	64	88	190
Jamaica .....	880	18	-	288	50	-	-	-	-	-	880	18	-	288	50
Mexico .....	7 500	663	705	2 200	-	880	165	270	810	6 600	8 380	828	975	3 010	6 600
Nicaragua .....	1 377	79.5	20	6	30	697	(15)	20	-	5 500	2 074	64.5	40	6	5 530
Panama .....	1 375	42.5	20	146	-	(80)	-	-	-	-	1 295	42.5	20	146	-
Paraguay .....	1 460	25	5	48	-	-	-	-	-	-	1 460	25	5	48	-
Peru .....	5 332	130.5	53	196	-	(46)	30	-	-	-	5 286	160.5	53	196	-
Trinidad and Tobago .	964	1 058	869	180	-	-	-	-	-	-	964	1 058	869	180	-
British Guiana .....	86	4	3	260	-	-	-	-	-	-	86	4	3	260	-
British Honduras .....	190	12	7	6	-	-	-	-	-	-	190	12	7	6	-
Dominica .....	90	1	-	45	-	-	-	-	-	-	90	1	-	45	-
Grenada .....	43	0.5	-	45	-	-	-	-	-	-	43	0.5	-	45	-
St. Lucia .....	68	1	-	70	-	-	-	-	-	-	68	1	-	70	-
Surinam .....	826	9	10	497	200	-	-	-	-	-	826	9	10	497	200
<b>Total .....</b>	<b>66 618</b>	<b>3 428</b>	<b>2 309</b>	<b>6 164</b>	<b>1 000</b>	<b>7 175</b>	<b>315.6</b>	<b>363.5</b>	<b>810</b>	<b>16 400</b>	<b>73 793</b>	<b>3 743.6</b>	<b>2 672.5</b>	<b>6 974</b>	<b>17 400</b>

- None.

The figures in parenthesis represent transfers to other programs.

- (a) In 1961 there were provided 56 000 tablets of aspirin, 400 000 tablets of camoprin, 2 000 lbs. of chloroquine-diphosphate in powder and 350 lbs. potassium phosphate.  
 (b) Revised amounts according to transfers made among countries in 1962. Besides, there were provided 500 tablets of aspirin, 2 120 tablets of chloroquine-diphosphate in powder, 2 160 lbs. of tricalcium phosphate and 20 tons of calcium arsenate.

Table 24

INTERNATIONAL CONTRIBUTIONS TO MALARIA ERADICATION PROGRAMS IN THE AMERICAS  
1962 AND ESTIMATED 1963  
(U. S. dollars)

Country or other political unit	Date of initiation of total coverage	1962				1963 (estimated)			
		PAHO/SMF	WHO and WHO/TA	UNICEF <sup>a</sup>	AID(USA) (fiscal year) <sup>b</sup>	PAHO/SMF	WHO and WHO/TA	UNICEF <sup>a</sup>	AID(USA) (fiscal year) <sup>b</sup>
Argentina .....	Aug. 1959	13 328	-	50 000	-	36 052	-	60 000	-
Bolivia .....	Sep. 1958	74 803	-	73 000	-	69 992	20 000	90 000	-
Brazil (excl. São Paulo)	Aug. 1959 <sup>c</sup>	136 030	-	-	1 896 000	244 946	-	-	3 600 000
Brazil (São Paulo) ....	Jan. 1960	52 990	-	-	-	68 363	-	-	-
Colombia .....	Sep. 1958	165 235	-	399 000	150 000	201 568	-	300 000	-
Costa Rica .....	Jul. 1957	124 400	-	37 000	-	70 403	-	40 000	-
Cuba .....	1962	-	43 417	-	-	-	84 778	-	-
Dominican Republic ...	Jun. 1958	91 501	-	125 000	-	107 208	-	300 000	-
Ecuador .....	Mar. 1957	107 255	20 267	290 000	420 000	111 070	18 710	400 000	445 000
El Salvador .....	Jul. 1956	118 369	-	180 000	-	164 190	-	165 000	200 000
Guatemala .....	Aug. 1956	106 642	-	192 000	517 000	121 794	-	190 000	585 000
Haiti .....	Jan. 1962	108 981	-	244 000	943 000	110 585	-	360 000	1 400 000
Honduras .....	Jul. 1959	88 881	-	180 000	410 000	101 899	-	90 000	410 000
Jamaica .....	Jan. 1958	61 079	-	13 000	15 000	11 983	-	5 000	-
Mexico .....	Jan. 1957	269 790	71 079	977 000	-	193 112	65 050	1 100 000	-
Nicaragua .....	Nov. 1958	147 385	-	200 000	433 000	163 094	-	150 000	430 000
Panama .....	Aug. 1957	89 433	-	256 000	-	112 905	-	165 000	-
Paraguay .....	Oct. 1957	69 509	-	-	-	108 811	-	-	-
Peru .....	Nov. 1957	78 445	37 365	163 000	-	128 252	-	300 000	-
Trinidad and Tobago ..	Jan. 1958	-	-	5 000	-	-	-	1 000	-
Venezuela .....	1945	1 327	-	-	-	-	-	-	-
British Guiana .....	Jan. 1947	35 289	-	11 000	-	26 159	-	10 000	-
British Honduras .....	Feb. 1957	53 971	-	34 000	-	19 333	-	10 000	-
Dominica .....	Jun. 1959	16 200	-	1 000	-	16 200	-	5 000	-
Grenada .....	Feb. 1957	4 049	-	-	-	-	-	-	-
St. Lucia .....	Jan. 1956	4 049	-	1 000	-	-	-	1 000	-
Surinam .....	May 1958	71 237	-	22 000	-	85 770	-	25 000	-
Inter-country Projects and general services		753 607	-	-	-	993 384	-	-	-
Total .....		2 843 785	172 128	3 453 000	4 784 000	3 267 037	188 538	3 767 000	7 070 000

- None.

(a) Rounded to the nearest thousands; shipping not included.

(b) AID fiscal year does not necessarily coincide with fiscal years of the countries shown.

(c) Program developed by stages, date of first area shown.

*directing council*



PAN AMERICAN  
HEALTH  
ORGANIZATION

XIV Meeting

*regional committee*

WORLD  
HEALTH  
ORGANIZATION



XV Meeting

Washington, D. C.  
September 1963

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Draft Agenda item 23

CD14/16 (Eng.)  
ADDENDUM I  
10 September 1963  
ORIGINAL; SPANISH

REPORT ON THE STATUS OF MALARIA ERADICATION IN THE AMERICAS

(Document presented by the Government of Mexico)

"STATUS OF MALARIA ERADICATION IN MEXICO, 31 DECEMBER 1962"

Dr. José Alvarez Amézquita  
Minister of Health and Welfare  
Chairman of the Governing Council of CNEP

STATUS OF MARIARIA ERADICATION IN MEXICO<sup>1/</sup>

Dr. José Alvarez Amézquita<sup>2/</sup>  
Minister of Health and Welfare

I N T R O D U C T I O N

For the seventh consecutive year, a report on the status of the malaria eradication campaign in Mexico is being submitted, on this occasion, to the XIV Meeting of the Directing Council of the Pan American Health Organization, XV Meeting of the Regional Committee of the World Health Organization for the Americas.

We once again wish to express our thanks to the Pan American Health Organization and the United Nations Childrens' Fund for their active participation in our program, and we hope that they will continue to collaborate with us until the eradication of malaria is complete.

STATUS OF THE PROGRAM

Further to the report presented between 3 - 17 October 1961 at the last meeting of the Directing Council, it must be stated that during the second half of 1961 and all of 1962, attention was turned to delimiting the foci of residual malaria more accurately, eliminating them, and keeping the area under consolidation free from any cases. With this design, the case-finding network was greatly increased, and regulations were drawn up requiring that every case found be examined immediately and given radical treatment, that the locality affected be sprayed, and that an epidemiological survey be made. To suppress the foci of residual malaria, the following changes aimed at making

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<sup>1/</sup> Report to the XIV Meeting of the Directing Council of PAHO, XV Meeting of the Regional Committee of WHO for the America, Washington, D. C. 16 - 27 September 1963.

<sup>2/</sup> Chairman of the Governing Council and Executive Member of the National Committee for Malaria Eradication (CNEP).

spraying techniques more effective were introduced: three cycles a year instead of two; coverage of the entire interior surface of a dwelling instead of only the usual 3 meters; spraying of all out-houses and maintenance of the same unit dosage of insecticide. These measures were undertaken as an experiment. As a supplement to spraying it was planned to increase case-finding in order to detect all or the greatest possible number of cases and give them radical treatment, thereby converting anti-malarial drugs into a control weapon complementary to spraying.

The changes proposed modified the theoretical principles established for eradication, and perhaps for this reason they did not receive the international support necessary for implementing them, since activities are carried out as part of a tripartite plan of the Government of Mexico, UNICEF, and PASB.

For reasons which will be indicated later, for the first time in 1962, insecticides were not sprayed with the same continuity as during the previous five years; but it was possible to increase case-finding by making a more thorough sampling, especially in rural areas. The number of cases detected exceeded the possibilities of the personnel assigned to administer radical treatment, and for this reason that measure, which was planned as a supplement to sprayings, could not be applied as widely as was desired.

Most of the area under consolidation continued to be negative or had only sporadic cases, but the areas bordering on areas of persistent transmission, or areas toward which populations migrated from the problem areas, suffered the consequences of the presence of infected persons, so that during the year it became necessary to again spray 11.1% of the originally malarious area of the country with insecticide.

To sum up, in 1963 an area of 418,000 square kilometers is being sprayed of which 128,000 square kilometers had already reached the consolidation phase; 732,000 square kilometers are still in the consolidation phase, that is to say, 63.7% of the initially malarious area (1955).

Technical assistance has already been received from PASB/WHO, and material assistance from UNICEF, for introducing the proposed changes in spraying technique, for intensifying case finding, and for increasing treatment, but for various reasons the additional funds needed have not yet been obtained and the program has therefore had to be adjusted to the real possibilities.

#### ACTIVITIES PERFORMED

In the consolidation area, the collection of blood smears through active and passive case-finding, the radical treatment of detected cases, the immediate study of the locality or area, and the spraying of the place where cases were found - all these activities were continued.

Tables and maps giving details of these activities are annexed to this report. Suffice it to say that during 1962 it was possible to cover 59.2% of all localities, which proportion contains 92.1% of the entire population.

In all, 4,477 cases were found in 1,833 localities, and of that total 4,421 were P. vivax infections, 35 were P. falciparum, 18 P. malariae, and 3 mixed. A study was made of 2,875 cases, which were classified as follows:

Imported	88
Introduced	728
Relapses	664
Autochthonous	1,392
Induced	3

The imported cases and those which had been overlooked in routine case-finding explain the existence of autochthonous cases in areas neighboring on problem areas, as revealed by the epidemiological investigations made in 263 localities.

Nearly all the cases found in that area were given radical treatment. Positive localities were sprayed, and special surveillance, including monthly case-finding, was established. An evaluation was made at the end of the year,



and 15,185 localities with 441,407 houses were included in the regular spraying program for 1963 to ensure their protection.

In the problem area, blood smears were collected in 64.1% of the localities, which contained 87.1% of the population.

The 9,642 positive blood smears came from 9,304 patients. Of these, 9,116 were P. vivax infections, 132 were P. falciparum, 50 were P. malariae, and 6 were mixed.

A study was made of 4,304 cases, which were classified as follows:

Autochthonous	2,057
Relapses	1,869
Introduced	378

In addition, exhaustive epidemiological investigations were made in 582 localities.

Radical treatment was given to 3,494 cases and 6,750 clinically suspect malaria cases.

As a result of case-finding and epidemiological investigation, it was decided to continue to spray these problem areas in 1963.

In the entire originally malarious area a total of 1,967,392 blood smears were collected by the notification posts and CNEP personnel, and of these 14,279 were positive; this means a 0.72% positivity and 7.15% morbidity for every 10,000 population, and 10.2% sampling.

The blood smears were collected in 70,685 localities with a population of 18,093,771; there were 5,415 positive localities with a population of 4,386,315.

The average annual number of visits to localities was 3.4, and the output of each evaluator per day was 28 houses and 5 blood films. These averages do

not include case-finding made by squad chiefs who visited 100% of the localities in the problem area twice per year.

As reported at the previous meeting, there is the problem of public relations owing to the excessive proliferation of bedbugs in some areas. HCH continues to be used to control these arthropods.

#### Use of drugs.

A total of 6,770 patients and 18,516 clinically suspect malaria cases were given radical treatment. Treatment was preferentially applied in the consolidation area; and mass treatment was occasionally given to entire villages. The method adopted at the beginning of the campaign, namely that of administering pyrimethamine to all fever cases from whom blood smears were taken, continued to be used.

An experimental program of mass treatment was begun in July 1962 in Pochutla, Oaxaca State, zone V, whereby a population of about 85,000 was given a fortnightly dose of primaquine and chloroquine during 14 consecutive cycles. The medication phase was completed in April of this year. This investigation is being carried out with the technical and material collaboration of PASB.

A study was begun in November 1962 to compare the percentage of radical cures obtained with primaquine given for 5 days with that obtained when the administration of the drug is prolonged, in the usual way, up to 14 days.

#### Epidemiological investigations.

Special epidemiological investigations were intensified through new techniques in entomological aspects, to learn more clearly the significance of the various causes to which the phenomenon of persistence of transmission is attributed. Special attention was given to the study of anopheline behavior towards the insecticide in use.

A total of 1,056 biological tests were made in 46 localities, and 113 series of DDT susceptibility tests were performed in 84 localities; no

physiological resistance to DDT in anophelines was observed in A. p. pseudopunctipennis or A. albimanus; but "vigorization" was observed in A. p. pseudopunctipennis in 14 localities, and in A. albimanus in 4. The phenomenon occurs in isolated localities and has not become widespread throughout the region.

In 32 localities in the areas of persistent transmission 56 special entomological studies were made during both the dry and the rainy season. It was observed that on the Atlantic slope 6 species of anophelines bite man, whereas on the Pacific A. p. pseudopunctipennis is almost the only vector in problem areas and has a strong tendency to exophilism, together with indiscriminate endo- or exo-phagia.

In addition to this probable form of behavioral resistance -- which is an eminently technical factor in the persistence of transmission -- there is the physiological resistance of A. albimanus to DDT, which was recently discovered in April 1963 in the cotton growing area of Tapachula, Chiapas State, bordering on Guatemala. Epidemiological surveys had already shown that persistence was due to two other groups of causes, namely administrative and operational. As a result the barrier that insecticide should constitute for the mosquito is faulty; thus, there is no barrier in the new, usually temporary, dwellings that are built between spraying cycles and cannot be promptly protected; nor is there any barrier on surfaces higher than 3 meters, or in out-houses, which are not sprayable according to the original standards; the barrier is also faulty in houses in which the sprayed surfaces have been interfered with; and among causes for persistence of transmission there is also the habit of the people of sleeping in unprotected places, and the difficulty involved in suitably protecting the rudimentary shelters for migrant agricultural workers.

During the period covered by this report, the technical personnel of the campaign in Mexico were able to observe the work and research being done by the malaria eradication services of Guatemala and El Salvador, and were assisted by the presence in Mexico of Dr. Julián de Zulueta and the entomologist Charles Garrett-Jones, who collaborated with the national staff in a special epidemiological survey of the coastal area of Oaxaca State, zone V.

Spraying operations.

During 1962 routine sprayings were made in 22,465 localities containing 974,884 houses and a population of 3,879,163. Sprayings amounted to 1,608,142 in all. A total of 1,078,208 kilograms of 75% DDT and 11,255 kilograms of 100% DDT were used in these operations.

The average consumption of 75% DDT was 687 grams per house, and 100% DDT consumption was 428 grams per house. The increase of 37% over last year was mainly due to the extension of the height of the surface sprayed to 6 meters, and the inclusion of other out-houses. Average work out-put per sprayman was inversely proportionate to consumption, for the reasons already stated: 8.6 houses per man per day, representing a decline of 22% from the previous year.

As part of the plan for reinforcing spraying measures which envisage 3 spraying cycles per year, three adjacent areas were chosen, with similar epidemiological characteristics and an equal number of houses (30,000 each) located in Costa Chica of Guerrero and Oaxaca States, on the Pacific slope. The experimental plan was put into practice during the current year, although on a smaller scale, with DDT sprayings carried out as follows: in one of the areas, 2 grams per square meter applied in three cycles; in another area, one gram per square meter at three cycles; and in the third area, one gram per square meter in the first and third cycles, and two grams per square meter in the second or intermediate cycle.

As regards transportation facilities, in addition to the vehicles furnished by UNICEF and the spray planes which are now the property of the users, the eradication service received several small planes from the Ministry of Health and Social Welfare.

As to insecticides, there was a delay in their arrival at ports, and it therefore became necessary to furnish emergency supplies to several work sectors and areas by means of interzone transfers. The total volume of insecticide transported during the year was a little over 12 million kilograms.

Public relations and promotion of notifiers.

The establishment of new notification posts and the elimination of posts that were non-productive was given special consideration during 1962. There are 26,591 notification posts located in 16,145 localities with 13,873,251 inhabitants, or 65% of all inhabitants of the malarious area. Monthly reports were made by 22% of all notification posts.

Special emphasis was placed on promoting notification by official medical services; it was also possible to install permanent rural health centers whose main mission in the future will be epidemiological surveillance.

Training.

Eight seminars were held in the course of the year, as follows: one with the participation of CNEP technical personnel and 26 state epidemiologists of the Ministry of Health and Welfare; another, an orientation seminar, was held in Chilpancingo, Guerrero State, and attended by technical personnel from headquarters and staff from zones IX and X; and six other orientation seminars were held in various parts of the country.

In addition, 3,371 field workers were retrained; 58 foreign students were trained; and 48 visiting experts from various parts of the world were received.

Financial status.

The budget for the year was approximately the same as that for the previous year (80.5 million pesos) including the 10.6 million from UNICEF and 4.4 from PASB.

The present status of malaria and its evolution during the past year has led to the conviction that, in order to eradicate the disease in a relatively short time, a larger amount of funds will be needed. To this end, CNEP has drawn up a five-year plan including budget estimates and methods of financing, which has been submitted to an international credit agency for its opinion on the financial and economic aspects.

In the plan the costs of the campaign for the five-year period 1964-1968 are estimated at 60 million dollars; the Government of Mexico would continue to make the same allocations for malaria eradication as hitherto and provide 26 million, and it is assumed that PASB/WHO and UNICEF would continue to give the same participation as before. In that event, there would be a balance of 27.9 million dollars lacking, which could be financed through international credit. The government would thus bear 90% of the total cost.

#### C O N C L U S I O N S

- One. The orthodox attack methods used in problem areas to date have not reduced malaria incidence below a certain point.
- Two. In view of our inability to intensify attack methods in 1962 as planned, we made no major progress toward eradication. A positivity of 1.3%, with seasonal increase, was observed in problem areas.
- Three. We continue to consider it essential to the speeding up of malaria eradication that sprayings throughout the entire problem area be intensified.
- Four. In problem areas where A. p. pseudopunctipennis tends to be exophilic, it is believed that sprayings should be supplemented with antimalarial drugs.
- Five. Since Mexico, a developing country, does not at present have a health infrastructure covering its entire rural area, the malaria eradication service must continue to have its own system of epidemiological surveillance until such time as the health services of the individual states are more developed.
- Six. The authorities responsible for the national investment program will have to be persuaded that the additional sums needed for the eradication campaign are a productive investment that must be made.

ANNUAL FINANCING REPORT

1962

a. Authorized funds

Fiscal Year	Public Health		CNEP		% for
	Mex. Ps.	US \$	Mex. Ps.	US \$	CNEP
1956	314 541 000	25 163 280	30 000 000	2 400 000	9.5
1957	381 900 000	30 552 000	52 000 000	4 160 000	13.5
1958	454 100 000	36 328 000	51 600 000	4 128 000	11.4
1959	483 210 000	38 656 800	63 500 000	5 080 000	13.1
1960	534 339 000	42 747 120	66 500 000	5 320 000	12.4
1961	550 246 000	44 019 680	60 500 000	4 840 000	11.0
1962	562 870 000	45 029 600	56 500 000	5 240 000	11.6
1963	607 708 000	48 616 640	65 500 000	5 240 000	10.8

b. CNEP annual expenditures

Year	Mex. Ps.	US \$
1956	46 567 676	3 725 414
1957	67 783 562	5 422 685
1958	86 035 000	6 882 800
1959	95 654 912	7 652 393
1960	86 075 162	6 886 013
1961	74 775 875	5 982 070
1962	80 489 288	6 439 143
1963	84 751 788	6 780 143

c. Expenditures by items in 1962

Item	Mex. Ps. (in thousands)	%
I. Personal	55 940	69.5
II. Insecticides	6 842	8.5
III. Transports	12 073	15.0
IV. Material & Equip	4 024	5.0
V. Others	1 610	2.0
Total	80 489	100.0

d. Expenditures by branches in 1962

Item	Mex. Ps. (in thousands)	%
I. Administration	7 485	9.3
II. Field Operations	51 352	63.8
III. Epidemiology	21 652	26.9
Total	89 489	100.0

## ANNUAL REPORT ON PERSONNEL MOVEMENT

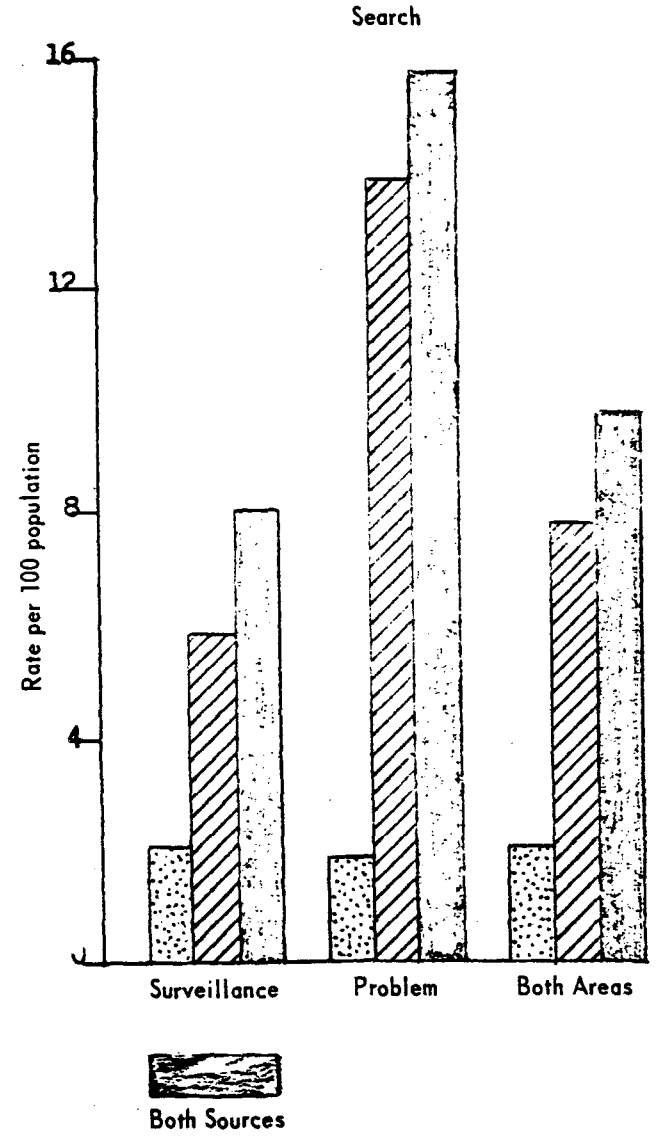
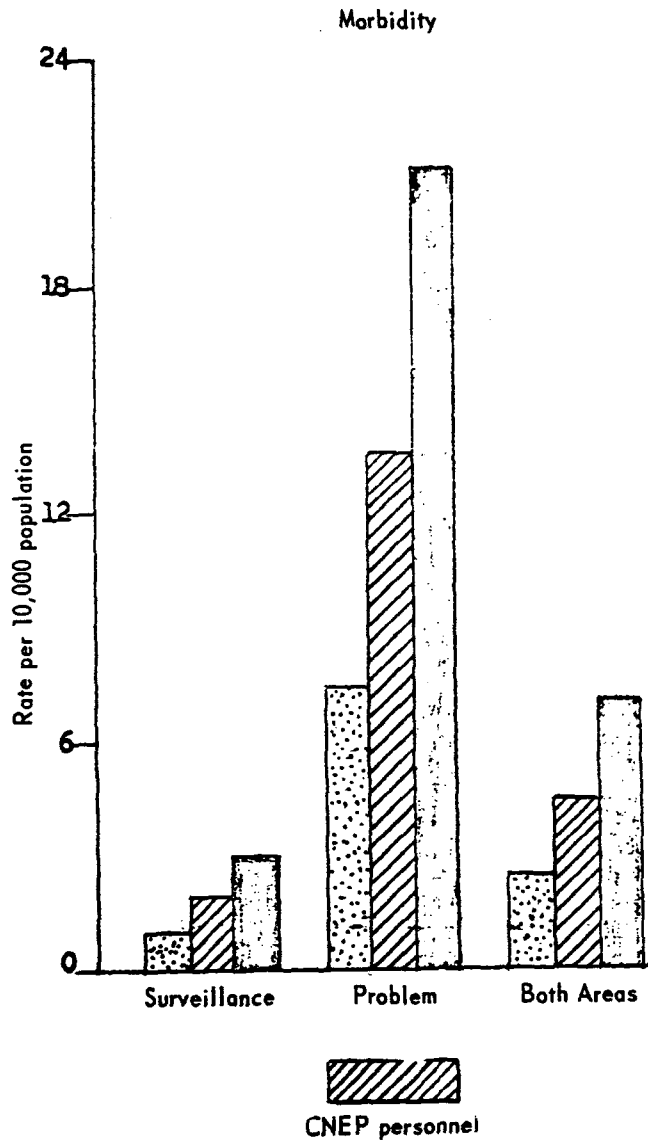
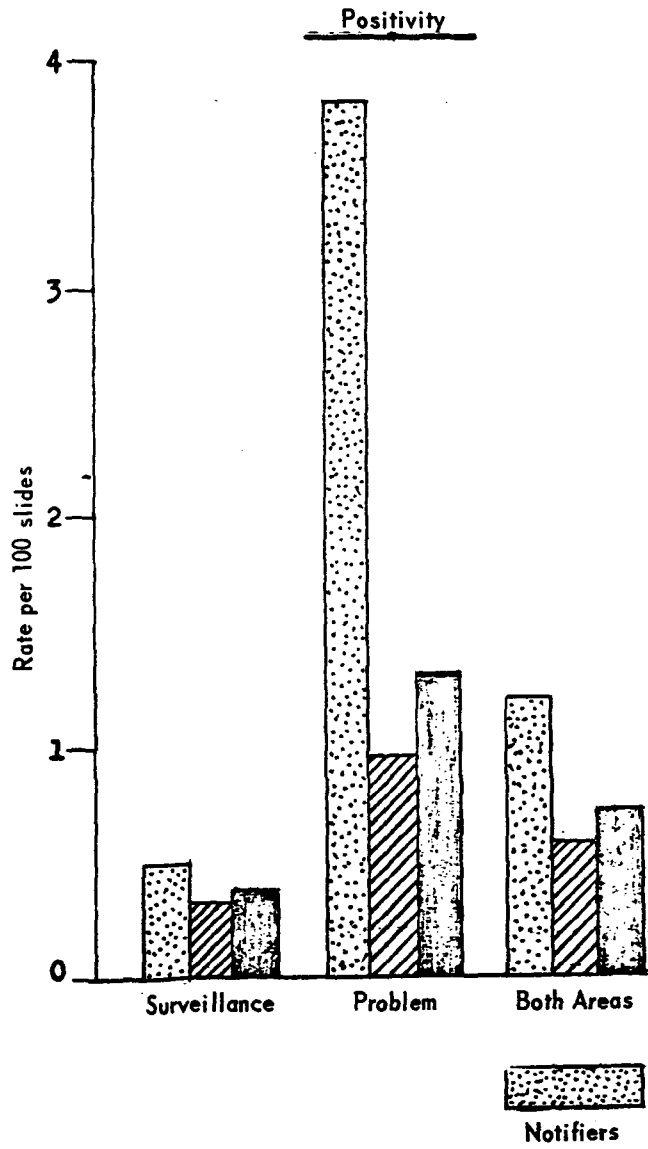
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P o s t s	N u m b e r o f E m p l o y e e s			
	At be- ginning of year	During the year		At end of year
		Added	Removed	
Administrators	11	6	3	14
Administrative aides	170	48	15	203
Warehousemen	10	4	-	14
Warehousemen aides	26	6	8	24
Legal advisers	3	-	-	3
Epidemiology auxiliaries	58	11	12	57
Treatment auxiliaries	-	127	40	87
Squad assistants	79	39	45	73
Engineer assistants	68	11	13	66
Cashiers (payroll officers)	15	3	2	16
Chauffeurs (motor vehicles)	23	8	5	26
Draftsmen	20	-	1	19
Health educators	15	2	2	15
Veterinary aides	5	-	5	-
Entomologists	1	-	-	1
Entomology aides	29	4	4	29
Statisticians	1	-	-	1
Statistical aides	1	-	-	1
Evaluation inspectors	119	24	9	134
Evaluators	1 190	318	212	1 296
Engineers	42	14	10	46
Instructors	5	1	4	2
Squad chiefs	168	62	45	185
Sector chiefs	46	14	9	51
Physicians	94	11	12	93
Chief Microscopists	1	-	-	1
Microscopists' aides	90	17	6	101
Mechanics	44	3	3	44
Mechanics aides	21	8	1	28
Launch operators	12	3	5	10
Office boys and messengers	67	11	9	69
Chemists	2	1	1	2
Spraymen	630	456	381	705
Secretaries	110	16	7	119
Logistics technicians	18	4	10	12
T o t a l:	3 194	1 232	879	3 547



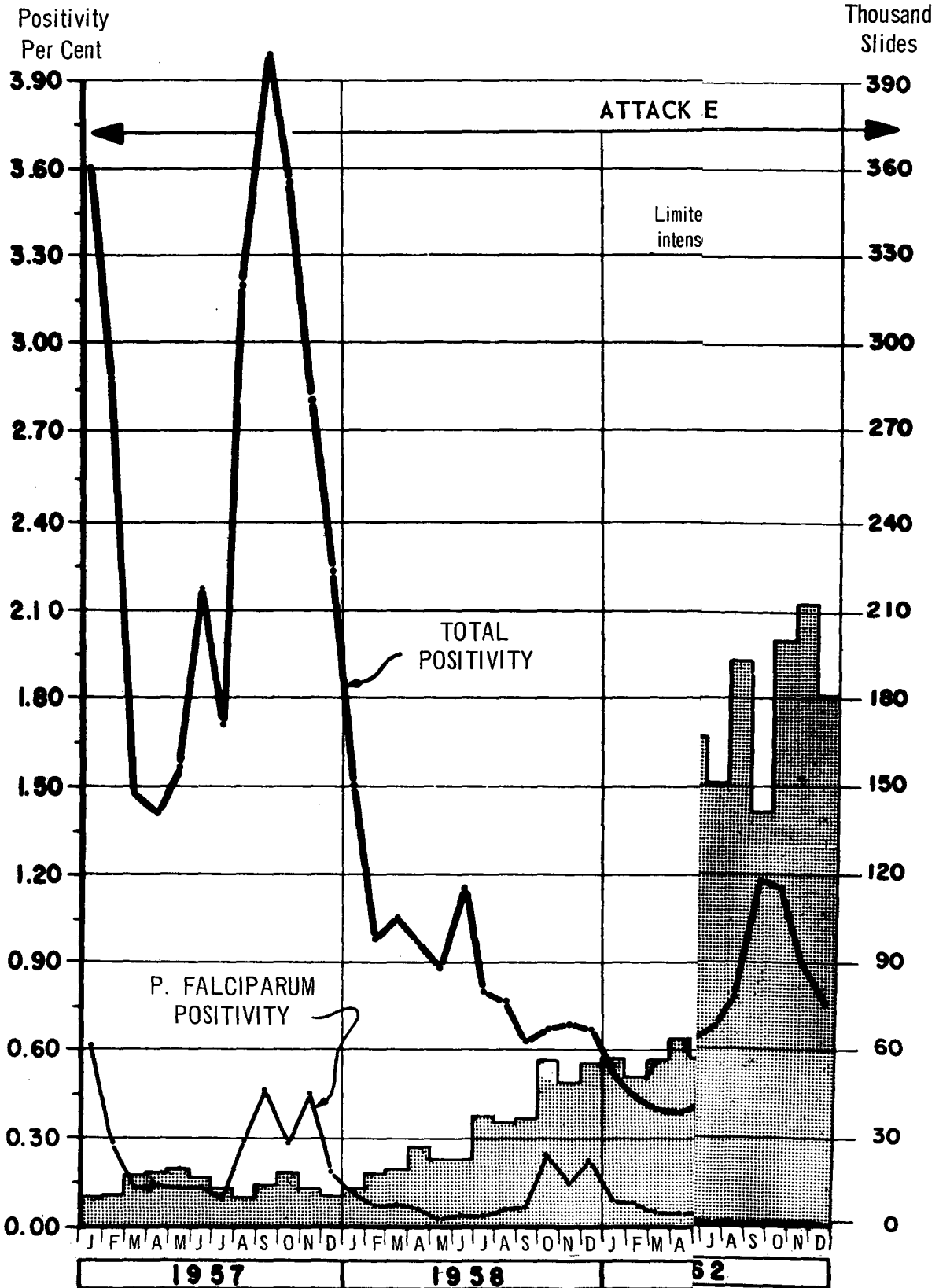


PRINCIPAL RATES OF CASE FINDINGS,  
BY SOURCE AND AREA  
1962



# MONTHLY VARIATION IN S

P.



REPORT ON SPRAYING OPERATIONS

TIME SCHEDULE

Period covered by report:  
 1 January to 31 December 1962  
 Beginning of Total Coverage: 2 January 1957  
 Beginning of Current Cycle: 1 January 1962

UNITED STATES OF MEXICO

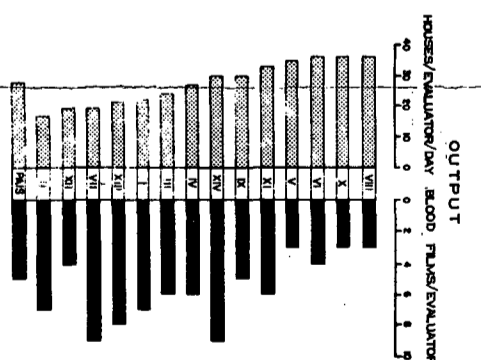
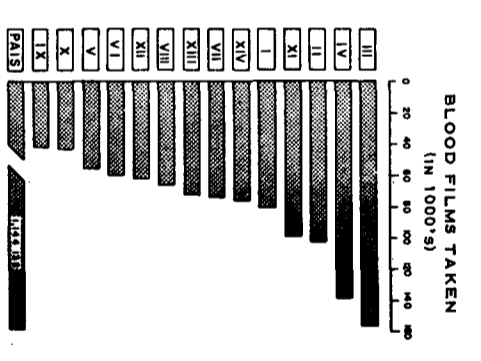
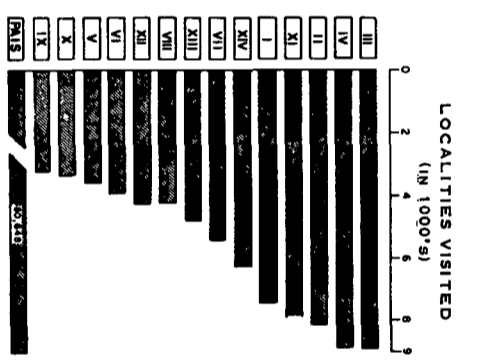
	1 9 6 1				1 9 6 2			
	1x	2x	Total	Sprayings	1x	2x	Total	Sprayings
1.- <u>Localities Sprayed:</u>	18 503	18 911	37 414	56 325	8 380	14 073	22 453	36 526
2.- <u>Houses Sprayed:</u>								
100% DDT	18 637	11 022	29 659	40 681	7 885	9 210	17 095	26 305
75% DDT (2 grams per m <sup>2</sup> )	887 323	753 393	1 640 716	2 394 102	333 741	624 048	957 789	1 581 837
T o t a l:	905 960	764 415	1 670 375	3 434 790	341 626	633 258	974 884	1 608 142
3.- <u>Houses not Sprayed:</u>								
Not Sprayable	-	-	12 130	-	-	-	3 733	-
Unwilling, closed, and other reasons	-	-	27 178	-	-	-	26 343	-
T o t a l:	-	-	39 308	-	-	-	30 076	-
4.- <u>Insecticide used:</u>								
100% DDT	-	-	15 318	-	-	-	11 255	-
75% DDT	-	-	1 200 738	-	-	-	1 087 208	-
5.- <u>Performance and Population protected</u>								
Houses per sprayman/day	-	-	10.96	-	-	-	8.64	-
100% DDT grams per house	-	-	376	-	-	-	514	-
Population Directly Protected	-	-	7 521 565	-	-	-	3 879 163	-
Population Indirectly Protected	-	-	123 758	-	-	-	-	-
Population Protected in Consolidation Areas	-	-	-	-	-	-	511 119	-
T o t a l:	-	-	7 645 323	-	-	-	4 390 282	-

CONCENTRATION BY SEMESTER

SE- ZONE TER	LOCALITIES (1)										HOUSES (1)										POPULATION (1)										BLOOD FILMS (2)														
	CONSOLIDATION					PROBLEM					TOTALS					CONSOLIDATION					PROBLEM					TOTALS					CONSOLIDATION					PROBLEM					TOTALS				
	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	ACT. DE- TEC.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.	HTLTH. TO- CAL.					
I	8 070	1 211	10 286	4 080	-	-	-	-	-	-	8 070	1 211	10 286	4 080	53 644	29 284	112 028	48 522	-	-	53 644	29 284	112 028	48 522	-	-	53 644	29 284	112 028	48 522	-	-	53 644	29 284	112 028	48 522	-	-	53 644	29 284	112 028	48 522			

OUTPUT

ZONE	HOUSE VISITS BY MEANS OF TRANSPORTATION				OF TRANSPORTATION				AUTHORIZED EVALUATORS				EVALUATOR/DAY				HOUSES PER EVALUATOR/DAY				BLOOD FILMS PER EVALUATOR/DAY			
	ON FOOT	MOTOR	AND BOAT	TOTAL	ON FOOT	MOTOR	AND BOAT	TOTAL	NO. TOR	MO. TOR	HTLTH. TOR	TOTAL	ON FOOT	MOTOR	AND BOAT	TOTAL	ON FOOT	MOTOR	AND BOAT	TOTAL	ON FOOT	MOTOR	AND BOAT	TOTAL
I	280 000	90 284	238 284	-	94 487	27 128	61 359	27 284	5	1 239	3 726	12 079	23	14	22	59	1	7	7	1	1	1	1	1



Científico: *[Signature]*  
 Director General: *[Signature]*  
 Asesor: *[Signature]*  
 Asesor: *[Signature]*  
 Asesor: *[Signature]*

**SECRETARIA DE SALUBRIDAD Y ASISTENCIA**  
**COMISION NACIONAL PARA LA ERRADICACION DEL PALUDISMO**  
**INFORME ANUAL DE BUSQUEDA DE ENFERMOS AÑO DE 1962**

Director General: *[Signature]*  
 Director: *[Signature]*  
 Asesor: *[Signature]*  
 Asesor: *[Signature]*  
 Asesor: *[Signature]*

Hecho en: *[City]*, el día *[Date]* de *[Month]* de *[Year]*.

- NOTES:
1. VISIT BY SPRAY PERSONNEL NOT INCLUDED
  2. INCLUDES BLOOD FILMS TAKEN BY CASE-FINDING AND SPRAY PERSONNEL
  3. ESTIMATED DATA
  4. NOT CLASSIFIED AS PROBLEM AREA
- CASE FINDING: HOUSE TO HOUSE SEARCH FOR FEVER PATIENTS  
 CHANNEL: HOUSE-TO-HOUSE VISITS TO EXPLAIN PURPOSE OF NOTIFICATION - HEALTH EDUCATION ALSO DONE THROUGH SCHOOLS.  
 SCHOOLS: "LOCALITIES" WERE TAKEN BY/FROM CENSUS

DRUGS USED FOR PRESUMPTIVE AND RADICAL TREATMENT

1 9 6 2

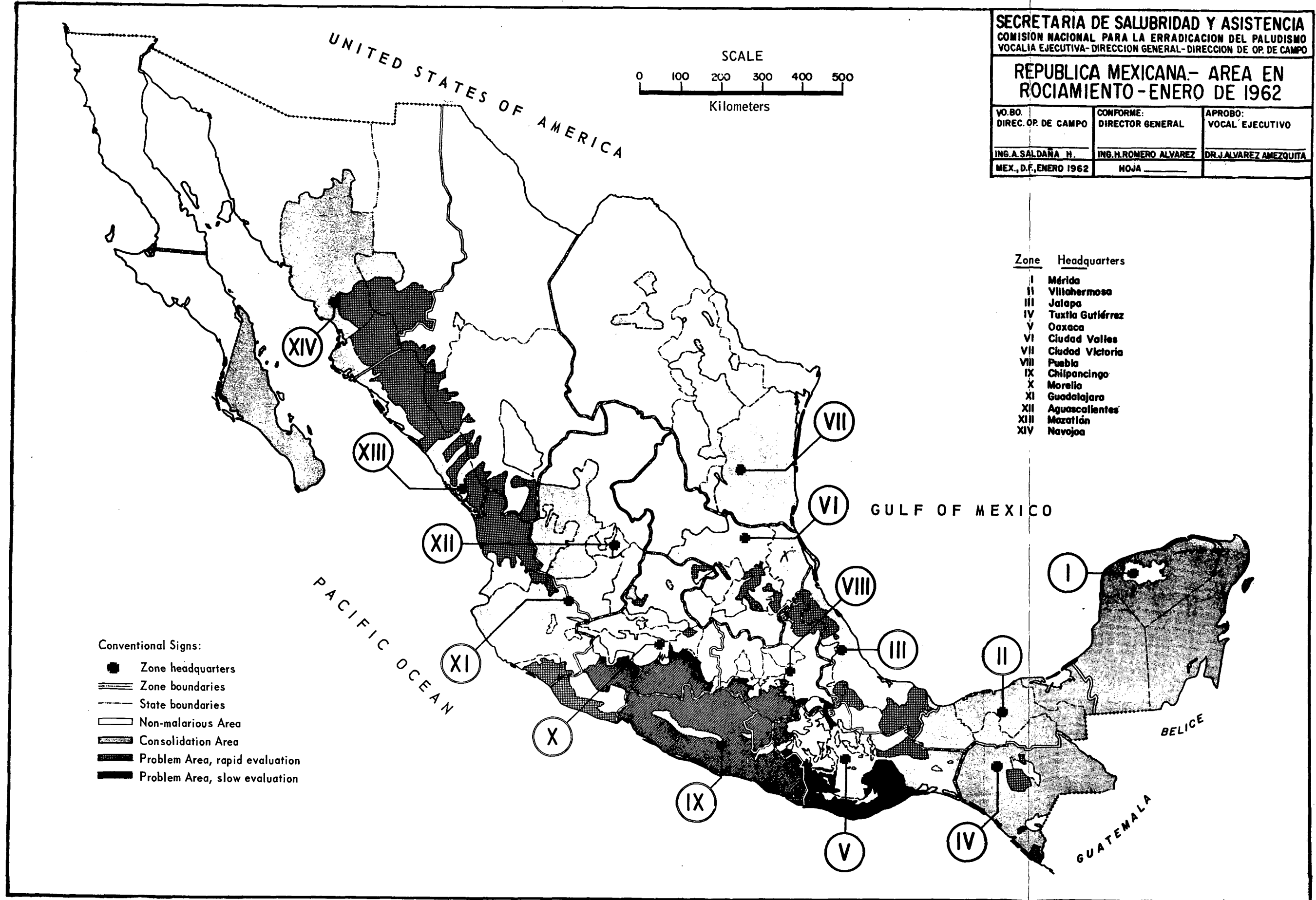
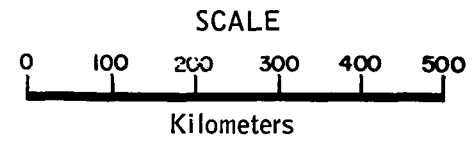
Use of Drug	Name of Drug	Form of Drug	Number of tablets used	Number of persons tested
<b>TREATMENT</b>				
As presumptive treatment applied in single doses to febrile patients from whom blood smears had been taken in problem area.	CHLOROQUINE	150 mg of the base	2 061 687	708 800
Radical treatment of <u>P. falciparum</u> infections, also <u>P. vivax</u> and <u>P. malariae</u> infections, and clinically suspect cases.	CHLOROQUINE		61 880	32 267
Radical treatment of <u>P. vivax</u> and <u>P. malariae</u> infections, and suspect malaria cases.	PRIMAQUINE	5 mg. tablets 15 mg. tablets	279 794 <u>182 807</u>	32 100
		T o t a l	462 601	
As presumptive treatment applied in single doses to persons from whom blood smears had been taken in the consolidation area.	PYRIMETHAMINE	25 mg of the base	1 676 309	1 135 174



SECRETARIA DE SALUBRIDAD Y ASISTENCIA  
 COMISION NACIONAL PARA LA ERRADICACION DEL PALUDISMO  
 VOCALIA EJECUTIVA-DIRECCION GENERAL-DIRECCION DE OP. DE CAMPO

REPUBLICA MEXICANA- AREA EN  
 ROCIAMIENTO -ENERO DE 1962

VO. BO. DIREC. OP. DE CAMPO	CONFORME: DIRECTOR GENERAL	APROBO: VOCAL EJECUTIVO
ING. A. SALDAÑA H.	ING. H. ROMERO ALVAREZ	DR. J. ALVAREZ AMEZQUITA
MEX., D.F., ENERO 1962	HOJA _____	



Zone	Headquarters
I	Mérida
II	Villahermosa
III	Jalapa
IV	Tuxtla Gutiérrez
V	Oaxaca
VI	Ciudad Valles
VII	Ciudad Victoria
VIII	Puebla
IX	Chilpancingo
X	Morelia
XI	Guadalajara
XII	Aguascalientes
XIII	Mazatlán
XIV	Navojoa

- Conventional Signs:
- Zone headquarters
  - ≡≡≡ Zone boundaries
  - State boundaries
  - Non-malarious Area
  - ▨ Consolidation Area
  - ▩ Problem Area, rapid evaluation
  - Problem Area, slow evaluation



REPUBLICA MEXICANA  
**OPERACIONES DE ROCIADO**  
 AÑO DE 1963

Va. Bo. Director de Op. de Campo	Conforme: DIRECTOR GENERAL	APROBO: VOCAL EJECUTIVO
Ing. Armando Saldaña Haysosillo	Ing. Humberto Romero Alvarez	Dr. José Alvarez Amézquita
México, D.F., Diciembre de 1962	Hoja Unica	

Zone	Headquarters
I	Merida
II	Villahermosa
III	Jalapa
IV	Tuxtla Gutierrez
V	Oaxaca
VI	Ciudad Valles
VII	Ciudad Victoria
VIII	Puebla
IX-N	Iguala
IX-S	Chilpancingo
X	Morelia
XI	Guadalajara
XII	Aguascalientes
XIII	Mazatlan
XIV	Navojoa

Conventional Signs:

- Zone headquarters
  - Zone boundaries
  - - - State boundaries
  - Non-malarious Area
  - ▨ Consolidation Area
  - Problem Area
  - Consolidation area shifted into attack phase
- SYSTEM OF DOSAGE IN GM/M<sup>2</sup> IN EXPERIMENTAL CYCLES OF THREE SPRAYINGS PER YEAR
- ▨ 1-1-1
  - 1-2-1
  - 2-2-2

Forma: Dibujaron:  
 Revisó: J. Herrera y A. Esbell G.  
 Ing. Gabriel Vazquez Ydígoras

