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XXXIX REPORT

INDEX

Page

INTRODUCTION 1

I. STATUS OF MALARIA IN THE WORLD 1

A. Population at risk 1

B. Reports of malaria cases to WHO 1

C. World trends 2

II. STATUS OF MALARIA IN THE AMERICAS, 1990 3

III. CURRENT SITUATION OF MALARIA PROGRAMS IN THE AMERICAS 11

A. General Information 11

México, Central América, Belize and Panamá 12

Caribbean Area 13

Andean Area 14

Amazon Region 15

B. Status of Malaria in countries with Transmission of the Disease 16

Field Operations 16

Problems in the Implementation of Malaria Programs . 17

Country Information 41

IV. PROBLEMS HINDERING MALARIA PREVENTION AND CONTROL IN THE AMERICAS 107

A. Socioeconomic Problems in Vector Control of Malaria and Management of Man-Vector Contact 107

B. Use of Residual Spraying 107

C. Use of Mosquito Nets, and Metal Curtains and Screens 108

Page

D. Environmental Management and Community Participation in Vector Control 109

E. Problems in Surveillance and Control of Malaria Parasites in the Human Reservoir 109

F. Economic development projects and infrastructure projects and their impact on malaria . . . 110

G. Environmental Degradation and Malaria Problems 111

H. Malaria Problems in an International Context 111

V. ADVANCES IN MALARIA RESEARCH 112

A. Epidemiology 112

B. Social and Economic Research 114

C. Diagnosis 117

D. Immunology 117

E. Chemotherapy 122

F. Entomology 122

VI. PERSONNEL TRAINING 126

Tables

1. Number of Malaria cases reported in the world 5

2. Population of malarious areas, 1958-1990 6

3. Malariometric rates of 21 countries of the Americas . . . 7

4. Malariometric rates, by geographical regions 9

5. Status of Malaria Programs in the Americas, by population 18

6. Status of Malaria Programs in the Americas, by area 19

Page

7. Malaria Morbidity in the Americas, 1958-1990 20

8. Number of blood slides examined and with plamodia, by geographical subregions and by phases of the programs, 1990 21

9. Slides examined and positives, by specie of plamodium - Non-malarious areas, 1990 23

10. Epidemiological situation of 21 countries with active malaria programs, 1990 25

11. Malaria cases registered in the Region of the Americas, 1987-1990 29

12. Comparative results of active and passive case detection under malaria programs in the Americas . . . 30

13. Sprayings with residual insecticides applied 1989-1990 31

14. Insecticidas used in 1990 by the malaria programs an estimate for 1991 32

15. Number of intradomiciliary sprayings with residual insecticides, 1987-1990 33

16. Consumption of antimalarial drugs in 21 countries with active malaria programs, 1986-1990 . . 34

17. Use of antimalarial drugs in 1989 and requirements for 1990 35

18. Personnel employed in malaria programs in the Americas, 1989-1990 37

19. Areas with technical and administrative problems in the control of malaria in the American Region . . . 38

20. Funds from country and international agencies for malaria research in the American Region 1985-1990 113

Maps

Page

1. World malaria situation, 1989 4

2. Countries with no evidence of transmission 22

3. México, Central America, Belize, Panama, Haiti and Dominican Republic 26

4. Brazil and Guianas 27

5. Andean Area and Southern Cone 28

Figures

1. Population of the world, 1989, exposed to malaria risk . . 5

2. Malariometric rates in 21 countries, 1960-1990 8

3. Malariometric rates of 21 countries of the Americas ABER and APIS 10

4. Percentage of malaria cases, American Region, 1990 . . . 24

5. Distribution of 2,150 students in 1990 by specialty/core topic 128

6. Distribution of students by country: Mexico, El Salvador, Panama, and Paraguay 129

INTRODUCTION

This document is the XXXIX Report on the Status of Malaria published by PAHO. It outlines the malaria situation in the Region during 1990, summarizing the information obtained from the Governments in response to the questionnaire sent to them annually.

The section on the status of malaria in the world refers to 1989. The information was taken from publications of the World Health Organization.[1]

I. STATUS OF MALARIA IN THE WORLD

A. Population at Risk

More than 40% of the world's population, i.e., more than two billion people, continues to be at some degree of risk for contracting malaria in approximately 100 countries and territories (Map 1). Of a total world population of some 5.16 billion, 1.4 billion (27%) live in regions where there has never been malaria or where it disappeared with no antimalarial intervention; 1.65 billion (32%) live in regions where malaria has been eradicated through malaria campaigns and has not recrudesced; 1.62 billion (31%) inhabit areas where endemic malaria had been considerably reduced or even eradicated, but transmission has begun again, and the situation is currently unstable or deteriorating. These regions include areas where malaria poses a major problem as a result of significant ecological and social changes. Such areas encompass only 1% of the world's population. Areas where endemicity remains practically unchanged, where there is intense transmission in many areas, and where antimalarial programs have not been fully implemented, are inhabited by 490 million people (almost 10% of the world population). This situation is encountered primarily in tropical Africa (Figure 1).

B. Reports of Malaria Cases to WHO

Every year WHO receives information from the Member States on the number of malaria cases registered by national surveillance programs. These cases are usually defined as those that require treatment and those that have been confirmed by microscopic examination; however, in countries that lack microscopic examination services at the peripheral level, most cases are diagnosed by clinical signs.

It is estimated that worldwide incidence of malaria comes to some 110 million clinical cases per year, and that approximately 280 million people are carriers of the parasite. These figures should be considered approximate in view of the difficulty of obtaining precise information. Reporting is quite erratic and

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[1] WHO. *Weekly Epidem Rec* 22:157-163, 1991 and 23:167-170, 1991.

incomplete in the highly endemic regions. For example, the countries of tropical Africa, which are estimated to account for approximately 80% of all clinical cases and more than 90% of all parasite carriers, report only 2% to 6% of the estimated world total.

Excluding Africa, in 1989, 5.2 million cases were reported to WHO; 95% came from just 25 of the more than 100 countries or territories with endemic malaria. Half of all cases were registered in India (39%) and Brazil (11%), while approximately one fourth were reported from Thailand, Sri Lanka, Afghanistan, Vietnam, China, and Myanmar (in decreasing order).

A general description of the malaria situation may tend to obscure the large variations between and within countries; this is the case with the information provided by India and Brazil, whose data account for half of all registered cases. In India, with 2 million cases reported in 1989, nearly 55% of all cases are from 3 states: Gujarat (599,000), Orissa (261,000), and Madhya Pradesh (253,000). In the Americas, where the incidence of malaria increased from 270,000 cases in 1974 to 1,100,000 in 1989, Brazil accounted for 52% of the total. Within Brazil, the Amazon region accounted for 97% of all cases, the majority in three states. Even in these states, the cases were concentrated in specific areas.

C. World Trends

From 1975 to 1979, there was a reduction in the number of reported cases of malaria, owing largely to the control measures implemented in India in response to an outbreak of the disease. Since 1985, the number of reported cases in India has stabilized, although it is currently showing an upward trend. Malaria incidence in China has continued to decline as a result of successful integration of the malaria campaign into the primary health care system. Excluding India and China, it appears that the malaria situation is deteriorating. Among the areas where this deterioration has been particularly marked are the "peripheral regions" of Southeast Asia and South America. The situation has not changed a great deal in the highly endemic areas of Africa, but large-scale epidemics have been reported in areas with less endemicity (see Table 1).

II. STATUS OF MALARIA IN THE AMERICAS, 1990

In 1990 it was estimated that 278 million people in the Region of the Americas were living in malarious areas. Morbidity from malaria was 149.67 per 100,000 population, while in 1974 morbidity had been only 49.37 per 100,000 inhabitants. As can be seen from Table 2, during the last four years more than one million cases have been registered in the Region. This figure is an indication of how the problem has worsened in the Region.

In the 21 countries with active malaria control programs, 1,042,817 cases had been confirmed as of the end of the year, with an Annual Parasite Incidence of 2.53 per 1,000 population, as described in Table 3 and Figure 2.

French Guiana continues to have the highest annual parasite incidence, as it has since 1987; in 1990, the API was 64.23 per 1,000 population; Guyana and Belize had an API of 21.81 per 1,000 and 16.57 per 1,000 respectively. The annual blood examination rate (ABER) was highest in French Guiana and Belize. The malariometric rates of 21 countries in the last five years are shown in Table 4; the regional total for the last 30 years is shown in Figure 3.

MAPA 1

WORLD MALARIA SITUATION, 1989

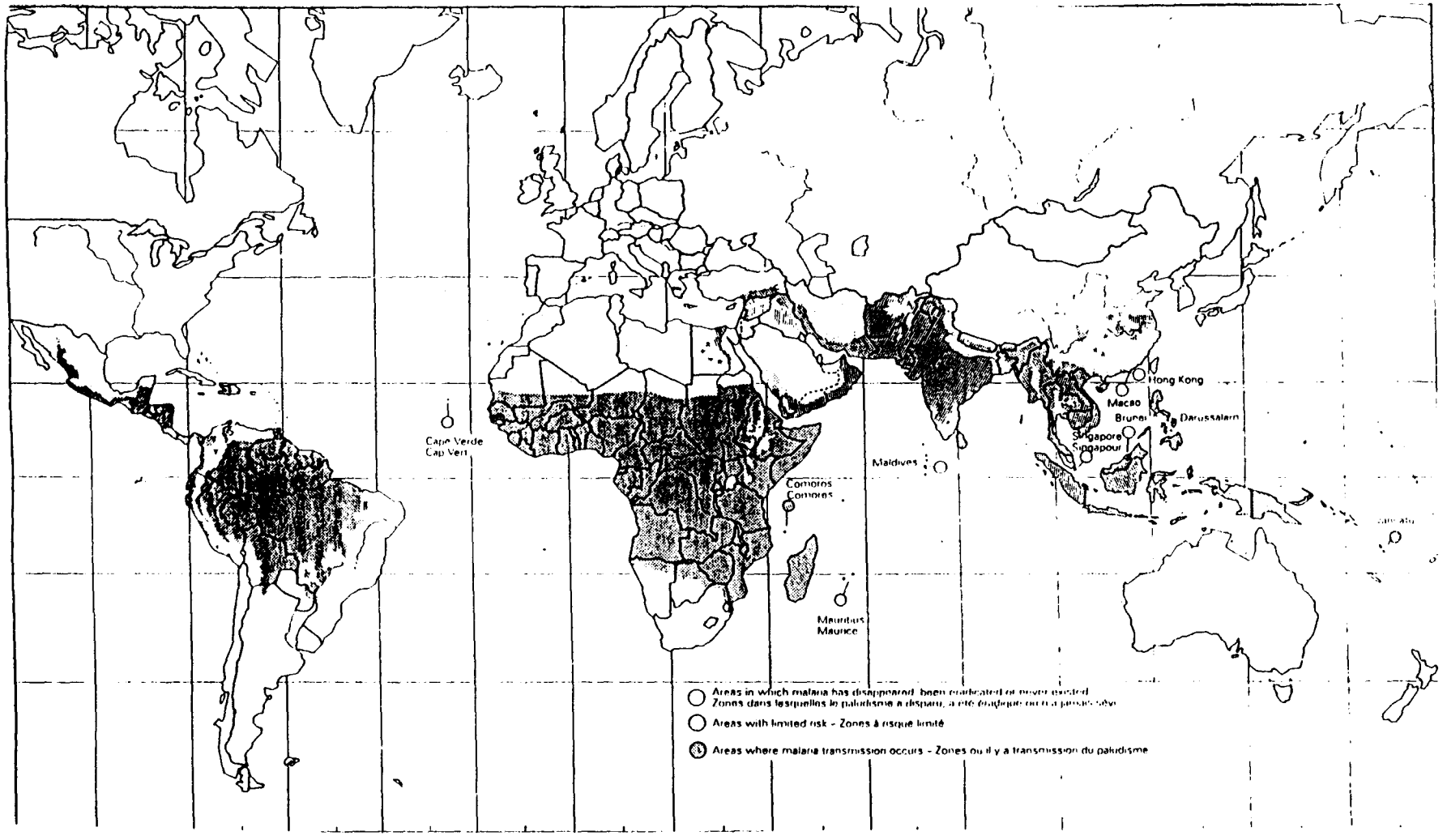


FIGURE 1

POPULATION OF THE WORLD, 1989
EXPOSED TO MALARIA RISK

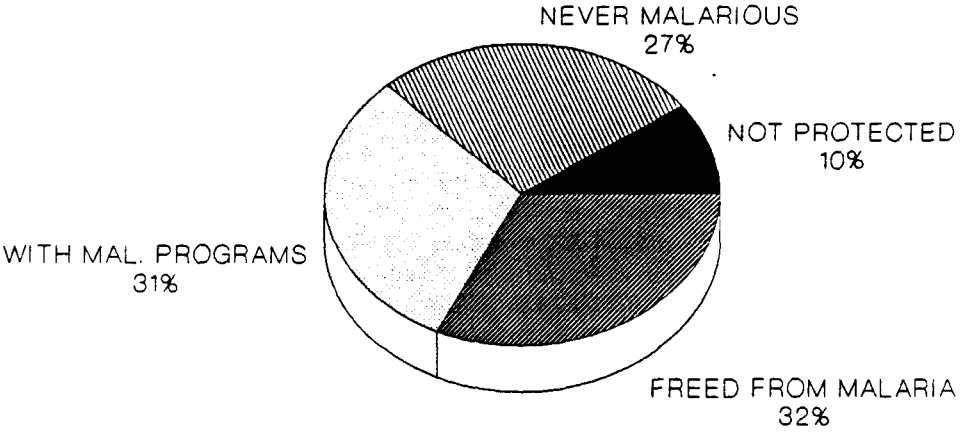


Table 1

NUMBER OF MALARIA CASES REPORTED IN THE WORLD
(In thousands)
1985-1989 (a)

WHO REGIONS	1985	1986	1987	1988	1989
AFRICA - AFRO	3,373	3,046	3,309	3,285	7
AMERICAS - AMRO	911	951	1,019	1,120	1,114
SOUTH-EAST ASIA - (SEARO)	2,521	2,689	2,823	2,719	2,810
EUROPA - EURO	32	45	28	24	21
EASTERN MEDITERRANEO - (EMRO)	391	610	566	602	531
WESTERN PACIFIC - (WPRO)	1,066	786	830	704	709
TOTAL (Excl. Africa)	4,921	5,081	5,266	5,169	5,185

(a) Source: "WHO Wkly Epid. Rec. 22: 1991.

Table 2

POPULATION OF MALARIOUS AREAS
1958 - 1990
(In thousands)

Year	Number of inhabitants in originally malarious areas					Total Population (In thousands)
	Maintenance	Consolidation	Attack	Prep. phase or Program not started	Total	
1958	52,866	1,996	46,196	34,351	135,409	387,276
1959	52,856	9,349	56,292	27,423	145,920	394,606
1960	54,363	10,101	53,400	25,722	143,586	400,500
1961	56,979	17,879	39,021	33,413	147,292	416,008
1962	59,299	30,424	49,276	14,743	153,742	427,919
1963	56,546	33,901	31,910	29,664	152,021	434,950
1964	57,414	32,277	34,426	34,525	158,642	447,666
1965	60,975	34,731	38,575	12,108	146,389	455,527
1966	69,760	36,128	43,369	17,212	166,469	463,649
1967	70,720	41,581	44,766	12,834	169,901	474,868
1968	72,441	45,812	56,234	217	174,704	484,664
1969	72,757	46,987	56,375	206	176,325	491,483
1970	80,770	40,518	59,807	162	181,257	505,819
1971	81,306	43,644	60,396	146	185,492	513,544
1972	86,634	42,016	61,645	153	190,448	524,774
1973	87,969	45,535	61,915	109	195,528	535,109
1974	91,527	46,042	63,130	56	200,755	544,865
1975	99,405	44,633	61,834	-	205,872	555,676
1976	101,068	48,813	61,205	-	211,086	565,249
1977	104,567	50,610	60,373	-	215,550	576,942
1978	105,611	59,734	54,808	-	220,153	587,704
1979	113,092	57,280	55,989	-	226,361	600,263
1980	114,620	58,087	58,659	-	231,366	610,021
1981	117,042	59,962	62,256	-	239,260	627,375
1982	118,338	62,028	64,941	-	245,307	635,954
1983	119,175	66,970	63,182	-	249,327	639,212
1984	124,408	68,372	64,496	-	257,276	659,535
1985	124,086	67,092	68,659	-	259,837	665,777
1986	116,143	43,717	103,500	-	263,371	662,983
1987	117,310	42,334	108,633	-	268,277	672,384
1988	124,250	46,048	109,927	-	280,225	703,358
1989	126,666	45,309	113,419	-	285,394	715,994
1990	120,980	47,481	110,139	-	278,600	698,199

Jul/30/91 (hs)

Table 3

MALARIOMETRIC RATES OF 21 COUNTRIES OF THE AMERICAS
WITH ACTIVE MALARIA PROGRAMS

Year	Total population	Blood slides examined						Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	AFI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
1959	183,870	2,531,566	1.38	71,138	0.39	19,879	0.11	13,148,306	71.51
1960	187,952	3,713,353	1.98	79,048	0.42	22,668	0.12	13,726,707	73.03
1961	193,493	5,019,034	2.59	133,161	0.69	28,240	0.15	10,377,938	53.63
1962	199,273	6,703,183	3.36	173,570	0.87	47,909	0.24	13,897,489	69.74
1963	205,362	7,388,147	3.60	225,731	1.10	68,785	0.33	14,901,921	72.56
1964	210,859	7,737,428	3.67	255,130	1.21	85,362	0.40	15,214,265	72.15
1965	216,906	8,635,009	3.98	243,259	1.12	84,161	0.39	12,255,286	56.50
1966	222,629	10,813,817	4.86	332,599	1.49	101,965	0.46	12,037,910	54.07
1967	228,762	10,464,355	4.57	366,346	1.60	101,216	0.44	12,836,614	56.11
1968	235,068	11,473,186	4.88	280,063	1.19	78,373	0.33	14,503,758	61.70
1969	241,652	11,178,193	4.63	320,383	1.33	84,851	0.35	14,260,457	59.01
1970	250,465	9,184,108	3.67	339,825	1.36	86,066	0.34	16,354,814	65.30
1971	257,600	9,449,291	3.67	335,290	1.30	90,027	0.35	15,942,166	61.89
1972	264,763	9,036,489	3.41	284,180	1.07	109,762	0.41	18,095,931	68.35
1973	271,756	8,778,033	3.23	280,044	1.03	116,180	0.43	16,523,538	60.80
1974	279,501	8,500,069	3.04	268,700	0.96	89,411	0.32	14,220,717	50.88
1975	290,670	8,863,987	3.05	356,196	1.23	110,961	0.38	13,428,977	46.20
1976	298,120	9,005,812	3.02	378,651	1.27	101,260	0.34	11,415,514	38.29
1977	305,675	8,929,851	2.92	398,290	1.30	116,238	0.38	10,151,758	33.21
1978	313,364	9,143,761	2.92	468,038	1.49	160,478	0.51	9,813,592	31.32
1979	320,522	8,280,680	2.58	514,110	1.60	166,581	0.52	9,905,425	30.90
1980	328,435	8,576,170	2.61	599,959	1.83	201,260	0.61	9,406,537	28.64
1981	333,333	8,622,478	2.59	635,877	1.91	188,658	0.57	8,275,938	24.83
1982	335,382	8,453,319	2.52	713,878	2.13	235,017	0.70	5,679,929	16.94
1983	352,619	8,969,388	2.54	829,546	2.35	295,253	0.84	4,886,234	13.86
1984	360,847	9,006,858	2.50	929,891	2.58	345,622	0.96	4,417,500	12.24
1985	369,556	8,781,416	2.38	909,162	2.46	285,319	0.77	4,808,740	13.01
1986	378,861	8,992,835	2.37	948,906	2.50	325,438	0.86	4,636,776	12.24
1987	386,252	8,675,128	2.25	1,016,327	2.63	370,818	0.96	4,940,182	12.79
1988	394,720	8,990,281	2.28	1,118,132	2.83	398,609	1.01	5,568,710	14.11
1989	403,267	8,595,096	2.13	1,111,732	2.76	376,187	0.93	5,689,129	14.11
1990	411,811	8,647,095	2.10	1,042,817	2.53	245,232	0.60	4,930,362	11.97

a) Estimated population in thoudsnf of inhabitants.
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants
h) Number of house sprayings during the year, regardless of cycles and insecticides.
i) HSR = House spraying rate, per 1000 inhabitants.

Jul/30/91 (hs)

FIGURE 2

MALARIOMETRIC RATES IN 21 COUNTRIES, 1960-1990

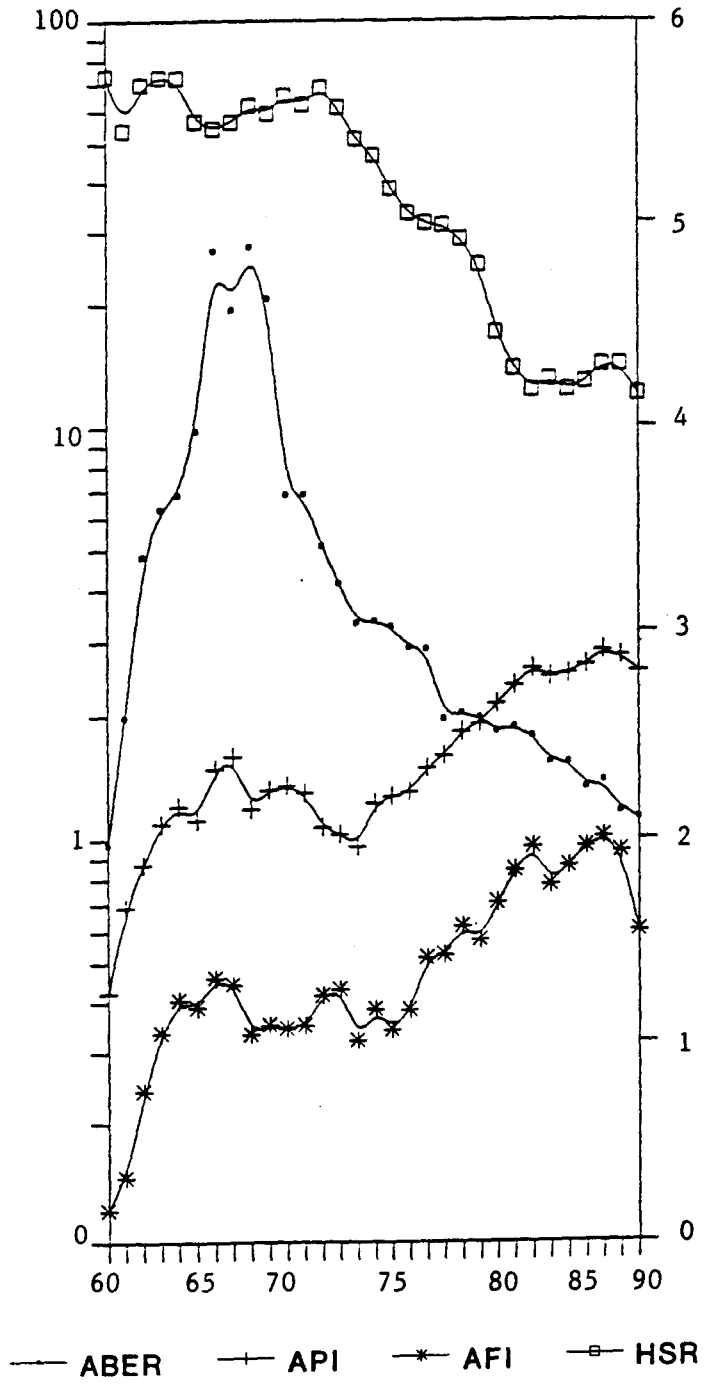


Table 4

MALRIOMETRIC RATES, BY GEOGRAPHICAL REGIONS a)

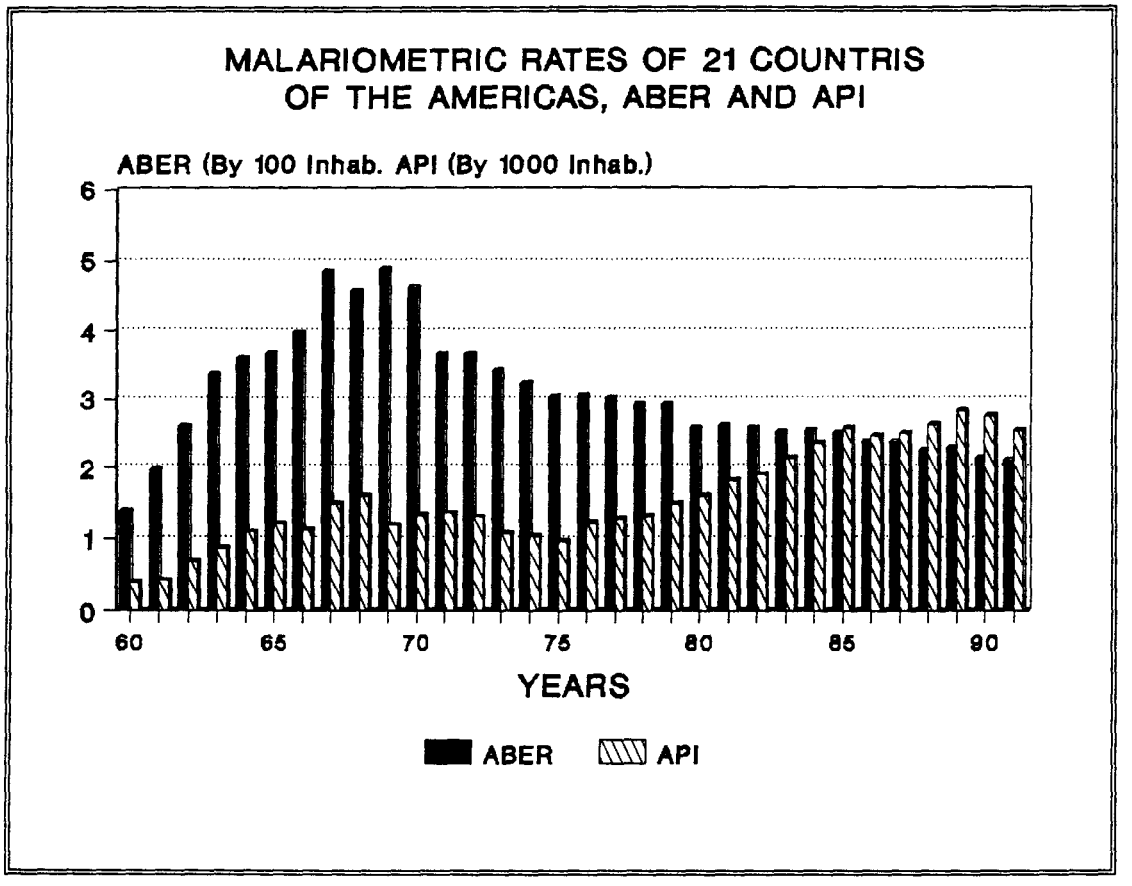
Countries (by geographical sub-regions)	Total population 1990 a)	ABER 1986	ABER 1987	ABER 1988	ABER 1989	ABER 1990	API 1986	API 1987	API 1988	API 1989	API 1990	HSR 1986	HSR 1987	HSR 1988	HSR 1989	HSR 1990
MEXICO	88,598	1.52	1.54	163.00	1.71	1.70	1.61	1.24	1.37	1.17	0.50	7.54	11.17	14.36	18.25	20.97
CENTRAL AMERICA																
Belize	183	12.49	13.02	12.88	11.13	9.40	16.64	19.16	15.66	18.46	16.57	218.28	172.49	156.11	137.42	133.66
Costa Rica	3,015	4.19	3.71	3.72	3.69	3.75	0.29	0.32	0.35	0.24	0.38	6.47	4.62	6.53	6.69	4.22
El Salvador	5,252	3.77	4.07	4.25	3.72	4.38	4.95	2.60	1.81	1.87	2.76	9.85	18.42	15.43	15.12	30.29
Guatemala	9,197	5.53	6.06	4.76	3.71	3.32	5.20	6.84	6.06	4.75	4.54	15.82	20.77	26.69	29.18	32.34
Honduras	5,138	9.07	8.30	8.73	7.85	8.15	6.43	4.08	6.16	9.22	10.33	46.62	33.84	30.79	27.02	24.13
Nicaragua	3,871	15.08	12.80	13.53	13.98	12.03	6.00	4.86	9.12	12.28	9.24	22.87	26.72	14.98	28.16	17.86
Panama	2,418	17.44	17.74	17.41	14.28	13.04	0.48	0.53	0.43	0.18	0.16	18.14	12.77	7.91	8.17	5.77
CARIBBEAN AREA																
Haiti b)	6,504	4.35	3.47	0.64	1.00	0.21	2.38	1.97	1.96	3.64	0.74	32.25	37.07	0.00	32.37	0.00
Dominican Rep.	7,170	6.51	5.83	5.24	4.18	4.15	0.21	0.18	0.16	0.18	0.05	...	...	7.96	1.96	2.42
BRAZIL	150,368	2.43	2.15	2.34	2.29	2.19	3.20	3.60	3.87	3.92	3.73	15.82	15.04	18.19	15.82	10.16
GUIANAS																
French Guiana	92	7.66	35.77	29.71	39.99	53.47	11.65	25.83	36.23	69.82	64.23	...	...	...	755.56	0.00
Guyana	1,040	8.73	16.71	18.00	14.04	13.01	16.88	34.52	35.26	20.35	21.81	7.39	10.79	7.92	4.39	0.00
Suriname	403	13.41	7.61	8.56	5.87	4.61	3.46	5.30	6.86	4.28	3.99	12.61	0.00	1.86	0.44	9.82
ANDEAN AREA																
Bolivia	7,314	1.56	1.72	1.52	1.59	1.66	3.21	3.70	3.22	3.57	2.69	16.79	12.57	12.92	14.01	13.67
Colombia	31,819	1.63	1.45	1.67	1.79	1.56	3.04	3.01	3.30	3.21	3.13	12.36	9.59	7.47	6.85	7.45
Ecuador	10,782	2.86	3.30	3.27	1.38	3.37	5.33	6.40	5.25	2.22	6.65	5.93	6.81	22.96	13.76	18.94
Peru	22,332	0.91	0.73	0.59	...	0.40 c)	1.82	1.89	1.52	1.47	1.29 c)	10.72	9.75	6.95	...	1.86 c)
Venezuela	19,736	1.63	1.70	1.85	1.83	1.40 d)	0.81	0.98	2.44	2.25	1.78 d)	14.48	19.69	17.53	16.74	10.58 d)
SOUTHERN CONE																
Argentina	32,322	0.08	0.07	0.06	0.07	0.07	0.06	0.05	0.02	0.05	0.05	0.52	0.49	0.48	0.26	0.86
Paraguay	4,277	2.70	2.49	1.91	2.15	2.30	1.14	0.95	0.71	1.26	0.39	12.29	10.36	9.70	13.29	6.79

ABER = Annual Blood Examination Rate, per 100 inhabitants.
API = Annual Parasite Incidence, per 1000 inhabitants.
HSR = House Spraying Ratem per 1000 inhabitants.

Aug/27/90 (hs)

a) Based on the total population of the country, in thousands of inhabitants.
b) Information of 1988 is incomplete. c) Information up to October. d) Information up to September.

FIGURE 3


MALARIOMETRIC RATES OF 21 COUNTRIS
OF THE AMERICAS, ABER AND API
ABER (By 100 Inhab. API (By 1000 Inhab.)
6
5
4
3
2
1
0
60
65
70
75
80
85
90
YEARS
ABER
API

III. CURRENT SITUATION OF MALARIA PROGRAMS IN THE AMERICAS

A. General Information

In 1990 it was estimated that the population of the Americas was 698,199,000, of which 278,600,000 people were living in areas originally considered malarious, i.e., 39.8% of the total population and 50.60% of the total area of the Hemisphere (see Tables 5, 6, and 7).

During the year there were 1,045,808 cases of malaria in 36 countries of the Americas. Of this total, 7,221 cases were detected in areas considered non-malarious and 29,550 in areas where transmission has existed or has been interrupted for more than three years (maintenance phase), for a total of 36,771 cases (i.e. 3.51% of the total) diagnosed in areas without permanent transmission of malaria (see Table 8).

These figures reflect the constant threat of transmission in still vulnerable areas. In these areas, institutions for social protection are still insufficiently developed, which makes it difficult to detect epidemics. Usually, these vulnerable areas are characterized by either organized or spontaneous influxes of migrants or migratory traffic from areas with ongoing malaria transmission.

In 1990, the transmission of epidemics due to P. vivax in vulnerable areas of Brazil (Foz do Iguaçu and Manaus) and Mexico (Guerrero, Michoacán, and Oaxaca) was controlled through the implementation of integrated control measures. These actions were adapted to the particular characteristics of these areas, reinforcing the idea that malaria transmission should be approached as a focal problem, and successful and solutions and intervention measures must be planned and executed at the local level, as described below in the individual country descriptions.

The countries used different epidemiological surveillance systems. In Cuba, for example, 801,946 blood samples from travelers who entered the country were examined, and 462 cases were detected. In the United States of America, where detection depends on spontaneous demand, 877 cases were found (Table 8 and Map 2). Of the 7,221 cases registered in non-malarious areas, 378 cases were detected in the Bahamas (4), Barbados (3), Bermuda (3), and Canada (368), while 6,843 cases were found in other countries with originally non-malarious areas (Table 9).

Among the 21 countries of the Region of the Americas where transmission of malaria now occurs, 1,044,069 malaria cases were registered in 1990 (see Table 9 and Figure 4). Based on the situation during that year, the 21 countries with active malaria programs can be divided into the following subregions:

Mexico, Central America, Belize, and Panama.

This subregion, which includes the eight contiguous countries of Middle America--Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama--has 59,990,000 inhabitants living in originally malarious areas, i.e., 54.80% of a total population of 109,482,000 inhabitants. In Mexico, 49.3% of the population lives in malarious areas. In the other seven countries, 19,990,000 individuals, or 70.3% of the total population, live in such areas (Tables 10 and 11).

Nonetheless, if the annual parasitic incidence (API) is taken as an indicator of the magnitude of the malaria problem, it is apparent that the risk to these population groups of becoming ill from malaria in these countries ranges from 0.16 cases per 1,000 exposed population in Panama to 16.57 per 1,000 in Belize. In addition, the distribution of risk varies from country to country (see Map 3).

In 1990 Belize recorded the highest annual parasitic incidence for the subregion, with areas such as the Cayo district having an API of 45 per 1,000 inhabitants. Despite the recognized flow of population from El Petén, Guatemala to Chiapas, Mexico by way of Belize, 98.5% of the cases diagnosed have been due to P. vivax infections.

In Costa Rica, 1,146 P. vivax infections were registered, as were five cases due to P. falciparum. The malarious area of the country encompasses 69.6% of the national territory; but the transmission of malaria is concentrated in three provinces, where 85% of the cases were detected. Costa Rica has attained a high degree of control over the endemic disease, reflecting the country's high level of social development.

In El Salvador the trend toward control of malaria that began in the 1980s has been maintained following implementation of an approach based on epidemiological stratification and the integration of diagnostic, treatment, and epidemiological surveillance services. Of the 9,269 cases registered during the year, 80% were detected in 62 of the country's 262 municipios, which are considered to constitute the hyper-endemic area.

Guatemala has reported the diagnosis of 41,711 cases of malaria (97.6% P. vivax). Even though the distribution of risk is well-known (i.e. five of the country's 22 departments accounted for 65% of all cases registered), very little progress has been made in controlling the endemic disease.

Honduras, with 288 municipios, has reported the diagnosis of 53,095 cases (98.8% P. vivax) in 64 municipios located in six departments. Honduras continues to use universal spraying and medication with antimalarial drugs, but has been unable to make any

significant headway in controlling the endemic disease. Although efforts to analyze the malaria problem were stepped up in 1990, as yet no changes have been made in the country's intervention strategies.

In Mexico the epidemiological situation improved significantly, with a turnaround in the trend toward uncontrolled spread of P. vivax transmission, which began in 1983. The reduced magnitude of the malaria problem, from an API of 1.17 per 1,000 population in 1989 to 4 per 1,000 in 1990, reflects an intense mobilization of resources aimed at strengthening the technical capability of states with transmission and those where tourism is important. However, the epidemiological conditions of southern Mexico continue to generate foci of transmission, and P. falciparum persists in the rain forest (logging) region of the border with Guatemala and Belize.

Nicaragua reported 35,785 cases of malaria (95.6% P. vivax) in 1990, maintaining an API of 9.24 cases per 1,000 population. In 49 of the country's 143 municipios, where 29.3% of the population lives, the risk of becoming infected with malaria is three times greater than in the rest of the country.

There are some noteworthy operational contrasts in Nicaragua. The municipality of León, through the efforts of the local health authority, reduced malaria transmission by 80% from 1988 to 1990. This achievement came about through a careful study of the local stratification of transmission and a precise definition of the risk factors associated with the case-generating area. In a context of municipal intersectoral actions, progress has been made in draining vast, previously unrecognized breeding sites. In other smaller breeding sites, traditional cleaning treatments and application of larvicides have been used. In the municipio of El Viejo, a cotton- and sugarcane-producing area characterized by considerable use of pesticides, the national control program continues to employ traditional measures--house spraying of insecticides and active detection and treatment of cases. Despite these measures, the municipio still had the highest API in the country during 1990 (71.7 per 1,000 population).

In Panama, cases continue to be generated in three areas: the province of Darién, the San Blas comarca, and the Bayano region. These areas account for 32.3% of the national territory and 3.4% of the country's population. There are 72 case-generating localities, representing 0.74% of all localities in the country. Despite the low number of total cases, 27.56% of the infections are due to P. falciparum (Table 6).

Caribbean Area*

In the Caribbean region, the island of Hispaniola (Haiti and the Dominican Republic) continues to constitute an area of

transmission by P. falciparum. Haiti launched a program aimed specifically at the integrated control of malaria. Details on this program are included in the section on specific countries.

In the Dominican Republic epidemiological surveillance has been maintained. A total of 297,599 blood slides were examined, with positive results in 356 cases; 22 were due to P. vivax and were probably imported.

Andean Area

In the Andean subregion, Bolivia, Colombia, Ecuador, Peru, and Venezuela reported 254,803 cases of malaria among a population of 54,339,000 in the original malarious area, i.e., 58.3% of the total population in the malarious areas. These cases represented an increase of 13.54%, bringing the annual parasitic incidence in the subregion to 4.7 cases per 1,000 population (see Maps 4 and 5).

In view of the fact that in Colombia, Ecuador, and Venezuela more than one-fourth of the cases registered were P. falciparum infections, the situation should be considered serious.

Infections due to P. falciparum in Colombia (35,490) and Ecuador (21,871) showed a proportional distribution that deviated from the classical epidemiological picture. In Colombia, the concentration of cases shifted from the northeast (Sarare Region) to the west (Pacific Coast), while the situation in the Magdalena Medio region remained relatively unchanged. In Ecuador, four provinces (Esmeraldas, Manabi, Guayas, and Los Ríos) accounted for 92.45% of registered cases of P. falciparum infection (19,081), showing the same pattern as in Colombia. This contrasts with the classical Ecuadorian distribution of P. falciparum in the valleys of the Putumayo along the border with Colombia and the valley of the Napo river in the Amazon region.

In Venezuela the highest proportion of infections due to P. falciparum continued to occur in jungle areas of its Amazon region (federal territory of Amazonas and the state of Bolívar). (See description under Amazon Region together with Brazil and the Guianas.)

Bolivia registered 19,680 cases and Peru 28,882 (as of October 1990), of which 3.31% and 0.45%, respectively, were diagnosed as P. falciparum infections. This situation is characterized by apparent endemic stability. The relative increase in the diagnosis of cases due to P. falciparum in Peru, from zero in 1988 to 131 in 1990, has occurred mainly in the region of Piura, Tumbes. This region has a recognized focus in San Lorenzo, which was resistant to efforts aimed at interrupting transmission in Peru during the eradication period. This resurgence of P. falciparum infection in a country that had maintained complete interruption of transmission for many years is a discouraging development.

Amazon Region

For purposes of the present report, this region is considered to include the Amazon macroregion which encompasses parts of Brazil, French Guiana, Guyana, Suriname, and the area south of the Orinoco River Basin in Venezuela (state of Bolívar and federal territory of Amazonas). (See Map 4.)

This region is considered an "unreachable" area in terms of traditional eradication strategy. In these areas traditional control measures such as household spraying and case detection and treatment have not achieved the same results as in areas with greater population density with higher basic indicators for social and economic development.

However, in this region the last decade has seen the opening of "great frontiers" in the context of a model of economic development has failed to assign sufficient importance to the development and social protection of man. There has been a tremendous volume of human traffic into and out of these frontiers of economic development, aided by the opening of roads and the ease of air and river transport, and this has created serious ecological imbalances. The situation has been exacerbated by an increase in the number of susceptible persons due to expansion of the parasite reservoir, as well as growth in vector population density as a result of ecological changes.

In this context of deficient social protection, traditional control programs have proven inadequate and the malaria control measures employed have been inappropriate for the region. There has been a lack of concrete possibilities for the implementation of intersectoral measures of social protection, sometimes owing to the absence of institutions in the area and other times due to the lack of a technical strategy for generating new, broader social measures.

This Amazon region has reported the diagnosis of 622,160 cases of malaria, of which, 278,421 were infections due to P. falciparum. They originated mainly in the jungles of the Amazon area, which account for 80.6% of all diagnosed cases of P. falciparum infection in the Region of the Americas.

Southern Cone

This area, which comprises mainly Paraguay and Argentina, is strongly affected in certain areas by the influx of population from southern Brazil through Paraguay (see Map 5).

These two countries, with a population in malarious areas of 7,947,000 inhabitants, registered 4,572 malaria cases (API of 0.39 per 1,000 and 0.79 per 1,000 population, respectively).

The traditional reservoir of cases in Paraguay (Amambay) has expanded considerably due to agricultural development, particularly since the creation of the Itaipú reservoir, which has forced the country to reactivate "attack" areas as part of its eradication strategy. Furthermore, the reservoirs and dams being constructed along the border with Argentina merit special attention. Engineering projects should seek to minimize the creation of conditions that are optimal for the expansion of vector density, which is favored by the increase in relative humidity of the air around the water reservoir.

B. Status of Malaria in Countries with Transmission of the Disease

Table 12 shows a comparison between the passive and active case-finding in each of the countries. In general the largest numbers of malaria patients continue to be detected through passive methods. However, seven countries have yet to change their system for detecting malaria cases. These countries--Argentina, Bolivia, Costa Rica, Panama, the Dominican Republic, Paraguay, and Venezuela--continue to employ active case-finding methods even though fewer cases are discovered this way than through passive case-detection. In 1990, the total of 861,733 blood samples taken by these countries through active case-finding, will all the efforts and costs that this implied, produced only 15,721 positive slides, yielding a slide positivity rate (SPR) of 1.8%. By contrast, the examination of 414,431 blood samples taken through passive case-detection (half the number obtained through active detection) revealed 45,501 positive cases--three times more than those discovered through active case-finding.

Field Operations

Use of insecticides continues to be the principal control measure. Table 13 shows the number of insecticide sprayings in malaria programs during 1989 and 1990. Table 14 shows insecticide use in each country during 1990 and estimates for 1991. Table 15 reflects the quantities used from 1987 to 1990. DDT is still the most commonly used insecticide, although in several countries, especially in Central America, it is no longer used.

Antimalarial drugs are used for ongoing presumptive treatment in most of the countries. Table 16 shows the quantities utilized, country by country, for 1990 and the estimated figures for 1991. Table 17 shows data on the total quantities of drugs consumed from 1986 to 1990.

Table 18 contains information on personnel engaged in malaria programs during 1989 and 1990.

Problems in the Implementation of Malaria Programs

The problems encountered in connection with the implementation of malaria programs are summarized in Table 19. Although information is lacking on five countries that have both technical and administrative problems, the table shows the population, area, insecticides used, number of cases registered, principal vectors, and causes of the problem. In the 13 countries for which information is included in the table, 621,722 cases were diagnosed, i.e. 59.6% of all cases registered in the 21 malarious countries of the Americas.

Table 5

STATUS OF MALARIA PROGRAM IN THE AMERICAS, BY POPULATION, 1990

Countries (by geographical sub-region)	Total Population a)	Population of originally malarious areas							
		Total Mal. area		Maintenance		Consolidation		Attack	
		Total	%	Total	%	Total	%	Total	%
Anguilla	7 b)	-	-	-	-	-	-	-	-
Antigua	86 b)	-	-	-	-	-	-	-	-
Netherland Antilles	195 b)	-	-	-	-	-	-	-	-
Bahamas	262 b)	-	-	-	-	-	-	-	-
Barbados	261 b)	-	-	-	-	-	-	-	-
Bermuda	58 b)	-	-	-	-	-	-	-	-
Canada	26,525 b)	-	-	-	-	-	-	-	-
Cuba	10,603	3,608 c)	34.03	3,608 d)	100.00	-	-	-	-
Chile	13,173 b)	325 c)	2.47	325	100.00	-	-	-	-
Dominica	78	17 c)	21.79	17 d)	100.00	-	-	-	-
United States of Amer.	226,575	64,166 c)	28.32	64,166 d)	100.00	-	-	-	-
Grenada	100	39	39.00	39 d)	100.00		-	-	-
Guadalupe	340 b)	333 c)	97.94	333 d)	100.00	-	-	-	-
Cayman Islands	21 b)	-	-	-	-	-	-	-	-
Falkland Islands	2 b)	-	-	-	-	-	-	-	-
Turks and Caicos Islands	9 b)	-	-	-	-	-	-	-	-
Virgin Islands (USA)	96	96	100.00	96 d)	100.00	-	-	-	-
Virgin Islands (UK)	14 b)	-	-	-	-	-	-	-	-
Jamaica	2,400	2,041 c)	85.04	2,041 d)	100.00	-	-	-	-
Martinica	331 b)	207 c)	62.54	207 d)	100.00	-	-	-	-
Montserrat	13 b)	-	-	-	-		-		-
Puerto Rico	3,186	3,186 c)	100.00	3,186 d)	100.00	-	-	-	-
St. Kitts-Nevis	50 b)	-	-	-	-	-	-	-	-
St. Peter & Miquelon	6 b)	-	-	-	-	-	-	-	-
St. Vincent	112 b)	-	-	-	-	-	-	-	-
Saint Lucia	136 b)	117 c)	84.78	117 d)	-	-	-	-	-
Trinidad and Tobago	1,234	1,178 c)	95.46	1,178 d)	100.00	-	-	-	-
Uruguay	3,128 b)	-	-	-	-	-	-	-	-
Mexico	81,141	40,000	49.30	-	-	-	-	40,000	100.00
Belize	183	183	100.00	-	-	-	-	183	100.00
Costa Rica	3,015	835	27.69	-	-	719	86.11	116	13.89
El Salvador	5,252	4,727	90.00	-	-	-	-	4,727	100.00
Guatemala	8,425	3,429	40.70	-	-	-	-	3,429	100.00
Honduras	5,177	4,620	89.24	-	-	-	-	4,620	100.00
Nicaragua	3,871	3,871	100.00	-	-	-	-	3,871	100.00
Panama	2,418	2,325	96.15	-	-	1,940	83.44	385	16.56
Haiti	6,000	5,360	89.33	-	-		-	5,360	100.00
Rep. Dominicana	7,170	7,127	99.40	6,979	97.92	52	0.73	96	1.35
French Guiana	112	112	100.00	41	36.61	62	55.36	9	8.04
Guyana	768 e)	768 c)	100.00	639	83.20	-	-	129	16.80
Suriname	420	302	71.90	267	88.41	6	1.99	29	9.60
Brazil	154,236	67,342	43.66	17,704	26.29	25,789	38.30	23,849	35.41
Bolivia	6,798	2,645	38.91	-	-	-	-	2,645	100.00
Colombia	33,547	22,555	67.23	-	-	17,265	76.55	5,290	23.45
Ecuador	10,782	6,250	57.97	-	-	-	-	6,250	100.00
Peru	22,332	7,370	33.00	-	-	-	-	7,370	100.00
Venezuela	19,735	15,519	78.64	14,850 f)	95.69	-	-	669	4.31
Argentina	34,079	4,241	12.44	4,136	97.52	-	-	105	2.48
Paraguay	4,277	3,706	86.65	1,051	28.36	1,648	44.47	1,007	27.17
T o t a l	698,741	278,600	39.87	120,980	43.42	47,481	17.04	110,139	39.53

a) Population in thousands. b) Midyear population estimated by PAHO. c) Pop. living in areas where malaria eradication has been registered by PAHO/WHO. d) Includes an area of 11,425,915 inhabitants where malaria eradication has been registered by PAHO/WHO.

Table 6

STATUS OF MALARIA PROGRAMS IN THE AMERICAS, BY AREA, 1990
(Area in Km2)

Countries (by geographical sub-region)	Total area	Originally malarious areas							
		Total Mal. area		Maintenance		Consolidation		Attack	
		Total	%	Total	%	Total	%	Total	%
Antigua	280	-	-	-	-	-	-	-	-
Netherlands Antilles	961	-	-	-	-	-	-	-	-
Bahamas	11,396	-	-	-	-	-	-	-	-
Barbados	430	-	-	-	-	-	-	-	-
Bermuda	53	-	-	-	-	-	-	-	-
Canada	221,016	-	-	-	-	-	-	-	-
Cuba	110,860	37,502 a)	33.83	37,502 b)	100.00	-	-	-	-
Chile	741,767	55,287	7.45	55,287	100.00	-	-	-	-
Dominica	765	164 a)	21.44	164 b)	100.00	-	-	-	-
United States of America	9.365,604	2,309,876 a)	24.66	2,309,876 b)	100.00	-	-	-	-
Grenada	344	103 a)	29.94	103 b)	100.00	-	-	-	-
Guadalupe	1,950	1,244	63.79	1,244 b)	100.00	-	-	-	-
Cayman Islands	183	-	-	-	-	-	-	-	-
Falklan Islands	11,961	-	-	-	-	-	-	-	-
Turks and Caicos	522	-	-	-	-	-	-	-	-
Virgin Islands (USA)	345	345 a)	100.00	345 b)	100.00	-	-	-	-
Virgin Islands (UK)	174	-	-	-	-	-	-	-	-
Jamaica	10,991	10,028 a)	91.24	10,028 b)	100.00	-	-	-	-
Martinica	1,080	300 a)	27.78	300 b)	100.00	-	-	-	-
Montserrat	84	-	-	-	-	-	-	-	
Puerto Rico	8,896	8,896	100.00	8,896 b)		-	-	-	-
St. Christopher and Nevis	396	-	-	-	-	-	-	-	-
San Pierre and Miquelon	240	-	-	-	-	-	-	-	-
St. Vincent	389	-	-	-	-	-	-	-	-
Saint Lucia	620	510 a)	82.26	510 b)	100.00	-	-	-	-
Trinidad and Tobago	5,128	4,963 a)	96.78	4,963 b)	100.00	-	-	-	-
Uruguay	186,926	-	-	-	-	-	-	-	-
Mexico	1,967,183	1,150,000	58.46	-	-	-	-	1,150,000	100.00
Haiti	27,750	24,938	89.87	-	-	-	-	24,938	100.00
Dominican Rep.	48,442	47,562	98.18	44,281	93.10	1,096	2.30	2,185	4.59
Belize	22.965	22,965	100.00	-	-	-	-	22,965	100.00
Costa Rica	50,900	35,446	69.64	-	-	27,832	78.52	7,614	21.48
El Salvador	21,041	19,153	91.03	-	-	-	-	19,153	100.00
Guatemala	108,889	80,350	73.79	-	-	-	-	80,350	100.00
Honduras	112,088	100,079	89.29	-	-	-	-	100,079	100.00
Nicaragua	127,358	118,358	92.93	-	-	-	-	118,358	100.00
Panama	75,517	69,707	92.31	-	-	34,890	50.05	34,817	49.95
French Guiana	90,000	90,000	100.00	50	0.06	82,350	91.50	7,600	8.44
Guyana	215,025	215,025	100.00	61,175	28.45	-	-	153,850	71.55
Suriname	163,820	163,670	99.91	21,620	13.21	12,050	7.36	130,000	79.43
Brazil	8,511,965	6,898,045	81.04	190,469	2.76	1,226,413	17.78	5,481,163	79.46
Bolivia	1,098,581	821,346	74.76	-	-	-	-	821,346	100.00
Colombia	1,138,914	970,849	85.24	-	-	156,863	16.16	813,986	83.84
Ecuador	291,906	175,462	60.11	-	-	-	-	175,462	100.00
Peru	1,285,215	961,171	74.79	-	-	-	-	961,171	100.00
Venezuela	915,741	600,000	65.52	460,054 c)	76.68	343	0.06	139,603	23.27
Argentina	3,761,274	349,051	9.28	337,776	96.77	-	-	11,275	3.23
Paraguay	406,752	406,552	99.95	271,010	66.66	80,749	19.86	54,793	13.48
T o t a l	31,124,687	15,748,947	50.60	3,815,653	24.23	1,622,586	10.30	10,310,708	65.47

a) Estimated. b) Areas where malaria eradication has been certified by PAHO/WHO.
c) Includes an area of 407,945 km2 where malaria eradication has been certified by PAHO/WHO

Jul/29/90 (hs)

Table 7

MALARIA MORBIDITY IN THE AMERICAS
1958 - 1990

Year	Population (Thousands)		Blood Slides			Morbidity per 100,000 inhabitants	
	Total country	Malarious Area	Examined	Positives	%	Total country	Malarious area
1958	387,276	135,409	1,716,103	56,705	3.30	14.64	41.88
1959	394,606	145,920	2,749,117	75,612	2.75	19.16	51.82
1960	400,500	143,586	3,955,149	79,998	2.02	19.97	55.71
1961	416,008	147,292	5,341,004	99,639	1.87	23.95	67.65
1962	427,919	153,742	7,221,367	177,089	2.45	41.38	115.19
1963	434,950	152,021	7,903,156	227,026	2.87	52.20	149.34
1964	447,666	158,642	8,156,290	254,572	3.12	56.87	160.47
1965	455,527	146,389	9,069,950	241,462	2.66	53.01	164.95
1966	463,649	166,469	11,797,983	333,280	2.82	71.88	200.21
1967	474,868	169,901	11,609,228	369,388	3.18	77.79	217.41
1968	484,664	174,704	12,522,696	282,773	2.26	58.34	161.86
1969	491,483	176,325	12,179,190	323,782	2.66	65.88	183.63
1970	505,819	181,257	9,925,162	344,170	3.47	68.04	189.88
1971	513,544	185,492	10,134,212	338,416	3.34	65.90	182.44
1972	524,774	190,448	9,695,953	284,813	2.94	54.27	149.55
1973	535,109	195,528	9,400,682	280,276	2.98	52.38	143.34
1974	544,865	200,755	8,997,318	269,003	2.99	49.37	134.00
1975	555,676	205,872	9,276,878	356,692	3.84	64.19	173.26
1976	565,249	211,086	9,352,775	379,364	4.06	67.11	179.72
1977	576,942	215,550	9,274,480	398,925	4.30	69.14	185.07
1978	587,704	220,153	9,493,751	468,923	4.94	79.79	213.00
1979	600,263	226,361	8,630,653	515,271	5.97	84.47	227.63
1980	610,021	231,366	8,943,369	602,836	6.74	98.82	260.56
1981	627,375	239,260	9,100,529	629,629	6.92	100.36	263.16
1982	635,954	245,307	8,826,418	715,177	8.10	112.46	291.54
1983	639,212	249,327	9,113,611	830,700	9.11	129.96	333.18
1984	659,535	257,276	9,422,827	931,356	9.88	141.21	362.01
1985	665,777	259,838	9,485,203	910,917	9.60	136.82	350.57
1986	662,983	263,371	10,070,388	950,570	9.44	143.38	360.92
1987 a)	672,941	268,217	9,764,285	1,018,864	10.43	151.40	379.87
1988 a)	703,370	280,758	10,092,472	1,120,040	11.10	159.24	398.93
1989 a)	715,994	285,394	9,638,847	1,113,764	11.55	155.55	390.25
1990 a)	698,741	278,600	9,459,912	1,045,808	11.06	149.67	375.38

a) The information of some countries is provisional

Jul/29/91 (hs)

Table 8

NUMBER OF BLOOD SLIDES EXAMINED AND WITH PLASMODIA, BY GEOGRAPHICAL SUB-REGIONS AND BY PHASES OF THE PROGRAMS, 1990

Country (by geographical sub-region) *	T o t a l		Maintenance		Consolidation		Attack phase		Non-malarious areas	
	Blood slides		Blood slides		Blood slides		Blood slides		Blood slides	
	Examined	Positive	Examined	Positive	Exam.	Posit.	Exam	Posit.	Exam.	Posit.
Bahamas a)	...	4	-	-	-	-	-	-	...	4
Barbados a)	...	3	-	-	-	-	-	-	...	3
Bermuda a)	...	3	-	-	-	-	-	-	...	3
Canada a)	...	368	-	-	-	-	-	-	...	368
Cuba	801,946	462	801,946	462	-	-	-	-	-	-
Chile	0	0	0	0	-	-	-	-	-	-
Dominica	0	0	0	0	-	-	-	-	-	-
United States	...	877	...	877	-	-	-	-	-	-
Grenada	43	0	43	0	-	-	-	-	-	-
Guadeloupe	...	...	...	...	-	-	-	-	-	-
Caiman Islands	...	...	-	-	-	-	-	-	-	-
Jamaica	281	0	281	0	-	-	-	-	-	-
Martinique	229	12	229	12	-	-	-	-	-	-
Saint Lucia	...	4	...	4	-	-	-	-	-	-
Trinidad & Tabago	8,217	6	8,217	6	-	-	-	-	-	-
Mexico	1,503,208	44,513	-	-	-	-	1,503,208	44,513	-	-
Belize	17,204	3,033	-	-	-	-	17,204	3,033	-	-
Costa Rica	113,167	1,151	-	-	62,363	923	50,334	132	470	96
El Salvador	230,246	9,269	-	-	-	-	230,246	9,269	-	-
Guatemala	305,791	41,711	-	-	-	-	305,791	41,711	-	-
Honduras	418,513	53,095	-	-	-	-	418,513	53,095	-	-
Nicaragua	465,830	35,785	-	-	-	-	465,830	35,785	-	-
Panama	315,359	381	-	-	136,593	27	178,766	354	-	-
Haiti	13,743	4,806	-	-	-	-	13,743	4,806	-	-
Dominican Rep.	297,599	356	247,231	261	14,560	41	35,753	54	55	0
French Guiana	49,192	5,909	7,691	663	19,987	2,613	21,514	2,633	-	-
Guyana	135,260	22,681	-	-	-	-	-	-	-	-
Suriname	18,594	1,608	5,176	261	-	-	2,200	424	11,218	923
Brazil	3,294,234	560,396	62,097	2,020	504,153	5,760	2,699,502	547,658	28,482	4,958
Bolivia	121,743	19,680	-	-	-	-	121,743	19,680	-	-
Colombia	496,087	99,489	-	-	119,309	5,299	376,778	94,190	-	-
Ecuador	363,080	71,670	-	-	-	-	362,351	71,502	729	168
Peru b)	90,040	28,882	-	-	-	-	90,040	28,882	-	-
Venezuela c)	277,164	35,082	193,214	24,642	-	-	82,221	9,789	1,729	651
Argentina	24,725	1,660	12,145	335	-	-	12,552	1,297	28	28
Paraguay	98,417	2,912	4,112	7	39,807	138	54,344	2,748	154	19
T O T A L	9,459,912	1,045,808	1,342,382	29,550	896,772	14,801	7,042,633	971,555	42,865	7,221

* With the exception of countries without transmission. ... Information not available. (hs)

a) Information from "weekly Epidemiological Reports. b) Information up to October. c) Information up to September

MAP 2

COUNTRIES WITH NO EVIDENCE OF TRANSMISSION

Countries or territories	Population 1990 a) originally malarious area	Registered malaria cases 1987	1988	1989	1990
Bahamas	262 b)	18 c)	17 c)	5 d)	4 c)
Barbados	261 b)	1 c)	1	1 d)	3 c)
Bermuda	58 b)	-	0	1 d)	3 c)
Canada	26,525 b)	327 c)	184 e)	195 e)	368 e)
Cuba	3,608	290	824	762	462
Chile	325	2	0	0	0
Dominica	17	...	0	0	0
USA	64,166	786	870	1,203 d)	877 d)
Grenada	39	...	...	0	0
Guadalupe	333	...	...	4	...
Caiman Islands	21	2 c)	0	4	...
Jamaica	2,041	6	4	2 c)	0
Martinica	207	...	...	23	12
Saint Lucia	115	3 c)	...	...	4
Trinidad & T.	1,178	5	8	10	6
T O T A L	99,156	1,440	1,908	2,210	1,739

a) Population estimated in thousand inhabitants, from areas originally malarious.
b) Total population. c) Information from the Weekly Epidemiological reports.
d) Information from the CAREC Surveillance Report. e) Information from the Canada Weekly Report.

Table 9

SLIDES EXAMINED AND POSITIVES, BY SPECIE OF PLASMODIUM
NON-MALARIOUS AREAS, 1990

Country By geographical region	Blood slides			Specie of plasmodium		
	Examined	Positives	%	P. falci parum	P.vivax	P. malariae
Bahamas a)	...	4	...	...	...	...
Barbados a)	...	3	...	...	...	...
Bermuda a)	...	3	...	...	...	...
Canada a)	...	368	...	...	...	...
Costa Rica	470	96	20.43	2	94	-
Dom. Republic	55	0	0.00	-	-	-
Suriname	11,218	923	8.23	902	18	3
Brazil	28,482	4,958	17.41	1,544	3,410	4
Ecuador	729	168	23.05	12	156	-
Venezuela b)	1729	651	37.65	110	541	-
Argentina	28	28	100.00	-	28	-
Paraguay	154	19	12.34	2	17	-
TOTAL	42,865	7,221	16.85	2,572	4,264	7

... No available information (hs)
a) Information del "weekly epidemiological report"
b) Information up to September.

FIGURE 4

PERCENTAGE OF MALARIA CASES
AMERICAN REGION, 1990

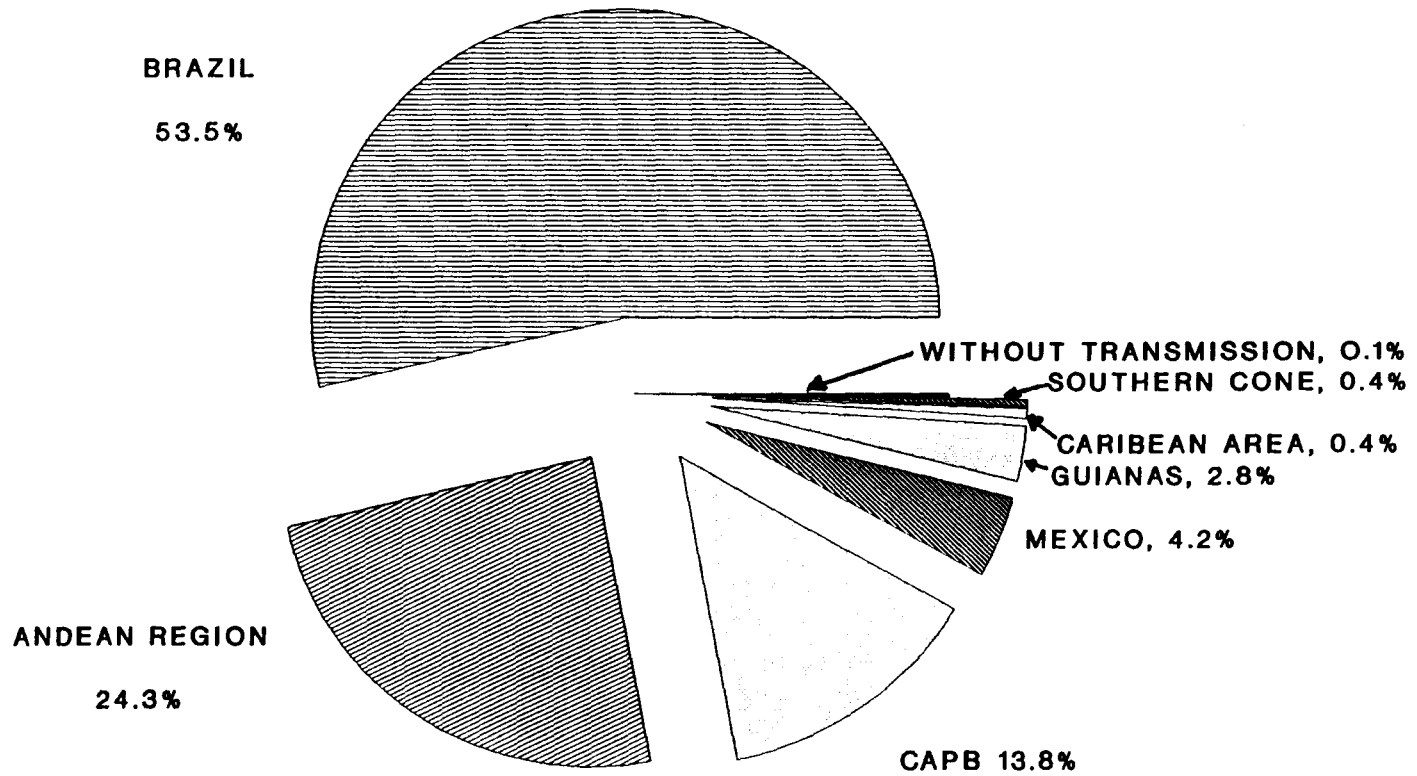


Table 10

EPIDEMIOLOGICAL SITUATION OF 21 COUNTRIES WITH ACTIVE MALARIA PROGRAMS, 1990

Countries (by geographical sub-regions)	Population malarious areas	Blood slides		Species of parasites			Epidemiological Indicators *			
		Examined	Posit.	P. falc. & Mixed	P. vivax	P.mal.	IAES	ILP	IPA	% de P.falc.
Mexico	40,000	1,503,208	44,513	62	44,451	0	3.76	2.96	1.11	0.14
Belize	183	17,204	3,033	40	2,987	6	9.40	17.63	16.57	1.32
Costa Rica	835	113,167	1,151	5	1,146	0	13.55	1.02	1.38	0.43
El Salvador	4,727	230,246	9,269	18	9,251	0	4.87	4.03	1.96	0.19
Guatemala	3,429	305,791	41,711	1,008	40,703	0	8.92	13.64	12.16	2.42
Honduras	4,620	418,513	53,095	659	52,436	0	9.06	12.69	11.49	1.24
Nicaragua	3,871	465,830	35,785	1,568	34,217	0	12.03	7.68	9.24	4.38
Panama	2,325	315,359	381	105	276	0	13.56	0.12	0.16	27.56
Sub-total	19,990	1,866,110	144,425	3,403	141,016	6	9.34	7.74	7.22	2.36
Haiti	5,360	13,743	4,806	4,806	0	0	0.26	34.97	0.90	100.00
Dominican Rep.	7,127	297,599	356	334	22	0	4.18	0.12	0.05	93.82
Sub-total	12,487	311,342	5,162	5,140	22	0	2.49	1.66	0.41	99.57
French Guiana	112	49,192	5,909	2,607	3,292	10	43.92	12.01	52.76	44.12
Guyana b)	768	135,260	22,681	12,904	9,777	0	17.61	16.77	29.53	56.89
Suriname	302	18,594	1,608	1,584	21	3	6.16	8.65	5.32	98.51
Sub-total	1,182	203,046	30,198	17,095	13,090	13	17.18	14.87	25.55	56.61
Brazil	67,342	3,294,234	560,396	252,191	308,184	21	4.89	17.01	8.32	45.00
Bolivia	2,645	121,743	19,680	652	19,028	0	4.60	16.17	7.44	3.31
Colombia	22,555	496,087	99,489	35,490	63,855	144	2.20	20.05	4.41	35.67
Ecuador	6,250	363,080	71,670	21,871	49,799	0	5.81	19.74	11.47	30.52
Peru c)	7,199	90,040	28,882	2131	28,693	58	1.25	32.08	4.01	0.45
Venezuela d)	15,519	277,164	35,082	9,135	25,944	3	1.79	12.66	2.26	26.04
Sub-total	54,168	1,348,114	254,803	67,279	187,319	205	2.49	18.90	4.70	26.40
Argentina	4,241	22,624	1,660	1	1,659	0	0.53	7.34	0.39	0.06
Paraguay	3,706	98,417	2,912	55	2,857	0	2.66	2.96	0.79	1.89
Sub-total	7,947	121,041	4,572	56	4,516	0	1.52	3.78	0.58	1.22
T O T A L	203,116	8,647,095	1,044,069	345,226	698,598	245	4.26	12.07	5.14	33.07

* ABER = Annual Blood Examination Rate. SPR = Slide Positive Rate. API = Annual Parasite Incidence
P. falc. = Plasmodium falciparum. P. mal. = Plasmodium malariae
a) Population in thousand of inhabitants. b) Provisional information. c) Information up to October.

MAP 3

MEXICO, CENTRAL AMERICA, BELIZE, PANAMA, HAITI AND DOMINICAN REP.

Countries	Population 1990 a) Originally malarious area	Registered Malaria cases 1987	1988	1989	1990
Mexico	40,000	102,984	116,238	101,241	44,513
Belize	183	3,258 b)	2,725	3,285	3,033
Costa Rica	835	883	1,016	699	1,151
El Salvador	4,727	12,834	9,095	9,605	9,269
Guatemala	3,429	57,662	52,561	42,453	41,711
Honduras	4,620	19,095	29,737	45,922	53,095
Nicaragua	3,871	17,011	33,047	45,982	35,785
Panama	2,325	1,195	1,000	427	381
Total, CAPB	19,990	111,938	129,181	148,373	144,425
Haiti	5,360	12,134	12,306 c)	23,231	4,806
Dominican Rep.	7,127	1,206	1,072	1,275	356
Total, CARIBE	12,487	13,340	13,378	24,506	5,162
TOTAL	72,477	228,262	258,797	274,120	194,100

a) Population in thousands of inhabitants. b) Provisional figures.
c) Incomplete information.

MAP 4

BRAZIL AND GUIANAS

Country	Population 1990 a) Originally malarious area	Registered Malaria Cases 1987	1988	1989	1990
Brazil	67,342	508,864	559,535	577,520	560,396
French Guiana	112	3,318	3,188	6,284	5,909
Guyana	768	34,142	35,470	20,822	22,681
Suriname	302	2,044	2,691	1,704	1,608
Total, Gianas	1,182	39,504	41,349	28,810	30,198
T O T A L	68,524	548,368	600,884	606,330	590,594

a) Population in thousands of inhabitants. b) Inf. up to November

MAPA 5

ANDEAN AREA AND SOUTHERN CONE

Country	Population 1990 a) Originally malarious area	Malaria cases registered 1987	1988	1989	1990
Bolivia	2,645	24,891	22,258	25,367	19,680
Colombia	22,555	90,014	100,850	100,286	99,489
Ecuador	6,250	63,503	53,607	23,274	71,670
Peru	7,370	39,136 b)	32,359 b)	32,114 b)	28,882 c)
Venezuela	15,115	17,988	45,349	43,374	35,082 d)
Total Area Andina:	53,935	235,532	254,423	224,415	254,803
Argentina	4,220	1,521	666	1,620	1,660
Paraguay	3,533	3,741	3,884	5,247	2,912
Total Cono Sur	7,753	5,262	4,550	6,867	4,572
T O T A L	61,688	240,794	258,973	231,282	259,375

a) Population in thousand inhabitants. b) Provisional figure. (hs)
c) Information up to October. d) Information up to September.

Table 11

MALARIA CASES REGISTERED IN THE REGION OF THE AMERICAS, 1987-1990

Countries (by geographical sub-regions		Population 1990 a) malarious areas	1987 Casos registrados	%	1988 Casos registrados	%	1989 Casos registrados	%	1990 Casos registrados	%
Countries without transmission and where Eradication of Malaria has been certified		75,313 b)	1,440 c)	0.14	1,908 c)	0.17	2,032 c)	0.18	1,739 c)	0.17
MEXICO		40,000	102,984	10.11	116,238	10.38	101,241	9.09	44,513	4.26
CAPB	Belize	183	3,258 c)		2,725		3,285		3,033	
	Costa Rica	835	883		1,016		699		1,151	
	El Salvador	4,727	12,834		9,095		9,605		9,269	
	Guatemala	3,429	57,662		52,561		42,453		41,711	
	Honduras	4,620	19,095		29,737		45,922		53,095	
	Nicaragua	3,871	17,011		33,047		45,982		35,785	
	Panama	2,325	1,195		1,000		427		381	
Sub-total		19,990	111,938	10.99	129,181	11.53	148,373	13.32	144,425	13.81
CARIBE	Haiti	5,360	12,134		12,306 d)		23,231		4,806	
	Dominican Rep.	7,127	1,206		1,072		1,275		356	
Sub-total		12,487	13,340	1.31	13,378	1.19	24,506	2.20	5,162	0.49
GUIANAS	French Guiana	112	3,318		3,188 c)		6,284		5,909	
	Guyana	768 c)	34,142		35,470		20,822		22,681 c)	
	Suriname	302	2,044		2,691		1,704		1,608	
Sub-total		1,182	39,504	3.88	41,349	3.69	28,810	2.59	30,198	2.89
BRAZIL		67,342	508,864	49.94	559,535 c)	49.96	577,520	51.85	560,396	53.58
ANDEAN REGION	Bolivia	2,645	24,891		22,258		25,367		19,680	
	Colombia	22,555	90,014		100,850		100,286		99,489	
	Ecuador	6,250	63,503		53,607		23,274		71,670	
	Peru	7,370	39,136 c)		32,359 c)		32,114 d)		28,882 e)	
	Venezuela	15,519	17,988		45,827		43,374		35,082 f)	
Sub-total		54,339	235,532	23.12	254,901	22.76	224,415	20.15	254,803	24.36
SOUTHERN CONE	Argentina	4,241	1,521		666		1,620		1,660	
	Paraguay	3,706	3,741		2,884		5,247		2,912	
Sub-total		7,947	5,262	0.52	3,550	0.32	6,867	0.62	4,572	0.44
TOTAL		278,600	1,018,864	100.00	1,120,040	100.00	1,113,764	100.00	1,045,808	100.00

a) Population in thousands. b) The total population of these countries is 289,003 inhabitants; including the total population of countries which have never been malarious, (see Table and Map 2). c) Provisional figure. (hs)
d) Incomplete provisional figure. e) Information up to October. d) Information up to September.

Table 12
COMPARATIVE RESULTS OF ACTIVE AND PASSIVE CASE DETECTION
UNDER MALARIA PROGRAMS IN THE AMERICAS, 1990

Countries (by geographical sub-region) *	Number of Evaluators	Active case detection			Pasive case detection					TOTAL		
		Blood slides			Product. notific.	Blood slides			Average slides per productive Not. post	Blood slides		
		Examined	Positives	%	Posts	Examined	Positives	%		Examined	Positives	%
Bahamas a)	-	-	-	-	-	4	4	-	-	...	4	-
Barbados a)	-	-	-	-	-	3	3	-	-	...	3	-
Bermuda a)	-	-	-	-	-	3	3	-	-	...	3	-
Canada a)	-	-	-	-	-	...	368	-	-	...	368	-
Cuba	-	91,815	...	-	-	710,131	...	-	-	801,946	462	0.06
Chile	-	-	-	-	-	-	-	-	-	0	0	0
Dominica	-	-	-	-	-	-	-	-	-	0	0	0
United States	-	-	-	-	-	...	877	-	-	...	877	-
Grenada	-	-	-	-	-	43	0	-	-	43	0	0.00
Guadeloupe	-	-	-	-	-	-	-	-	-	...	...	...
Caiman Islands	-	-	-	-	-	-	-	-	-	...	...	...
Jamaica	-	231	0	-	-	50	0	0.00	-	281	0	0.00
Martinique	-	-	-	-	-	229	12	5.24	-	229	12	5.24
Saint Lucia	-	-	-	-	-	...	4	-	...	...	4	...
Trinidad & Tobago	-	4,617	6	-	-	3,600	0	-	-	8,217	6	0.07
Mexico	...	...	...	...	...	...	...	...	...	1,503,208	44,513	2.96
Belize	19	5,980	442	7.39	317	11,224	2,591	23.08	2.95	17,204	3,033	17.63
Costa Rica	110	110,057	754	0.69	79	3,110	397	12.77	3.28	113,167	1,151	1.02
El Salvador	105	57,995	494	0.85	2,503	172,251	8,775	5.09	5.73	230,246	9,269	4.03
Guatemala	100	397	8	2.02	1,780	305,394	41,703	13.66	14.30	305,791	41,711	13.64
Honduras	180	...	...	...	...	...	...	...	...	418,513	53,095	12.69
Nicaragua	205	47,015	921	1.96	3,924	418,815	34,864	8.32	8.89	465,830	35,785	7.68
Panama	294	182,000	227	0.12	240	133,359	154	0.12	46.31	315,359	381	0.12
Haiti	...	-	-	-	...	13,743	4,806	34.97	...	13,743	4,806	34.97
Dominican Rep.	168	251,974	201	0.08	...	45,625	155	0.34	...	297,599	356	0.12
French Guiana	...	20,163	950	4.71	...	29,029	4,959	17.08	...	49,192	5,909	12.01
Guyana b)	...	...	...	...	...	...	...	...	...	135,260	22,681	16.77
Suriname	45	5,981	483	8.08	108	12,613	1,125	8.92	9.73	18,594	1,608	8.65
Brazil	...	1,397,364	53,384	3.82	20,125	1,896,870	507,012	26.73	7.85	3,294,234	560,396	17.01
Bolivia	64	83,649	6,628	7.92	...	38,094	13,052	34.26	...	121,743	19,680	16.17
Colombia	337	89,996	9,504	10.56	312	406,091	89,985	22.16	108.46	496,087	99,489	20.05
Ecuador	...	47,992	7,092	14.78	...	315,088	64,578	20.50	-	363,080	71,670	19.74
Peru c)	...	15,679	2,562	16.34	...	74,361	26,320	35.39	...	90,040	28,882	32.08
Venezuela d)	724	167,296	6,830	4.08	...	109,868	28,252	25.71	-	277,164	35,082	12.66
Argentina	70	16,657	598	3.59	53	8,068	1,062	13.16	12.69	24,725	1,660	6.71
Paraguay	...	50,100	483	0.96	...	48,317	2,429	5.03	...	98,417	2,912	2.96
T o t a l	-	2,646,958	91,567	3.46	-	4,755,983	833,490	17.53	-	9,459,912	1,045,808	11.06

... No available information. (hs)
a) Information from Weekly Epidemiological Report. b) Provisional information. c) Information up to October. d) Information up to September.

Table 13

SPRAYINGS WITH RESIDUAL INSECTICIDES APPLIED IN 1989 and 1990

Countries (by geogra- sub-regions)	Hydrochlorides		Organophosphates				Carbamatos				Pirethroides	
	DDT		Malathion		Propoxur		Bendiocarb		Deltamethrin		Deltamethrim	
	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990
Mexico	1,509,022	1,830,543	-	-	3,469	-	-	-	74,068	27,222	-	-
Belize	24,460	...	-	...	-	...	-	...	-	...	-	...
Costa Rica	-	-	10,493	7,492	-	-	9,171	5,217	-	-	-	-
El Salvador	-	-	-	-	-	-	73,866	70,496	3,765	18,116	-	-
Guatemala b)	-	-	-	-	153,401	1,850 a)	28,507	-	-	-	76,043	295,641
Honduras	-	-	-	-	134,593	123,963	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	68,348	-	-	-	-	105,454	-
Pamama	804	-	-	-	15,665	13,955 b)	2,892	(b)	-	-	-	-
Haiti	-	-	-	-	206,541	-	-	-	-	-	-	-
Domincan Rep.	13,788	17,342	-	-	-	-	-	-	-	-	-	-
French Guiana	68,000 c)	-	-	-	-	-	-	-	-	-	-	-
Guyana	4,490	...	-	...	-	...	-	...	-	...	-	...
Suriname	176	3,959	-	-	-	-	-	-	-	-	-	-
Brazil	2,332,347 d)	1,527,169 d)	-	-	-	-	-	-	-	-	-	-
Bolivia	94,457	99,989	213	-	-	-	-	-	-	-	-	-
Colombia	225,721 e)	210,593	-	-	(e)	13,993	-	-	-	-	-	-
Ecuador	9,035	173,987	133,144	30,265	2,167	-	-	-	-	-	-	-
Peru	...	41,564	-	-	-	-	-	-	-	-	-	-
Venezuela	193,089	126,711 f)	-	-	129,144	82,092	-	-	-	-	-	-
Argentina	8,165 g)	27,868 g)	-	-	-	-	-	-	-	-	-	-
Paraguay	39,386	29,047	15,249	-	-	-	-	-	-	-	-	-
T O T A L	4,522,940	4,088,772	159,099	37,757	644,980	304,201	114,436	75,713	77,833	45,338	181,497	295,641

... Information not available.

a) (GUT) Includes houses sprayed with Deltamethrim and Fenitrothion. b) (PAN) Includes sprayed houses with Propoxur and Fenitrothion.

c) (FRG) Includes houses sprayed with Deltamethrin, Fenitrothion and Actellic. d) (BRA) Includes houses sprayed with DDT, Malathion and Deltamethrim. e) (COL) Includes houses sprayed with DDT and Fenitrothion. f) (VEN) Information up to September.

g) (ARG) Includes houses sprayed with DDT and K'otrina.

Jul.31/91 (hs)

Cuadro 14

INSECTICIDAS UTILIZADOS EN 1990 POR LOS PROGRAMAS DE MALARIA.
Y CANTIDAD ESTIMADA PARA 1991

País	D D T (Kg)				Malation 50 %		Propoxur 50% (Kg.)		Fenitrotion 40% (Kg.)		O t r o s	
	1990		1991 (Est.)		1990	1991 (Est)	1990	1991	1990	1991	1990	1991
	100%	75%	100%	75%								
Mexico	50,525	1,254,925	54,500	1,421,175	117,334	144,536	-	-	-	-	194,552 a)	173,820 a)
Belice	5,000	8,000	5,000	8,000	972 b)	972 b)	-		-	-	-	-
Costa Rica	-	-	-	-	6,559 c)	14,000 c)	1,897	3,000	-	-	2,370 c)	4,000 c)
El Salvador	-	-	-	-	-		11,302	...	-	-	7,876 d)	10,000 d)
Guatemala	-	-	-	-	-	-	3,014	40,000	85,809	100,000	34,460 e)	65,000 e)
Honduras	-	-	-	-	-	-	-	-	507,424	500,424	-	-
Nicaragua	-	-	-	-	-	-	-	-	10,127	15,000	27,339 f)	20,000 f)
Panama	-	-	-	-	-	-	906	...	6,872 g)	18,000 g)	-	-
Haiti	-	-	-	-	-	-	-		-	-	-	-
Rep. Dominicana	119	...	7,192	...	-	-	-		-	-	-	-
Guay. Francesa	-	-	280	...	-	-	-	-	-	-	3,820 h)	...
Guyana	...	...	...	...	...	...	...	...	...	...	...	...
Suriname	70	3,394	200	4,000	...	...	...	...	...	...	...	...
Brasil	24,033	354,680	-	1,680,000	7,500	...	-	-	-	-	2,792 i)	...
Bolivia	-	113,057	-	100,000	-	-	-	-	-	-	-	-
Colombia	312	118,939	7,000	330,000	-	-	-	-	5,375	60,000	-	-
Ecuador	340	102,355	400	212,000	21,654	50,000	-	-	-	-	-	-
Peru	-	16,722	...	276,800	-	-	-	-	-	-	-	-
Venezuela j)	-	-	-	-	42,229	57,448	-	-	92,300 k)	186,673 k)	100,986 l)	168,013 l)
Argentina	701	5,496	1,000	10,000	-	-	-	-	584 m)	-	-	-
Paraguay	-	14,741	-	16,215	-	-	-	-	-	-	-	-
Total	81,100	1,990,309	75,572	4,058,190	196,248	266,956	17,119	43,000	708,491	880,097	374,195	440,833

... No se dispone de informacion.

a) (MEX) En 1990 incluye 138,650 Kg. Fention 2%, 3,440 Lit. Temefos 50%, 41,500 Kg. Temefos 1% y 11,002 Kg. Bendiocrb 80%.Para 1991 se estiman 79,000 Kg. Fention 2%, 4,320 L Temefos 50%; y 90,500 Kg. Temefos 1% b) (BZE) Galones de Fenitrotion. c) (COR) Incluye, 4,057 K. Mal. 50%, 962 Lit, Mal. 95% y 1550 L. Mal 57%. Para 1991 se estiman 10,000 K. Malation 50%, 2,000 L. Mal. 95% y 2,000 Lt. Mal. 57% d) (ELS) Incluye 6,321 K. Bendiocarb 80%, 425 Gal. Abate en Emulsion y 1,130 Gal. Permetrina. e) (GUT) Incluye 10,199 K. Deltametrina 5% y 29,261 K. Fention 2%. Para 1991 se estiman 15,000 K Deltametrina 5% y 50,000 K Fentión 2%. f) (NIC) Kilos de Deltametrina. g) (PAN) Incluye 6,872 K. Fenitrotion 40% y 656 L. Fenit. 50% y para 1991 se estiman 18,000 K. y 1,000 L. Fenitrotion 40 y 50%. h) (FRG) Litros DDT.

Jul/19/91 (hs)

Table 15

NUMBER OF INTRADOMICILIARY SPRAYINGS WITH RESIDUAL INSECTICIDES, 1987-1990

Insecticides	1987		1988		1989		1990	
	Number of countries	Sprayings	Number of countries	Sprayings	Number of countries	Sprayings	Number of countries	Sprayings
DDT	12 b)	3,979,995 b)	15 c)	4,523,053 c)	14 d)	4,522,940 d)	10 e)	4,088,772 e)
FENITROTION	9 b)	640,741 b)	6	476,335	7	644,980	5 f)	290,208 g)
PROPOXUR	5	123,841	4	88,809	4	114,436	2	75,713 f)
MALATHION	1	12,899	2	162,621	4	159,099	2	37,757
DELTAMETHRIN	3	191,806 g)	3	133,991	2	181,497	1	295,641
BENDIOCARB	1	121,618	1	181,484	2	77,833	2	45,338
CHLORFOXIM	1	5,420	-	-	-	-		
T O T A L	-	5,076,320		5,566,293	-	5,700,785	-	4,833,429

a) Information from two countries is not included. b) Includes sprayings with Fenitrothion and Deltamethrim from two countries. c) Includes Sprayings with Malathion, Fenitrothion, Deltamethrim and Piretroides from 3 countries. d) Includes Sprayings with DDT, Deltamethrim, Malathion and Actellic from 4 countries. e) Includes sprayings with Malathion and Deltamethrin from 3 countries. f) Includes houses sprayed with Deltamethrim, Fenitrothion and Propoxur

Jul.31/91 (hs)

Jan/24/91 (hs)

Table 16

CONSUMPTION OF ANTIMALARIAL DRUGS IN 21 COUNTRIES WITH ACTIVE MALARIA PROGRAMS

Drug		QUANTITIES				
		1986	1987	1988	1989 a)	1990 b)
4-Aminoquinolines:						
Chloroquine (150 mg. base)	Tabs.	29,729,100	49,193,600	38,647,500	51,114,500	48,961,700
Amodiaquine (150 mg. base)	Tabs.	13,356,000	5,057,800	5,439,000	2,380,800	1,162,000
8-Aminoquinolines:						
Primaquine (15 mg. base)	Tabs.	8,756,100	9,656,700	14,734,800	19,767,500	18,079,200
Primaquine (05 mg. base)	Tabs.	5,600,900	4,084,700	7,463,400	9,151,900	11,428,200
Chloroquine/Primaquine (150/15)	Tabs.	7,036,900	9,922,100	5,073,200	7,474,400	7,281,100
Cloroquine/Primaquine (75/7.5)	Tabs.	1,485,600	1,419,000	765,400	1,538,600	1,747,000
Pyrimethamine (25 mg. base)	Tabs.	392,100	431,400	127,900	289,200	263,200
Sulphfadoxine (500 mg. base)	Tabs.	854,500	202,500	500	321,400	167,200
Sulphadoxine/Pirimethamine	Tabs.	1,246,500	2,372,300	2,532,400	918,200	135,500
Chloroquine/Pyrimethamine	Tabs.	13,000	2,000	0	0	0
Amodiaquine/Primaquine	Tabs.	655,000	851,500	0	0	0
Mefloquine	Tabs.	13,600	17,500	105,788	72,900	302,300
Paludrine	Tabs.	12,000	-	0	0	0
Tetracycline	Tabs.	2,000	-	0	630,003	0
Lapudrine (20 mg. base)	Tabs.	10,000	-	0	0	0
Quinine/Sulphate (200,300 y 500 mg)	Tabs.	975	242,000	2,472,200	3,587,400	3,477,300
Quinine Dihydrocloride	Tabs.	-	-	108,500	14,000	535,000
Quinine - Sulphate	Ampoules	15	22,500	15,100	85,600	14,100
Total		69,164,290	83,475,600	77,485,688	97,346,403	93,553,800

a) In additon, Brazil, used 36,017 Paludil Ampules.
b) Venezuela used also Chloroquine Dihydrocloride and Mitizina.

Jul/31/91 (hs)

Table 17

USE OF ANTIMALARIAL DRUGS IN 1989 AND REQUIREMENTS FOR 1990

Countries (by geographical region)	Chloroquine 150 mg.		Primaquine 15 mg.		Primaquine 05 mg		Chloroquine/Primaquine combined Adult doses		Chloroquine/Primaquine combined Infant doses		Pyrimethamine 25 mg	
	1990	1991 a)	1990	1991 a)	1990	1991 a)	1990	1991 a)	1990	1991 a)	1990 a)	1991
Mexico	10,468.0	7,347.0	3,111.8	1,322.5	3,970.0	1,927.5	1,888.0	2,671.0	640.0	698.0		
Belize	65.0	75.0	35.0	40.0	35.0	40.0	-	-	-	-	-	-
Costa Rica	752.9	1,100.0	73.2	150.0	65.2	100.0	300.2	350.0	5.9	25.0	-	-
El Salvador	312.0	70.0	480.3	20.0	407.0	5.0	1,604.0	3,500.0	475.0	500.0	-	-
Guatemala	1,570.4	6,500.0	194.9	240.0	150.5	1,200.0	34.7	1,500.0	26.6	150.0	-	-
Honduras	1,608.4	1,930.1	461.6	776.9	528.6	678.6	657.8	757.8	30.4	80.4	-	-
Nicaragua	10,000.0	10,000.0	6,441.3	6,000.0	3,000.0	-	-	-	-	-	-	-
Panama	77.0	100.0	32.0	100.0	49.0	100.0	359.0	500.0	17.0	25.0	19.0	25.0
Haiti	1,250.0	-	14.1	-	-	-	-	-	-	-	-	-
Dominican Rep.	300.5	405.6	-	-	8.5	1.0	895.1	1,202.4	-	-	-	-
French Guiana	...	...	...	...	...	...	...	...	...	...	...	...
Guyana	...	...	...	...	...	...	...	...	...	...	...	...
Suriname	75.0	80.0	10.9	12.0	19.0	20.0	-	-	-	-	-	-
Brazil	14,661.0	17,202.2	4,542.4	4,708.4	2,056.0	1,177.1	-	-	-	-	-	-
Bolivia	450.3	...	406.0	...	703.0	...	-	-	-	-	3.0	-
Colombia	2,418.0 b)	3,000.0 b)	1,262.8	1,000.0	18.8	20.0	89.3	...	-	-	239.2	200.0
Ecuador	3,230.0	4,893.0	360.0	723.0	294.0	356.0	600.0	1,013.0	230.0	506.0	-	-
Peru	378.4	1,600.0	227.4	500.0	9.2	60.0	-	-	-	-	-	-
Venezuela c)	1,978.7 b)	6,715.3 b)	359.4	725.0	98.4	150.0	853.0	2,650.0	22.1 d)	540.7 d)	2.0	95.0
Argentina	28.1	60.0	16.1	40.0	6.0	20.0	-	-	-	-	-	-
Paraguay	500.0	900.0	50.0	800.0	10.0	100.0	-	500.0	300.0	-	-	-
T O T A L	50,123.7	61,978.2	18,079.2	17,157.8	11,428.2	5,955.2	7,281.1	14,644.2	1,747.0	2,525.1	263.2	320.0

... No information available.
a) Estimated by countries. b) Includes Amodiaquine 150 mg. base. c) Information up to September.
d) Includes Chloroquine/Amodiaquin combined tablets.

Table 17 (Pag. 2)

USE OF ANTIMALARIAL DRUGS IN 1988 AND REQUIREMENTS FOR 1989

Countries (by geographical sub-region)	Sulfadoxine/Pyrimet. Fansidar		Fanasil 500 mg		Mefloquine		Quinine sulfate 500 mg.		Quinine ampoules		Quinine capsu	
	1990	1991 a)	1990	1991 a)	1990	1991	1990	1991 a)	1990	1991 a)	1990	1991 a)
Mexico	-	-	-	-	-	-	-	-	-	-	-	
Belize	-	-	-	-	-	-	-	-	-	-	-	
Costa Rica	-	-	-	-	-	-	-	-	-	-	-	
El Salvador	-	-	-	-	-	-	-	-	-	-	-	
Guatemala	-	-	-	-	-	-	-	-	-	-	-	
Honduras	-	-	-	-	-	-	-	-	-	-	-	
Nicaragua	-	-	-	-	-	-	-	-	-	-	-	
Panama	-	-	2.1	5.0	-	-	-	-	-	-	-	
Haiti	-	-	-	-	-	-	-	-	-	-	-	
Dominican Rep.	20.0	100.0	-	-	-	-	-	-	-	-	-	
French Guiana	-	-	-	-	-	-	-	-	-	-	-	
Guyana	...	...	...	...	...	...	...	...	... ..	... ..	... ..	.
Suriname	54.0	60.0	-	-	-	-	-	-	-	-	-	
Brazil b)	-	-	-	-	302.3	224.6	3,258.5	2,730.6	9.3	122.9	521.0	4,608
Bolivia	-	-	-	-	-	-	4.0	...	0.5	...	-	
Colombia	0.5	300.0	165.1	400.0	-	-	-	-	4.3	10.0	14.0	20
Ecuador	12.0	10.0	-	-	-	-	-	-	-	10.0	-	
Peru	-	-	-	-	-	-	-	-	-	-	-	
Venezuela c)	49.0	71.0	-	-	-	-	14.8	18.8	-	-	-	
Argentina	-	-	-	-	-	-	-	-	-	-	-	
Paraguay	-	-	-	-	-	-	-	10.0	-	-	-	
T O T A L	135.5	541.0	167.2	405.0	302.3	224.6	3,277.3	2,759.4	14.1	142.9	535.0	4,628

... No information available.

a) Estimated by countries. b) (VEN) Information up to September. In addition, Chloroquine Dihydrocloride and Mitizina.

Table 18

PERSONNEL EMPLOYED IN MALARIA PROGRAMS IN THE AMERICAS
1989 and 1990 a)

Category	1989	1990
Engineers	37 b)	34 b)
Spraying Chiefs	440	372
Sector Chiefs	641	658
Squad Chiefs	1,758	1,732
Spraymen	7,584 c)	7,125 c)
Draftsmen	44 b)	41 b)
Medical Officers	113	118
Entomologists	31	34
Assistant entomologists	347	352
Statisticians & Statist. assist.	315	298
Evaluation Inspectors	2,602	1,872
Evaluadores	7,967 c)	7,563 c)
Microscopists	1,429	1,282
Administrators	36 d)	35 d)
Administrative assistants	300 d)	67 d)
Accountans	28	33
Disbursing Officers	31	27
Storekeepers	49	49
Storekeepers' assistants	22	7
Secretaries	279	257
Other	365	237
Transport chiefs, Mechanics and.... Assistant mechanics	179	165
Drivers	1,105	956
Motorboat operators	213	183
Boatmen	163	123
T O T A L	26,078	23,620

a) The administration of some malaria programs is under the national health services.
b) Ingeneers and draftsmen work in different programs.
c) In some programs this personnel works in spraying, larvicides, and epidemiological activities
d) The administration of the malaria services, is under the general health services.

Jul/31/91 (hs)

Table 19

AREAS WITH TECHNICAL AND ADMINISTRATIVE PROBLEMS IN THE CONTROL OF MALARIA IN THE AMERICAN REGION

Country and areas (by geographical region)	Population of affected areas	Area km2	Insecticide		Number of cases	Principal vectors	Causes of the problem
			Type used	Years of coverage			
Mexico:							
Estates of: Campeche, Chiapas, Guerrero, Michoacan, Navarit, Oaxaca, Quintana Roo, Sinaloa, Tabasco and Veracruz	...	...	DDT	33	39,896	A. psudopunct. A. albimanus	Intense population movements: including sick persons from other countries which difficults identification and oportune treatments. Insufficient sprayings, poor housing.
El Salvador:							
Pacific coastal zone a)	895,604	4,819	Pro-poxur	10	7,731	A. albimanus	Migrations, poor housing, new anopheles foci formation in swamps and ponds.
Guatemala:							
Zonas ecológicas, Norte, Sur y Centro-Oriental	3,631,810 (b)	80,350 (b)	Fenit. Propoxur	De 10 a 12	38,750	A. albimanus A. pseudopunct. A. vestitipennis A. darlingi	Topographic conditions, migrations, ecological changes.
Honduras:							
...	...	...	...	...	...	...	Socio-political problems, difficult access and/or lack of transportation and insufficient funds
Nicaragua:							
...	...	...	...	...	...	...	...
Panama:							
...	...	...	...	...	...	...	...
Subtotal	4,527,414	85,169	-	-	86,377	-	-

... Information not availalble.

Table 19 (Pag. 2)

AREAS WITH TECHNICAL AND ADMINISTRATIVE PROBLEMS IN THE CONTROL OF MALARIA IN THE AMERICAN REGION

Country and areas (by geographical region)	Population of affected areas	Area km2	Insecticide		Number of cases	Principal vectors	Causes of the problem
			Type used	Years of coverage			
Haiti:							
...	...	...	..	...	...	...	...
Dominican Republic:							
...	111,470	...	DDT	...	356	A. albimanus	Ecological and climatological condit Migrations.
Guayana Francesa: * Maroni, Oyapock, Litoral et Arriera-Pays	71,312	...	DDT	...	5,245	A. darlingi	Problems in the antivector campaign; Population movements
Guyana: * Rupununi, Region Noroeste, Mazaruni/Cuyuni/Potaro	...	...	DDT	Mas de 20	...	A. darlingi A. aquasalis	Poor housing; population movements; difficult terrains, difficult operations.
Brasil: * Acre, Amapa, Amazonas, Goias, Maranhao, Mato Grosso, Para, Rondonia, Roraima	19,227,968	5,202,940	DDT	23	546,060	A. darlingi	Intense population movements; poor housing; P. falciparum resistance; & high anophelinic density in the Amaz region; administrative and personnel problems.
Bolivia: * Riberalta y Guayamerin Federico Roman, Siglo XX, y Araras	75,697	35,634	DDT	8 y 31	2,738	A. darlingi A. pseudopunct.	Poor housing; migrations, P. falcipa resistance to 4-aminoquinolines; are of difficult access; insufficient spraying coverage.
Colombia: * Magdalena Medio; Catatumbo; Sarare; Amazonia; Litoral Pacifico; Uraba; Bajo Cauca	2,520,113	308,444	DDT Prop. Malat. Fenit. K'otrina	24 a 31	67,323	A. darlingi A. nuneztovari A. albimanus A. evansae A. neivae	Poor spraying coverage; social problems; vector resistance; lack of resources; technical and financial problems.
Sub-total	22,006,560	5,547,018		-	621,722		-

Table 19 (Pag. 3)

AREAS WITH TECHNICAL AND ADMINISTRATIVE PROBLEMS IN THE CONTROL OF MALARIA IN THE AMERICAN REGION

Country and areas (by geographical region)	Population of affected areas	Area km2	Insecticide		Number of cases	Principal vectors	Causes of the problem
			Type used	Years of coverage			
Ecuador: *							
Provinces: Esmeraldas Manabi, Guayas, Los Rios, Pichincha, Sucumbios, Napo and Cotopaxi	4,173,478	61,168	DDT Malatiòn	25 1 ciclo	60,098	A. albimanus A. punctimacula A. pseudopunct. A. nuneztovari A. trinkae A. rangeli A. oswaldoi	Insufficient spraying coverage; labor problems; ecologicalk factors; P. falciparum resistance; areas under agricultural development; oil operatio and intense colonization, lack of DDT.
Peru: *							
...	...	...	...	...	...	...	...
Venezuela: *							
Areas Occidental and Meridional	669,065	139,603	DDT Fenit.	42 1	9,789	A. nuneztovari A. darlingi	Vector exophily, population movements; anthropological problems
Argentina:							
Tartagal, Oran,	100,753	11,275	DDT	43	1,179	A.pseudopunct.	Intense internal and external migrations; areas with difficult acces climatological and financial problems: areas bordering malarious countries
Paraguay:							
Part of Depto. San Pedro Depto Caaguazú, parte de Yhú, Depto. A. Paraná, Canindeyú, Depto. Amambay	1,282,568	64,567	DDT	27 a 28	2,790	A. darlingi	Residual foci; internal and external migration; formation of breeding places, construction of hydroelectrica dams.
Subtotal	6,225,864	276,613	-	-	73,856	-	-
T o t a l	32,759,838	5,632,187	-	-	708,099	-	-

* Countries with malarious areas in the Amazon basin.

Jul/31/91 (hs)

Country Information

Below is a brief description of the malaria situation in each country, including a table and a graph showing the malariometric rates from 1960 to 1990.

MALARIOMETRIC RATES - ARGENTINA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other specie	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	20,476	21,868	0.11	1,094	0.05	-	1,094	-	0.00	0.05	57,995	2.83
1960	20,611	96,629	0.47	2,039	0.10	7	2,032	-	0.00	0.10	173,008	8.39
	20,930	137,859	0.66	4,541	0.22	4	4,537	-	0.00	0.22	152,725	7.30
	21,245	152,151	0.72	4,708	0.22	-	4,705	3	0.00	0.22	136,994	6.45
	21,558	157,410	0.73	845	0.04	-	843	2	0.00	0.04	101,369	4.70
	21,868	181,722	0.83	554	0.03	-	554	-	0.00	0.03	84,402	3.86
1965	22,179	182,881	0.82	254	0.01	-	249	5	0.00	0.01	78,664	3.55
	22,488	211,281	0.94	411	0.02	-	410	1	0.00	0.02	117,704	5.23
	22,800	259,335	1.14	1,620	0.07	1	1,618	1	0.00	0.07	142,013	6.23
	23,113	240,859	1.04	579	0.03	-	579	-	0.00	0.03	138,248	5.98
	23,428	159,178	0.68	247	0.01	-	247	-	0.00	0.01	101,738	4.34
1970	23,748	95,410	0.40	86	0.00	-	86	-	0.00	0.00	50,000	2.11
	24,068	99,695	0.41	518	0.02	-	517	1	0.00	0.02	7,368	0.31
	24,392	99,806	0.41	359	0.01	-	359	-	0.00	0.01	36,048	1.48
	24,820	92,241	0.37	805	0.03	-	805	-	0.00	0.03	-	0.00
	25,620	71,168	0.28	171	0.01	-	171	-	0.00	0.01	35,156	1.37
1975	26,052	52,015	0.20	100	0.00	-	100	-	0.00	0.00	27,105	1.04
	26,483	47,610	0.18	70	0.00	1	69	-	0.00	0.00	18,951	0.72
	26,915	46,841	0.17	463	0.02	-	463	-	0.00	0.02	18,330	0.68
	27,349	39,922	0.15	325	0.01	-	325	-	0.00	0.01	17,918	0.66
	27,789	48,945	0.18	936	0.03	1	935	-	0.00	0.03	15,440	0.56
1980	28,237	35,501	0.13	341	0.01	-	341	-	0.00	0.01	11,960	0.42
	28,694	31,431	0.11	323	0.01	-	323	-	0.00	0.01	9,005	0.31
	29,157	27,803	0.10	567	0.02	1	566	-	0.00	0.02	11,393	0.39
	29,625	27,020	0.09	535	0.02	1	534	-	0.00	0.02	8,057	0.27
	30,094	24,943	0.08	437	0.01	-	436	1	0.00	0.01	6,199	0.21
1985	30,331	23,611	0.08	774	0.03	3	770	1	0.00	0.03	5,374	0.18
	31,737	26,345	0.08	2,000	0.06	1	1,999	-	0.00	0.06	16,381	0.52
	31,138	20,419	0.07	1,521	0.05	-	1,521	-	0.00	0.07	15,312	0.49
	31,536	20,028	0.06	666	0.02	-	664	2	0.00	0.03	15,262	0.48
	31,930	21,080	0.07	1,620	0.05	-	1,620	-	0.00	0.08	8,165	0.26
1990	32,322	22,624	0.07	1,660	0.05	1	1,659	-	0.00	0.07	27,868	0.86

a) Estimated population, in thousands of inhabitants. (hs)
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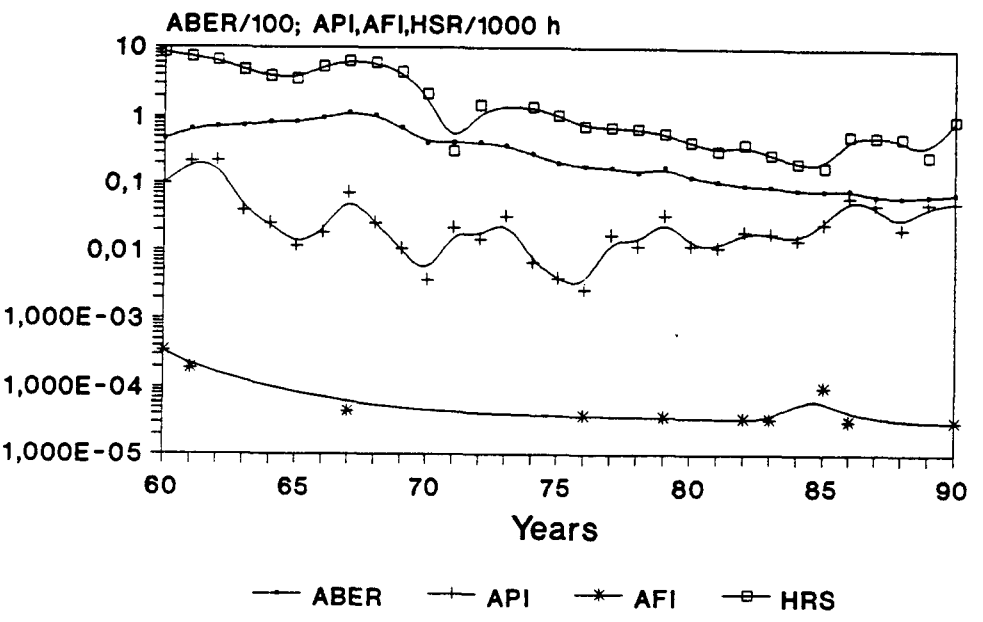

The malaria control program reported that:

a) 87.2% of the epidemiological surveillance planned was actually carried out;

b) 62.5% of the household spraying planned was actually carried out;

c) the failure to fully implement programmed activities was due mainly to a lack of funds or to unavailability of funds when the services needed them;

d) available resources were used for the coverage of highest-risk areas;

e) during the year there was a significant reduction of personnel (managerial, laboratory);

f) no evidence was observed of resistance to insecticides and/or drugs.

MALARIOMETRIC RATES - BELIZE

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	88	11,307	12.85	1,019	11.58	712	211	96	8.09	2.40	22,526	255.98
1960	91	13,307	14.62	196	2.15	55	138	3	0.60	1.52	31,008	340.75
	93	12,355	13.28	23	0.25	1	22	-	0.01	0.24	31,410	337.74
	95	14,556	15.32	20	0.21	-	20	-	0.00	0.21	32,566	342.80
	99	13,085	13.22	17	0.17	-	17	-	0.00	0.17	-	0.00
	103	11,826	11.48	35	0.34	-	35	-	0.00	0.34	-	0.00
1965	107	10,787	10.08	206	1.93	188	18	-	1.76	0.17	_	0.00
	111	13,920	12.54	552	4.97	260	292	-	2.34	2.63	_	0.00
	115	14,773	12.85	375	3.26	170	205	-	1.48	1.78	15,820	137.57
	116	12,271	10.58	39	0.34	1	38	-	0.01	0.33	16,095	138.75
	120	12,194	10.16	28	0.23	-	28	-	0.00	0.23	19,593	163.28
1970	120	15,522	12.94	33	0.28	-	33	-	0.00	0.28	19,215	160.13
	124	15,703	12.66	33	0.27	3	30	-	0.02	0.24	20,132	162.35
	128	19,835	15.50	86	0.67	-	86	-	0.00	0.67	22,298	174.20
	132	24,414	18.50	99	0.75	-	99	-	0.00	0.75	23,080	174.85
	136	23,100	16.99	96	0.71	-	96	-	0.00	0.71	15,890	116.84
1975	140	19,116	13.65	90	0.64	-	90	-	0.00	0.64	12,379	88.42
	140	23,513	16.80	199	1.42	-	199	-	0.00	1.42	11,752	83.94
	140	39,151	27.97	894	6.39	-	894	-	0.00	6.39	13,300	95.00
	140	30,818	22.01	1,218	8.70	2	1,216	-	0.01	8.69	17,768	126.91
	142	20,952	14.75	1,391	9.80	13	1,378	-	0.09	9.70	11,399	80.27
1980	145	23,925	16.50	1,529	10.54	34	1,495	-	0.23	10.31	16,835	116.10
	149	46,460	31.18	2,041	13.70	41	2,000	-	0.28	13.42	13,353	89.62
	152	31,945	21.02	3,868	25.45	191	3,677	-	1.26	24.19	15,954	104.96
	156	31,889	20.44	4,595	29.46	634	3,961	-	4.06	25.39	8,046	51.58
	159	31,146	19.59	4,117	25.89	521	3,596	-	3.28	22.62	28,228	177.53
1985	163	20,905	12.83	2,800	17.18	97	2,703	-	0.60	16.58	22,935	140.71
	167	20,859	12.49	2,779	16.64	136	2,643	-	0.81	15.83	36,452	218.28
*	170	22,139	13.02	3,258	19.16	243	3,004	6	1.43	17.67	29,324	172.49
	174	22,403	12.88	2,725	15.66	95	2,617	13	0.55	15.04	27,163	156.11
	178	19,806	11.13	3,285	18.46	95	2,617	13	0.53	14.70	27,163	152.60
1990	183	17,204	9.40	3,033	16.57	40	2,987	6	0.22	16.32	...	0.00

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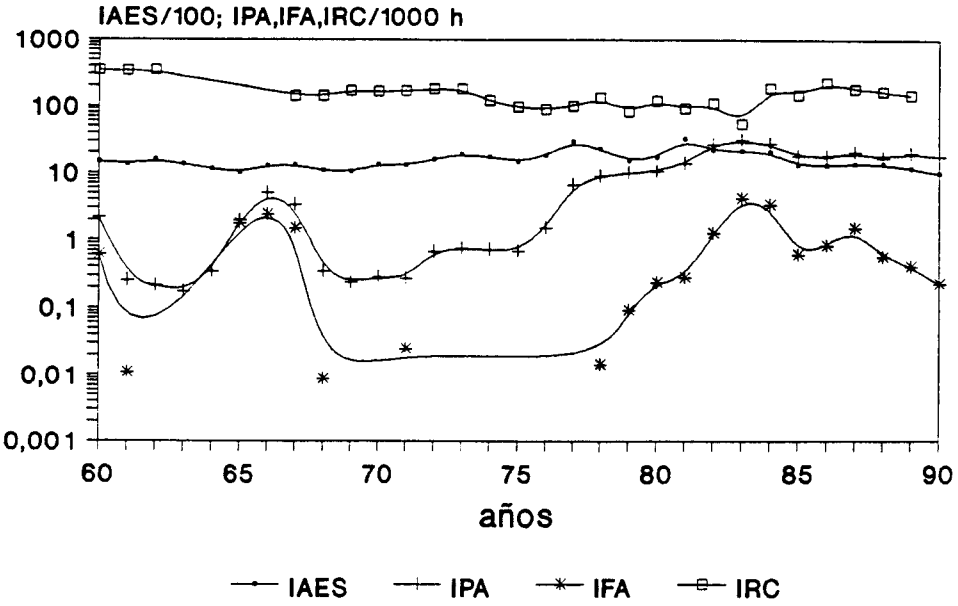
BELICE - Malariometric Rates
1960-1990



In 1990, 3,033 cases of malaria were registered; 98.5% were P. vivax infections. The API declined in 1990 to 16.57 per 1,000 population as compared to 18.46 per 1,000 for 1989. As in previous years, there continued to be a high degree of malaria transmission in the Cayo and Toledo Districts, with 40 and 47 cases per 1,000 population, respectively. The situation in the northern districts remained essentially unchanged. Only the Belize District registered a lower number of cases.

The Ministry of Health of Belize has adopted a strategy of "integrated control" with the support of other ministries, including Agriculture, Natural Resources, and Education.

MALARIOMETRIC RATES - BOLIVIA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other specie	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	3,616	83,762	2.32	1,970	0.54	243	1,419	308	0.07	0.39	286,827	79.32
1960	3,825	87,775	2.29	893	0.23	143	621	129	0.04	0.16	301,995	78.95
	3,920	153,008	3.90	796	0.20	58	725	13	0.01	0.18	262,670	67.01
	4,019	177,528	4.42	1,110	0.28	378	721	11	0.09	0.18	188,193	46.83
	4,121	173,019	4.20	2,345	0.57	910	1,435	-	0.22	0.35	67,510	16.38
	4,226	155,540	3.68	3,454	0.82	497	2,955	2	0.12	0.70	59,669	14.12
1965	4,334	270,754	6.25	941	0.22	138	801	2	0.03	0.18	40,991	9.46
	4,446	260,145	5.85	1,373	0.31	214	1,159	-	0.05	0.26	53,591	12.05
	4,561	214,537	4.70	1,442	0.32	200	1,242	-	0.04	0.27	54,987	12.06
	4,680	187,635	4.01	1,998	0.43	472	1,526	-	0.10	0.33	53,214	11.37
	4,770	185,299	3.88	4,425	0.93	891	3,534	-	0.19	0.74	29,035	6.09
1970	4,931	167,265	3.39	6,862	1.39	651	6,211	-	0.13	1.26	17,797	3.61
	5,063	158,786	3.14	8,080	1.60	699	7,381	-	0.14	1.46	58,251	11.51
	5,195	132,750	2.56	4,275	0.82	364	3,911	-	0.07	0.75	77,492	14.92
	5,331	118,417	2.22	7,696	1.44	640	7,056	-	0.12	1.32	84,406	15.83
	5,470	114,805	2.10	4,936	0.90	349	4,586	1	0.06	0.84	86,477	15.81
1975	4,894	133,605	2.73	6,615	1.35	711	5,903	1	0.15	1.21	19,867	4.06
	5,021	124,101	2.47	6,714	1.34	1,383	5,331	-	0.28	1.06	52,055	10.37
	5,151	118,002	2.29	10,106	1.96	1,211	8,895	-	0.24	1.73	75,191	14.60
	5,286	124,082	2.35	10,897	2.06	1,042	9,855	-	0.20	1.86	88,449	16.73
	5,426	110,235	2.03	14,873	2.74	710	14,163	-	0.13	2.61	98,409	18.14
1980	5,570	143,648	2.58	16,619	2.98	432	16,187	-	0.08	2.91	122,018	21.91
	5,720	176,235	3.08	9,774	1.71	496	9,278	-	0.09	1.62	154,572	27.02
	5,874	166,124	2.83	6,699	1.14	885	5,814	-	0.15	0.99	122,384	20.83
	6,034	151,187	2.51	14,441	2.39	1,713	12,728	-	0.28	2.11	89,551	14.84
	6,200	99,003	1.60	16,338	2.64	1,218	15,120	-	0.20	2.44	56,145	9.06
1985	6,371	85,378	1.34	14,354	2.25	890	13,454	-	0.14	2.11	56,205	8.82
	6,547	101,878	1.56	20,993	3.21	1,674	19,319	9	0.26	2.95	109,926	16.79
	6,730	115,512	1.72	24,891	3.70	1,512	23,379	-	0.22	3.47	84,588	12.57
	6,918	104,888	1.52	22,258	3.22	1,494	20,764	-	0.22	3.00	89,348	12.92
	7,113	112,770	1.59	25,367	3.57	1,363	24,004	-	0.19	3.37	99,640	14.01
1990	7,314	121,743	1.66	19,680	2.69	652	19,028	-	0.09	2.60	99,989	13.67

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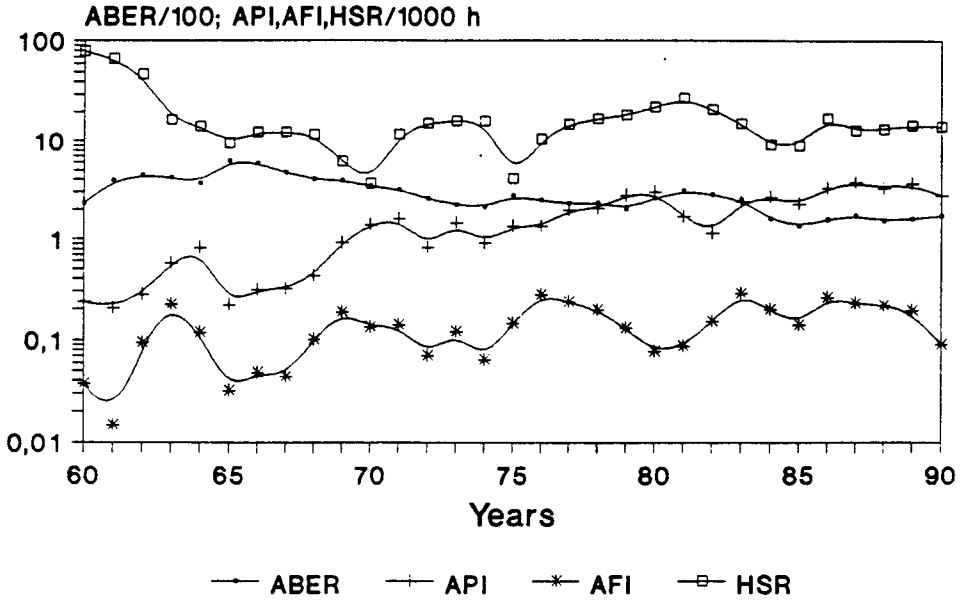
BOLIVIA - Malariometric Rates
1960-1990



Currently there appears to be better integration of the specific activities aimed at detection and treatment of cases by the general health services, which detected 69% of all malaria cases.

A comparative analysis of the last decade shows malaria trends in terms of the classic indicators. In 1980 there was a SPR of 11.6%, which fell to 4.0% in 1983 and began to rise in 1989, when it reached 22.5%. However, in 1980 the SPR was 16.2%, which indicates a relative reduction of positivity in febrile persons. This contrasts with the low yield of case-finding as indicated by the ABER, which went from 7.2% in 1980 to 4.6% in 1990. In effect there was a 15% reduction in case-finding (active and passive), which is also related to the system of reporting, participation of the health services, and active detection activities on the part of operational personnel, which yielded just 31% of total cases detected. Based on the total estimated population of the country in 1980, the API was 2.83 per 1,000 population. Its lowest point was in 1982, when it fell to 1.14 per 1,000 population. In 1990 it was back up to 2.69 per 1,000 population.

MALARIOMETRIC RATES - BRAZIL

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	Other P.vivax species		AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	67,711											
1960	69,720	114,622	0.16	8,297	0.12	66	8,230	1	0.00	0.12	873,746	12.53
	71,868	438,707	0.61	44,188	0.61	4,883	39,300	5	0.07	0.55	881,920	12.27
	74,096	884,434	1.19	72,060	0.97	22,910	49,142	8	0.31	0.66	4,081,914	55.09
	76,526	1,245,674	1.63	111,417	1.46	37,929	73,388	100	0.50	0.96	4,419,463	57.75
	78,730	1,775,864	2.26	111,278	1.41	42,041	69,180	57	0.53	0.88	4,481,579	56.92
1965	81,006	1,874,955	2.31	110,306	1.36	51,273	58,925	108	0.63	0.73	3,757,685	46.39
	82,930	1,854,939	2.24	108,630	1.31	57,728	50,654	248	0.70	0.61	4,222,505	50.92
	85,240	2,151,470	2.52	102,842	1.21	57,266	45,348	228	0.67	0.53	5,006,241	58.73
	87,620	2,081,679	2.38	81,324	0.93	44,289	36,799	236	0.51	0.42	6,584,083	75.14
	90,070	2,139,885	2.38	56,951	0.63	31,346	25,454	151	0.35	0.28	5,725,743	63.57
1970	92,520	2,030,459	2.19	54,644	0.59	28,557	25,935	152	0.31	0.28	5,642,025	60.98
	95,170	2,012,625	2.11	80,293	0.84	46,605	33,597	91	0.49	0.35	4,462,581	46.89
	97,850	2,291,682	2.34	85,325	0.87	51,420	33,845	60	0.53	0.35	6,826,559	69.77
	99,920	2,329,563	2.33	79,161	0.79	42,002	37,107	52	0.42	0.37	6,724,621	67.30
	102,400	2,271,691	2.22	66,481	0.65	29,997	36,393	91	0.29	0.36	5,761,532	56.26
1975	108,032	2,617,755	2.42	88,630	0.82	39,572	49,020	38	0.37	0.45	5,282,378	48.90
	110,592	2,600,871	2.35	89,765	0.81	38,397	51,331	37	0.35	0.46	4,648,871	42.04
	113,197	2,638,765	2.33	104,436	0.92	42,027	62,381	28	0.37	0.55	4,643,422	41.02
	112,849	2,825,890	2.50	121,577	1.08	51,568	69,983	26	0.46	0.62	4,191,780	37.15
	118,545	2,691,966	2.27	147,630	1.25	60,916	86,693	21	0.51	0.73	4,180,295	35.26
1980	121,286	2,838,643	2.34	176,237	1.45	75,920	100,302	15	0.63	0.83	4,016,014	33.11
	124,070	2,839,488	2.29	205,544	1.66	77,779	119,431	2	0.63	0.96	4,382,444	35.32
	126,895	2,672,904	2.11	221,939	1.75	98,999	122,934	6	0.78	0.97	2,334,628	18.40
	129,757	2,881,660	2.22	297,687	2.29	147,504	150,169	14	1.14	1.16	1,900,883	14.65
	132,648	3,277,492	2.47	378,257	2.85	206,414	171,836	7	1.56	1.30	1,888,740	14.24
1985	135,564	3,452,943	2.55	401,904	2.96	214,193	187,706	5	1.58	1.38	2,241,251	16.53
	138,502	3,363,962	2.43	443,627	3.20	243,761	199,857	9	1.76	1.44	2,190,413	15.82
	141,459	3,034,540	2.15	508,864	3.60	270,458	238,403	3	1.91	1.69	2,127,939	15.04
	144,427	3,373,283	2.34	559,535	3.87	287,750	271,784	1	1.99	1.88	2,626,667	18.19
	147,399	3,368,564	2.29	577,520	3.92	275,674	301,841	5	1.87	2.05	2,332,347	15.82
1990	150,368	3,294,234	2.19	560,396	3.73	252,191	308,184	21	1.68	2.05	1,527,169	10.16

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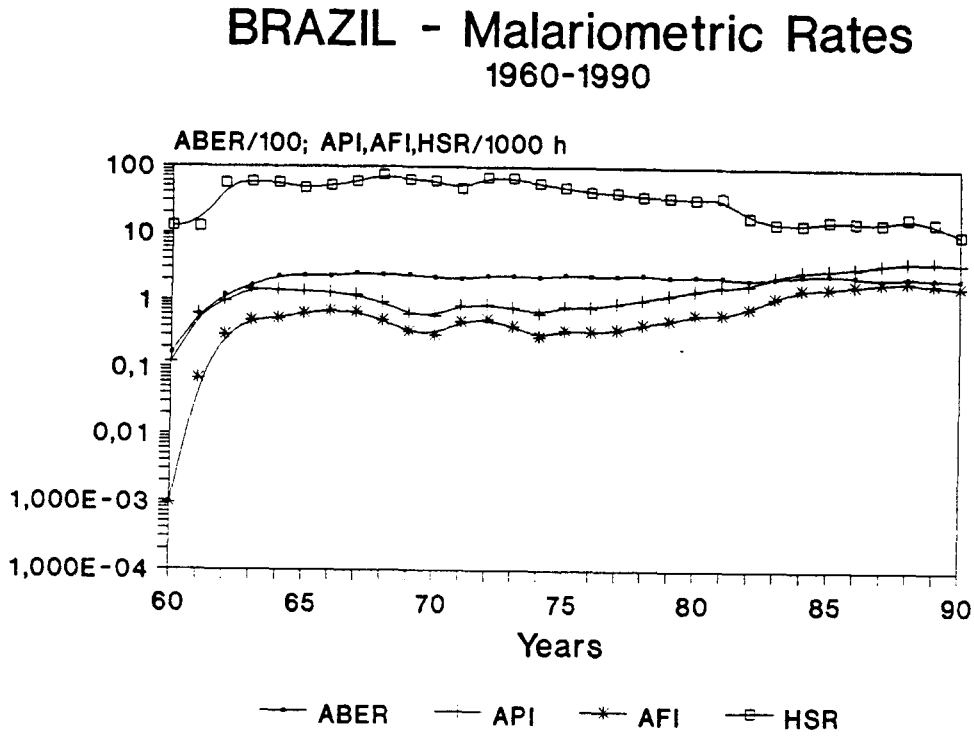


The estimated population of the country for 1990 was 154,235,703 inhabitants, of which 67,341,152 (43.7%) are considered to live in originally malarious areas. Of the latter group, 43,492,501 (64.6%) live in areas where the transmission of malaria has been interrupted. The rest of the population, i.e., 23,848,651 people (35.4%), live in areas where transmission continues.

In 1990, 560,396 cases of malaria were registered. Of these, 252,191 were caused by P. falciparum, 308,184 by P. vivax, and 21 by P. malariae. These data reflect a decrease in malaria cases since 1989 (577,520), as well as a reduction of P. falciparum in the parasite formula.

Of the three macroregions into which the country can be divided, the one with the highest rate of transmission is the Amazon region, which comprises nine states and territories: Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantíns. This region is a tropical rain forest, with heavy rainfall, high temperatures, and altitudes generally near sea level. The states of the Amazon region account for nearly 99% of all malaria cases. The main vector species is A. darlingi, but malaria parasites have been found in other species of mosquitoes.

The three states that accounted for the highest rates of malaria transmission in the Amazon region in 1990 were Rondônia (33.4%), Pará (20.1%), and Mato Grosso (25.0%). An analysis by municipio shows that 30 of the nation's 2,278 municipios, all located in the endemic area, accounted for 67.2% of cases. These municipios include 6.46% of the country's population and comprise 11.03% of the malarious area.

During the year the number of cases in the states of Mato Grosso and Roraima tended to increase, while in the other states experienced a decrease in number of cases. The increase in Mato Grosso is due mainly to growth in mining activity in the northern part of the state. In Roraima the increase of malaria continues to be related to the introduction of miners in regions where access is difficult.

The rest of the country can be divided into two regions, in which there is little malaria transmission. The northeast region is arid and semiarid and includes the states of Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe. This area is also characterized by high temperatures and is periodically afflicted by long droughts. The southern region comprises the states of Espíritu Santo, Goiás, Mato Grosso do Sul, Minas Gerais, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, São Paulo, and the Federal District. This is the most developed region of the country and its climate is temperate. In some localized areas there have been outbreaks of malaria, such the ones that occurred in Foz de Iguaçú, Paraná, in early 1989. This resulted mainly from growth of the A. darlingi population in the area, and the migration of malarious persons from the states of the Amazonia. In 1990, this outbreak was contained by control measures carried out by the three countries affected (Brazil, Argentina, and Paraguay). In 1989 more than 1,000 autochthonous cases were detected on the Brazilian side, while in 1990 only 200 cases were detected there.

Causes that Contribute to the Persistence of Malaria

The states that account for most of the malaria cases, particularly in the Amazon region, constitute the two **"great frontiers"** that exist in this area. The **first frontier** is the **mining** area, with the presence of garimpeiros (miners), who enter remote areas of the Amazon region in search of gold, cassiterite, and other minerals. Most of the garimpeiros live under subsistence conditions, in shelters with makeshift roofs and no walls.

Control activities in these areas are quite limited by the difficulty of access, which is primarily by private or rented airplane. In the state of Pará the national control agency (SUCAM) initiated "microzonage" activities, which involve assigning an official to a segment of the population in a specific area. However, despite the access problems, there continues to be

considerable migration of garimpeiros, who continually move from one place to another. In the closed mining settlements, or garimpos, such as Serra Pelada in Pará, malaria has never been a serious problem, thanks to control activities carried out by the government, which kept track of who was entering and leaving. In contrast, in the open garimpos no type of control is exercised.

Mining disrupts the ecological balance, since mining mechanisms are entirely predatory, destroying the rain forest through complete deforestation of extensive areas and diverting small watercourses, which become stagnant as they are dammed up with earthworks. Pools and water holes are thus formed and become vector breeding sites. The heavy rainfall in the region contributes to the formation and maintenance of breeding sites, which multiply over time. The use of mercury to separate out gold has polluted the rivers to the extent that the fish are so contaminated they cannot be eaten. Direct mercury poisoning of the garimpeiros is also a problem.

The second frontier that has added to malaria transmission in the Amazon region is the agriculture, which predominates in the states of Acre and Rondônia. In these frontier areas, tenant farmers settle on lands that are often inaccessible during rainy periods. During their first years they spend most of their time to clearing land and planting subsistence crops, devoting little time or effort to the construction of houses. As a result, they live in shelters with only partial walls or none at all.

Rondônia accounted for more than 31.1% of total cases in the country, although there was a reduction of 23.5% with respect to 1989.

Acre is divided into 12 municipios, four of which reported 95% of the malaria cases in 1990. The other municipios produced 687 cases during the entire year. The municipio of Rio Branco is among the 30 municipios with highest incidence of malaria nationwide, and the municipio of Plácido de Castro produces almost as many cases, and has the highest API in the state (198.9 per 1,000). The municipio of Senador Guiomard has an API of 101.9 per 1,000 population. The four municipios that generate most of the cases are also those with the highest APIs in the state.

The state of Amapá is divided into nine municipios, three of which accounted for 81% of the malaria cases in 1990. The other municipios registered 2,074 cases during the entire year. The municipio of Macapá is among the 30 with highest incidence of malaria nationwide. The municipality of Tartarugal has the highest API (125 per 1,000); the other municipios, with the exception of Laranjal do Jari, have a high API, ranging from 25 to 90.

The state of Amazonas is divided into 62 municipios. Ten had a higher incidence of malaria, accounting for 62% of all cases

registered in 1990. Of the 30 municipios with the highest incidence of malaria in the country, Manaus has the lowest API, 5.2 per 1,000, due to the large population of this municipality, which is also the state capital. Of the other 61 municipios, three have an API greater than 100, two of them (Apuí and Barcelos) have the greatest incidence of malaria in the state, and 19 have an API ranging from 25 to 99 per 1,000 population.

The state of Maranhão is divided into 136 municipios. The 10 with the highest incidence of malaria generated less than 50% of the malaria cases registered in 1990. Only the municipio of Imperatriz is among the 30 with highest incidence of malaria of the country, with an API of 13.0. The municipio of Pindare Mirim registered the highest API, 26.8 per 1,000 population, while the other municipios have an API of less than 22 per 1,000.

The state of Mato Grosso is divided into 22 municipios. The 10 with greatest incidence generated less than 92% of malaria cases in 1990. Nine of these are among the 30 with the highest incidence of malaria, with APIs ranging from 129 per 1,000 population to 3,924 per 1,000. The APIs of the other municipios of the state are lower, the lowest being 20 per 1,000 population.

The state of Pará is divided into 105 municipios. The 10 with the highest incidence of malaria accounted for 66% of all cases registered in the state. Five are among the 30 with highest incidence of malaria in the country; all have an API ranging from 26.6 to 583.8 per 1,000 inhabitants. Some of the municipios in this state did not report cases during 1990.

The state of Rondônia is divided into 23 municipios. The 10 with the highest incidence of malaria generated 90% of the cases in the state. Seven are among the 30 municipios with the highest incidence of malaria nationwide; in two the API was greater than 100 per 1,000 population.

The state of Roraima is divided into eight municipios. The five with the greatest incidence of malaria generated approximately 95% of the cases in the state. One, Boa Vista, figures among the 30 municipios with the highest incidence of malaria in the country. Boa Vista's API was 79.5 per 1,000. The APIs of three municipios were greater than 100; the others ranged from 14 per 1,000 to 93 per 1,000.

The state of Tocantíns is divided into 80 municipios. The 10 municipios with the highest incidence of malaria generated 62% of the cases. Three had an API ranging from 25 to 68 per 1,000, while in the others it was less than 17 per 1,000. Some did not report any cases of malaria during the year. None of the municipios of Tocantíns is among those with the highest incidence in the country.

The migration of tenant farmers and miners has also contributed to the occurrence and resurgence of malaria in other regions of the country where transmission had been interrupted.

In some cases, urban transmission is still a serious problem in the Amazon region. In places such as Porto Velho, the capital of Rondônia, the rate of urban transmission has been reduced through weekly applications of ULV imagicides. In contrast, in the city of Manaus, where urban transmission had been interrupted in 1974, it became reestablished in 1989 with the expansion of the city. Efforts have been made to reduce sources of transmission in several peripheral neighborhoods.

One of the major challenges the country is facing is manpower training, particularly in the areas of epidemiology, entomology, and vector control. During the year several courses were developed and offered to upgrade personnel in these areas. In the cities of Belém, Pará, and Manaus, Amazonas, 15 persons participated (two from abroad--one from Colombia and one from Portugal) in the three-month International Course on Malariology. A one-month course on medical entomology was also offered in Rio de Janeiro. Another course was given on entomology in public health and vector control for upper-level personnel in Manaus, Amazonas. This three-month course was attended by 12 students, one of whom came from abroad (Ecuador).

Malaria Control in International Border Areas

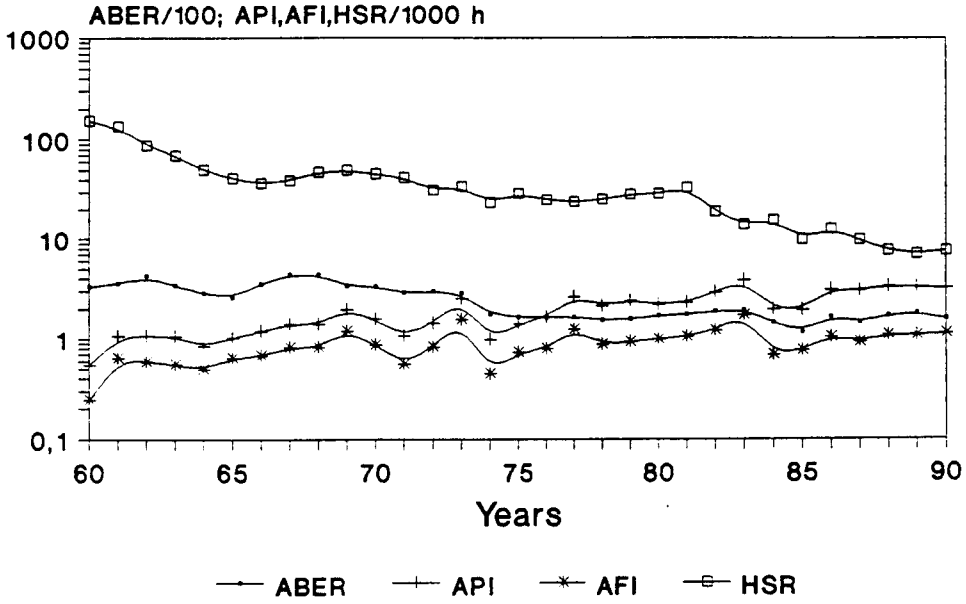
Among the **international agreements** currently in force with other countries is the **Southern Cone Pact,** which was signed by Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay. Malaria is endemic only in Paraguay, Bolivia, and Brazil, and in a small part of northern Argentina. In intercountry technical meetings it was recommended that exchange activities be stepped up in the areas of human resources, research, epidemiological surveillance, documentation, and acquisition and supply of inputs, material and equipment, with a view to attaining effective and lasting control over the disease.

MALARIOMETRIC RATES - COLOMBIA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	14,938	329,288	2.20	4,172	0.28	1,195	2,942	35	0.08	0.20	2,357,627	157.83
1960	15,416	509,920	3.31	8,426	0.55	3,758	4,642	26	0.24	0.30	2,358,989	153.02
	15,908	570,160	3.58	16,974	1.07	10,235	6,694	45	0.64	0.42	2,127,057	133.71
	16,417	697,245	4.25	17,497	1.07	9,718	7,745	34	0.59	0.47	1,431,774	87.21
	16,941	577,406	3.41	17,898	1.06	9,375	8,499	24	0.55	0.50	1,163,280	68.67
	17,485	499,523	2.86	14,729	0.84	8,648	6,058	23	0.49	0.35	871,294	49.83
1965	17,996	470,708	2.62	18,277	1.02	11,593	6,668	16	0.64	0.37	744,002	41.34
	18,468	655,897	3.55	22,135	1.20	12,512	9,610	13	0.68	0.52	677,228	36.67
	18,956	827,511	4.37	26,633	1.40	15,626	10,944	63	0.82	0.58	741,895	39.14
	19,462	858,857	4.41	27,333	1.40	15,964	11,344	25	0.82	0.58	916,892	47.11
	19,984	676,866	3.39	39,435	1.97	24,092	15,326	17	1.21	0.77	980,578	49.07
1970	20,527	685,412	3.34	32,272	1.57	17,975	14,280	17	0.88	0.70	922,943	44.96
	21,088	604,773	2.87	22,402	1.06	11,722	10,675	5	0.56	0.51	873,910	41.44
	21,668	646,399	2.98	30,997	1.43	17,709	13,282	6	0.82	0.61	671,412	30.99
	22,343	631,563	2.83	56,494	2.53	34,635	21,855	4	1.55	0.98	754,124	33.75
	22,981	404,120	1.76	22,406	0.97	10,275	12,127	4	0.45	0.53	533,332	23.21
1975	23,177	385,691	1.66	32,690	1.41	16,880	16,880	10	0.73	0.73	663,863	28.64
	23,672	386,897	1.63	39,022	1.65	18,827	20,185	10	0.80	0.85	589,367	24.90
	24,183	401,621	1.66	63,888	2.64	30,344	33,496	48	1.25	1.39	573,765	23.73
	24,707	381,978	1.55	53,412	2.16	21,741	31,600	71	0.88	1.28	618,052	25.02
	25,245	401,005	1.59	60,957	2.41	23,621	37,267	69	0.94	1.48	714,348	28.30
1980	25,794	436,275	1.69	57,346	2.22	25,658	31,663	25	0.99	1.23	738,538	28.63
	26,355	463,864	1.76	60,972	2.31	27,909	33,047	16	1.06	1.25	872,088	33.09
	26,929	505,220	1.88	78,601	2.92	32,916	45,650	35	1.22	1.70	506,585	18.81
	27,575	535,962	1.94	105,360	3.82	47,957	57,362	41	1.74	2.08	380,043	13.78
	28,110	407,627	1.45	55,268	1.97	19,411	35,776	81	0.69	1.27	429,845	15.29
1985	28,713	334,062	1.16	55,791	1.94	21,921	34,291	86	0.76	1.19	280,988	9.79
	29,325	477,503	1.63	89,251	3.04	30,526	58,612	113	1.04	2.00	362,410	12.36
	29,943	434,646	1.45	90,014	3.01	27,749	62,250	15	0.93	2.08	287,152	9.59
	30,566	510,526	1.67	100,850	3.30	33,106	67,689	55	1.08	2.21	228,323	7.47
	31,210	557,129	1.79	100,286	3.21	33,540	66,691	55	1.07	2.14	213,854	6.85
1990	31,819	496,087	1.56	99,489	3.13	35,490	63,855	144	1.12	2.01	237,053	7.45

a) Estimatated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

COLOMBIA - Malariometric Rates
1960-1990



The malaria situation has gradually and continuously worsened. Although it is considered one of the country's health priorities, the results of control efforts have not been satisfactory, and prevalence of the disease has increased over the last ten years.

The Administration of Direct Campaigns (DCD) registered a total of 99,489 malaria cases in 1990, of which 35,322 (35.5%) were diagnosed as P. falciparum infections.

The highest rates of malaria transmission continues to occur in the Pacific Coast, Lower Cauca, Urabá, Amazon, Sarare, and Magdalena Medio regions. In these six regions, 79,962 cases of malaria were detected in 74 municipios, which accounted for 80.4% of the 99,489 cases registered in the country. Of these 74 municipios, 28 registered 64,735 cases, or 65.1% of the national total and 80.9% of all cases detected in the six regions.

However, the limited number of localities in the malarious area that reported information (4,629) is noteworthy; this represents only 12% of the total number of localities in the malarious area. No information was received from the remaining 87.9% of the localities.

The Sectional Health Service of Antioquía reported mortality due to malaria at two per 100,000 population, which represents a very significant reduction, compared to the figure for 1983 of 34

per 100,000 population, and 1984, 19 per 100,000 population. This reduction is the result of actions carried out by the Sectional Health Service since 1984, based on diagnosis and timely treatment. The Health Service of Antioquía also reported taking 211,826 blood samples, from which it detected 80,936 malaria cases in 1990.

The malaria situation in Colombia can be summed up as follows:

Stability during the 1988-1990 period, with approximately 100,000 cases per year. Slight reduction in infections due to P. falciparum in the regions of Sarare, Catatumbo, the Orinoco River Basin, and the Amazon Basin, and a deterioration of the situation in the Pacific Coast, Urabá, Lower Cauca-Nechí, and Upper Sinú regions.

There is considerable underregistration of mortality from malaria. In some communities of the Pacific Coast there have been findings of up to 20% apparently healthy carriers with confirmed parasitemia.

Of all cases registered in 1990, 46% were detected in 13 municipios, and 18% in three of these. Of the total number of P. falciparum cases in 1990, 50% were concentrated in eight municipios; of these, four municipios accounted for 38% of the cases registered.

Immunological methods detected P. falciparum infection in An. darlingi, An. albimanus, and An. neomacutipalpus, and P. vivax infection in An. albimanus and An. rangel.

Causes Contributing to the Persistence of Malaria

Reservoir-related factors: Large population concentrations in recently-settled tropical areas where health care services are lacking. The situation is exacerbated by the different types of migration that occur in response to the different demands of agricultural, livestock-raising, and mining activities; public order problems that impede the application of timely control measures; and risk factors associated with the physical environment (heavy rainfall and high relative humidity and temperatures).

Other contributing factors are related to the knowledge, attitudes, practices, and behavior of the population with regard to ecological and cultural considerations that alter their susceptibility and degree of exposure to malaria.

The hemorrhagic dengue emergency in 1990, and the resulting diversion of resources, caused a major reduction in the malaria control activities that had been programmed at the national level.

Decentralization

In accordance with the provisions of Law 10 of 10 January 1990, responsibility for the various units of the current Administration of Direct Campaigns (DCD) and their respective functions is to be assumed by national or territorial entities. Accordingly, the governments of the municipios are to assume responsibility for actions to control malaria and other vector-borne diseases (VBD). The process of decentralization provided for in the aforementioned law has been initiated by the Administration of Direct Campaigns through a survey of the epidemiological situation in each community (locality) over the last five years; a review of the service records of all personnel; an inventory of resources, especially lots, buildings, and transportation; and an assessment of needs and availability with regard to human resources for the operational levels in the municipios.

In addition, workshops and meetings have been held with mayors of the municipios, in which the problem of malaria was placed within the framework established by creation of the Committees for Community Participation.

Epidemiological Stratification

The process of stratification in Colombia has made it possible to identify and group the areas with the highest rates of malaria transmission, using as principal indicators the annual parasite incidence (API) and the annual P. falciparum incidence (AFI).

The utilization of these two indicators has led to improved use of resources, which are concentrated in those areas where the API is highest. Three risk levels have been established based on API: below 0.5, low risk; 0.5-10.0, medium risk; and greater than 10.0, high risk.

In the attack area, which is considered high-risk, 94,190 cases of malaria were registered in 1990, for an API of 17.8 per 1,000 population.

In the low-risk area (area being consolidated), 5,299 cases were diagnosed, for an API of 0.3 per 1,000. This situation reflects the knowledge available as to the magnitude and intensity of malaria transmission in Colombia. However, identification of the risk factors at the local level is still deficient.

Malaria Control in International Border Areas

In cooperation with the armed forces of neighboring countries, periodic visits continued to be made to villages located along the Putumayo and Amazon rivers under the Civilian-Naval Plan of Action. In addition, as an outcome of Colombian-Venezuelan border meetings,

joint actions with Venezuela have been carried out for malaria control in the Sarare and Catatumbo regions.

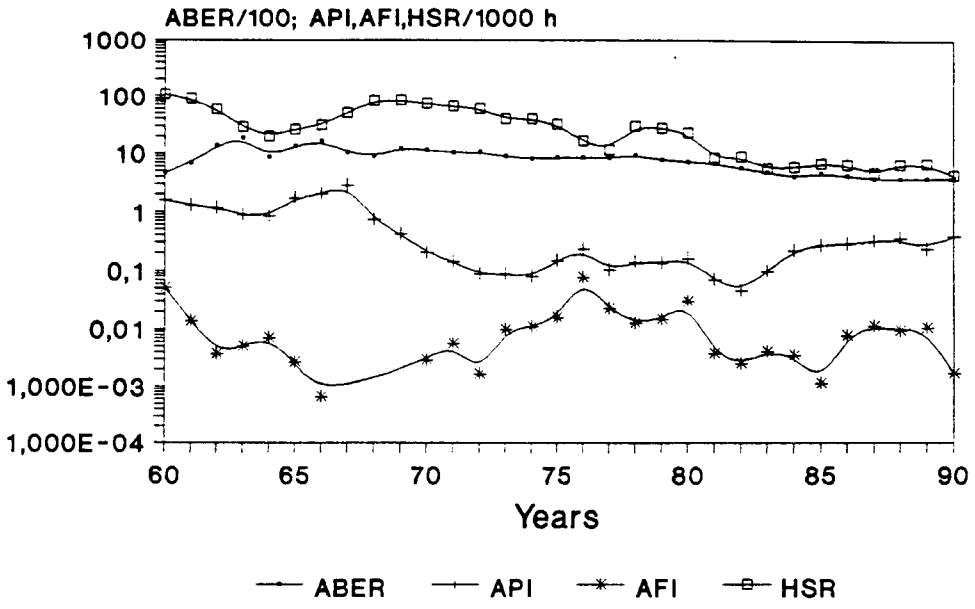
In the region of the Putumayo River, along the border with Ecuador, the problem of malaria has been reduced through actions agreed upon in border meetings. The network of microscopists in this region has make it possible to reduce the time between the taking of samples and their diagnosis, as well as between diagnosis and treatment.

MALARIOMETRIC RATES - COSTA RICA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	1,200	55,524	4.63	1,899	1.58	121	1,775	3	0.10	1.48	112,162	93.47
1960	1,254	57,603	4.59	2,000	1.59	64	1,936	-	0.05	1.54	131,942	105.22
	1,298	87,889	6.77	1,673	1.29	18	1,655	-	0.01	1.28	115,513	88.99
	1,343	183,642	13.67	1,583	1.18	5	1,577	1	0.00	1.17	78,386	58.37
	1,391	257,850	18.54	1,228	0.88	7	1,221	-	0.01	0.88	39,456	28.37
	1,439	123,285	8.57	1,212	0.84	10	1,202	-	0.01	0.84	28,088	19.52
1965	1,490	197,751	13.27	2,563	1.72	4	2,559	-	0.00	1.72	38,049	25.54
	1,541	250,135	16.23	3,047	1.98	1	3,046	-	0.00	1.98	47,683	30.94
	1,590	164,109	10.32	4,443	2.79	0	4,443	-	0.00	2.79	78,646	49.46
	1,634	142,029	8.69	1,191	0.73	0	1,191	-	0.00	0.73	132,618	81.16
	1,685	202,362	12.01	688	0.41	0	688	-	0.00	0.41	138,241	82.04
1970	1,727	195,484	11.32	350	0.20	5	344	1	0.00	0.20	125,344	72.58
	1,798	185,011	10.29	257	0.14	10	247	-	0.01	0.14	116,907	65.02
	1,843	191,152	10.37	159	0.09	3	156	-	0.00	0.08	110,578	60.00
	1,873	166,355	8.88	161	0.09	18	143	-	0.01	0.08	74,048	39.53
	1,922	154,656	8.05	152	0.08	21	131	-	0.01	0.07	75,629	39.35
1975	1,965	166,814	8.49	290	0.15	31	259	-	0.02	0.13	62,454	31.78
	2,022	171,753	8.49	473	0.23	155	318	-	0.08	0.16	33,194	16.42
	2,083	175,973	8.45	217	0.10	47	170	-	0.02	0.08	24,083	11.56
	2,148	202,284	9.42	307	0.14	28	285	-	0.01	0.13	64,545	30.05
	2,213	176,219	7.96	308	0.14	33	274	-	0.01	0.12	61,800	27.93
1980	2,279	166,894	7.32	376	0.16	69	307	-	0.03	0.13	53,205	23.35
	2,343	162,861	6.95	168	0.07	9	159	-	0.00	0.07	19,868	8.48
	2,406	139,019	5.78	110	0.05	6	104	-	0.00	0.04	21,821	9.07
	2,470	120,116	4.86	245	0.10	10	235	-	0.00	0.10	14,155	5.73
	2,534	103,987	4.10	569	0.22	9	560	-	0.00	0.22	14,994	5.92
1985	2,642	121,456	4.60	734	0.28	3	731	-	0.00	0.28	17,814	6.74
	2,716	113,720	4.19	790	0.29	21	768	-	0.01	0.28	17,559	6.47
	2,791	103,456	3.71	883	0.32	32	851	-	0.01	0.30	12,899	4.62
	2,866	106,611	3.72	1,016	0.35	27	989	-	0.01	0.35	18,725	6.53
	2,941	108,614	3.69	699	0.24	31	668	-	0.01	0.23	19,664	6.69
1990	3,015	113,167	3.75	1,151	0.38	5	1,146	-	0.00	0.38	12,709	4.22

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

COSTA RICA - Malariometric Rates
1960-1990



The principal objective of the Malaria Program in Costa Rica has been to consolidate the process of interrupting the disease in the country.

The malarious area in the Costa Rica includes 35,446 km^2, which represents 69.6% of the country's area, and a population of 835,485. In 1990, 113,167 blood samples were examined, 1,151 of which were positive (1,146 P. vivax, and 5 P. falciparum).

Epidemiological analysis indicates that the provinces most affected were Limón, with 779 cases; Alajuela, with 105; and Guanacaste, with 92. These accounted for 85% of total cases in the country and were the result of epidemic outbreaks. Of the 1,151 cases registered, 117 were classified as having been imported from abroad--107 from Nicaragua, three from Panama, one from Honduras, two from Guatemala, two from Colombia, one from India, and one from Brazil.

Causes Contributing to the Persistence of Malaria

One of the cantons where the dispersion and persistence of transmission has been most problematic is Limón, which had 280 cases, most of which occurred in areas where access is difficult and/or where there has been migration.

The most recent outbreak was in the canton of Siquirres, with 221 cases. This area is undergoing drastic changes as a result of the presence of unstable and scattered populations, and also due to the reactivation of banana-growing on many farms.

Prevailing climatological conditions also favored increased transmission in the area and hindered the implementation of control measures. In many cases treatment has had to be interrupted due to continuous high waters and floods. Excessive rainfall during the year led to an increase in anopheline density, which established transmission in places where it had previously been interrupted.

Malaria Control in International Border Areas

With a view to preventing malaria and dengue in the border region between Costa Rica and Nicaragua, a cooperation agreement was signed with the Governments of Sweden and Finland in August 1988. This facilitated joint work through the coordination of efforts not only in the area of malaria and dengue control but also in regard to the primary care program. The arrangement also made it possible to establish shared goals, identify common problems, and devise coherent solutions to address local health problems with the resources available.

In August 1990 a proposal was developed to provide financing for the second phase of the project aimed at strengthening the operational capacity of local level health care. The project is promotes the prevention and control of vector-borne diseases in border areas between Costa Rica and Honduras, and Costa Rica and Nicaragua.

The Basic Technical Councils (local health systems) are responsible for carrying out activities at the local level, including surveillance and control of malaria, dengue, and A. aegypti. Coordination at higher levels is carried out by Regional Technical Councils. This regional and local structure is supported by the normative programs of the central level.

The actions carried out in 1990 were framed within the policies and strategies established for these areas by the health program component of the National Plan for Economic and Social Development for 1990-1994.

MALARIOMETRIC RATES - ECUADOR

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	4,230	98,977	2.34	5,887	1.39	2,313	3,571	3	0.55	0.84	440,477	104.13
1960	4,358	119,562	2.74	9,084	2.08	3,158	5,906	20	0.72	1.36	349,331	80.16
	4,501	213,169	4.74	9,733	2.16	1,489	8,243	1	0.33	1.83	806,254	179.13
	4,655	269,004	5.78	5,531	1.19	658	4,868	5	0.14	1.05	856,598	184.02
	4,814	286,453	5.95	3,857	0.80	237	3,599	21	0.05	0.75	773,026	160.58
	4,979	314,700	6.32	4,628	0.93	264	4,363	1	0.05	0.88	720,136	144.63
1965	5,150	340,127	6.60	4,179	0.81	203	3,976	-	0.04	0.77	645,198	125.28
	5,326	311,821	5.85	4,976	0.93	406	4,570	-	0.08	0.86	194,823	36.58
	5,400	289,660	5.36	10,756	1.99	956	9,809	-	0.18	1.82	14,832	2.75
	5,580	350,183	6.28	37,043	6.64	4,196	32,835	12	0.75	5.88	307,305	55.07
	5,770	421,650	7.31	50,957	8.83	4,317	46,634	6	0.75	8.08	680,266	117.90
1970	5,960	360,879	6.06	28,375	4.76	2,828	25,539	8	0.47	4.29	745,376	125.06
	6,170	283,114	4.59	9,171	1.49	909	8,261	1	0.15	1.34	643,967	104.37
	6,380	321,611	5.04	6,707	1.05	727	5,982	-	0.11	0.94	611,398	95.83
	6,600	374,151	5.67	6,810	1.03	1,014	5,796	-	0.15	0.88	464,693	70.41
	6,830	314,685	4.61	5,481	0.80	1,003	4,470	8	0.15	0.65	366,261	53.63
1975	7,035	306,917	4.36	6,555	0.93	1,235	5,319	1	0.18	0.76	409,442	58.20
	7,242	313,053	4.32	10,974	1.52	1,945	9,020	9	0.27	1.25	267,971	37.00
	7,454	307,540	4.13	11,275	1.51	2,612	8,662	1	0.35	1.16	449,096	60.25
	7,671	303,139	3.95	9,815	1.28	2,205	7,609	1	0.29	0.99	416,546	54.30
	7,894	285,597	3.62	8,207	1.04	2,648	5,559	-	0.34	0.70	488,113	61.83
1980	8,123	367,129	4.52	8,748	1.08	2,755	5,993	-	0.34	0.74	222,997	27.45
	8,361	357,855	4.28	12,745	1.52	3,427	9,318	-	0.41	1.11	189,742	22.69
	8,605	384,792	4.47	14,633	1.70	3,126	11,507	-	0.36	1.34	30,206	3.51
	8,857	453,067	5.12	51,606	5.83	16,515	35,091	-	1.86	3.96	100,230	11.32
	9,114	408,465	4.48	78,599	8.62	15,637	62,962	-	1.72	6.91	266,068	29.19
1985	9,378	370,998	3.96	68,989	7.36	11,998	57,061	-	1.28	6.08	401,160	42.78
	9,647	275,865	2.86	51,430	5.33	11,985	39,445	-	1.24	4.09	57,253	5.93
	9,922	327,653	3.30	63,503	6.40	17,849	45,654	-	1.80	4.60	67,571	6.81
	10,203	333,918	3.27	53,607	5.25	13,561	40,046	-	1.33	3.92	234,233	22.96
	10,490	144,851	1.38	23,274	2.22	6,569	16,705	-	0.63	1.59	144,346	13.76
1990	10,782	363,080	3.37	71,670	6.65	21,871	49,799	-	2.03	4.62	204,252	18.94

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
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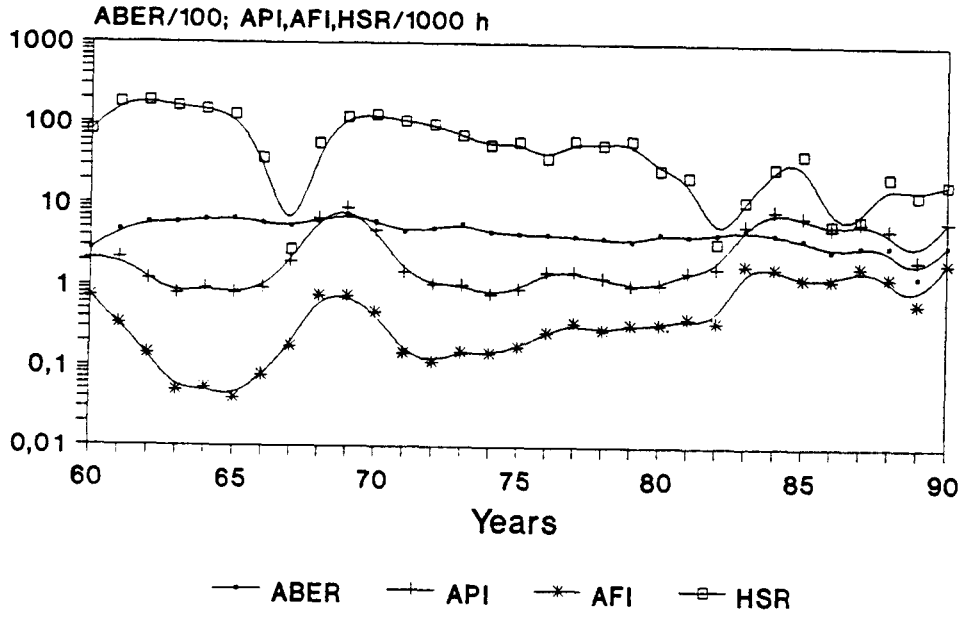
ECUADOR - Malariometric Rates
1960-1990



Ecuador reported 71,690 cases of malaria, 21,871 (30.5%) of which were P. falciparum infections. Of these cases, 91.5% occurred in the provinces of Esmeraldas, Manabí, Guayas, and Los Ríos. This region constitutes the new frontier for development in Ecuador, with the opening up of new areas for agriculture and mining.

The province with the highest prevalence of P. falciparum continues to be Esmeraldas, located on the border with Colombia along the Pacific coast, where 40% of all P. falciparum cases were registered. However, the classical scenario of high prevalence changed in the valley of the Napo river in the Amazon region, where the number of cases declined to 15% of the total.

MALARIOMETRIC RATRICOS - EL SALVADOR

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	2,386	71,259	2.99	17,521	7.34	4,051	13,430	-	1.70	5.63	556,360	233.18
1960	2,454	76,287	3.11	10,066	4.10	2,959	7,064	1	1.21	2.88	581,562	236.99
	2,527	127,293	5.04	12,563	4.97	2,960	9,594	4	1.17	3.80	749,266	296.50
	2,627	194,069	7.39	15,433	5.87	2,557	12,873	4	0.97	4.90	389,910	148.42
	2,721	238,791	8.78	17,846	6.56	1,879	15,962	5	0.69	5.87	436,369	160.37
	2,824	350,843	12.42	25,827	9.15	2,661	23,195	1	0.94	8.21	240,295	85.09
1965	2,928	506,442	17.30	34,070	11.64	2,186	31,884	-	0.75	10.89	6,393	2.18
	3,037	530,357	17.46	68,562	22.58	10,703	57,859	-	3.52	19.05	302,112	99.48
	3,151	535,494	16.99	82,960	26.33	7,227	75,734	-	2.29	24.03	372,167	118.11
	3,266	805,311	24.66	35,831	10.97	1,025	34,808	-	0.31	10.66	693,150	212.23
	3,390	858,916	25.34	25,299	7.46	1,994	23,344	-	0.59	6.89	681,157	200.93
1970	3,534	572,373	16.20	45,436	12.86	4,286	41,234	-	1.21	11.67	749,747	212.15
	3,647	414,331	11.36	46,858	12.85	3,235	43,623	1	0.89	11.96	227,668	62.43
	3,668	394.935	10.77	38,335	10.45	3,059	35,276	-	0.83	9.62	720,592	196.45
	3,771	393,110	10.42	35,095	9.31	7,286	27,809	-	1.93	7.37	258,027	68.42
	3,887	478,553	12.31	66,691	17.16	13,133	53,558	-	3.38	13.78	276,703	71.19
1975	4,143	538,909	13.01	83,100	20.06	16,816	66,284	-	4.06	16.00	319,126	77.03
	4,265	533,610	12.51	83,290	19.53	13,820	69,470	-	3.24	16.29	294,620	69.08
	4,392	471,109	10.73	32,243	7.34	2,934	29,300	-	0.67	6.67	302,401	68.85
	4,524	507,237	11.21	56,533	12.50	8,634	47,899	-	1.91	10.59	10,000	2.21
	4,388	434,475	9.90	75,657	17.24	13,391	62,266	-	3.05	14.19	88,092	20.08
1980	4,525	425,264	9.40	95,835	21.18	15,782	80,053	-	3.49	17.69	-	0.00
	4,527	367,447	8.12	93,187	20.58	10,878	82,309	-	2.40	18.18	21,600	4.77
	4,598	351,426	7.64	86,202	18.75	10,263	75,939	-	2.23	16.52	54,000	11.74
	4,668	306,648	6.57	65,377	14.01	9,696	55,681	-	2.08	11.93	-	0.00
	4,738	270,156	5.70	66,874	14.11	11,172	55,292	-	2.36	11.67	65,873	13.90
1985	4,767	201,177	4.22	44,473	9.33	4,373	40,100	-	0.92	8.41	77,497	16.26
	4,840	182,622	3.77	23,953	4.95	2,395	21,558	-	0.49	4.45	47,684	9.85
	4,927	200,654	4.07	12,834	2.60	598	12,236	-	0.12	2.48	90,766	18.42
	5,026	213,518	4.25	9,095	1.81	230	8,975	-	0.05	1.79	77,529	15.43
	5,135	190,995	3.72	9,605	1.87	40	9,565	-	0.01	1.86	77,631	15.12
1990	5,252	230,246	4.38	9,269	1.76	18	9,251	-	0.00	1.76	159,108	30.29

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
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f) Number of slides showing P. falciparum and other associated plasmodia.
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i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
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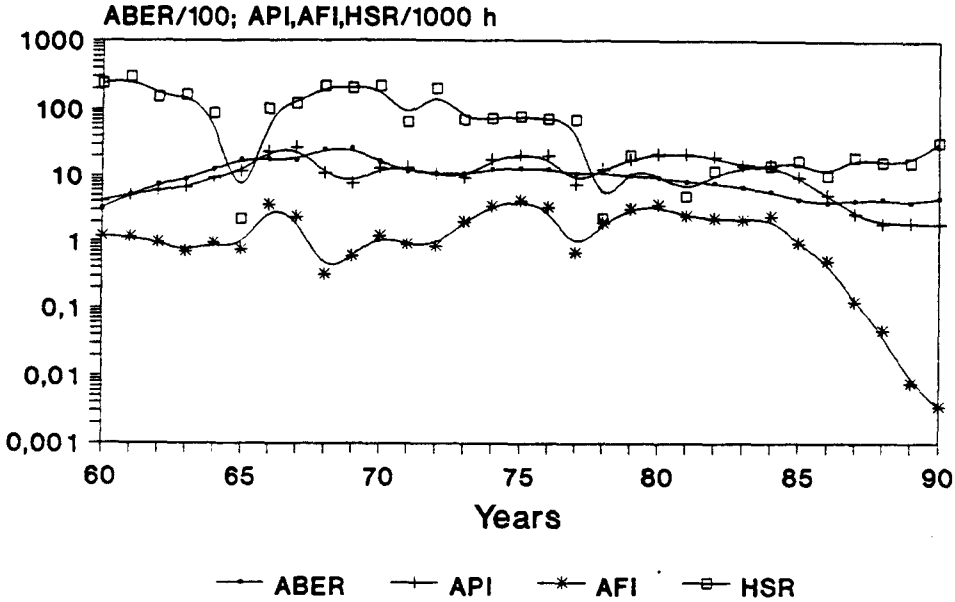
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

EL SALVADOR - Malariometric Rates
1960-1990



Malaria transmission declined for the third year consecutive year in El Salvador. In 1990, only 9,269 cases were registered. P. falciparum infection rates are the lowest ever registered, with 18 cases, or 0.2% of all cases diagnosed in 1990.

Since 1980, when the highest number of malaria cases were detected (96,000 cases, including 16,000 due to P. falciparum), the situation has improved steadily for 11 years. There has been a 90% reduction in the number of cases overall, and a 99.8% reduction in P. falciparum cases.

These achievements are the result of implementation of a strategy of integrated control, with a purely epidemiological approach, based on stratification of the problem and its constant adaptation to the evolution of the malaria situation. In this connection, it has been necessary to utilize a computerized information system to aid in immediate decision-making. In addition, the decentralization of diagnosis to the rural level and local medical services has permitted more timely treatment of cases. Finally, the training of program personnel, 2,700 voluntary collaborators, health services personnel, and others has played an important part in implementation of the aforementioned strategy.

MALARIOMETRIC RATES - GUATEMALA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	3,695	108,047	2.92	7,894	2.14	1,548	6,346	-	0.42	1.72	631,998	171.04
1960	3,810	129,742	3.41	3,387	0.89	417	2,969	1	0.11	0.78	697,557	183.09
	3,928	218,628	5.57	4,083	1.04	780	3,298	5	0.20	0.84	756,185	192.51
	4,051	323,373	7.98	5,996	1.48	1,601	4,375	20	0.40	1.08	606,853	149.80
	4,185	348,866	8.34	15,116	3.61	5,557	9,522	37	1.33	2.28	427,022	102.04
	4,305	289,058	6.71	20,401	4.74	5,003	15,358	40	1.16	3.57	411,234	95.52
1965	4,438	380,562	8.58	14,472	3.26	2,313	12,157	2	0.52	2.74	393,924	88.76
	4,565	376,439	8.25	22,045	4.83	3,230	18,812	3	0.71	4.12	278,804	61.07
	4,698	439,186	9.35	19,684	4.19	1,377	18,306	1	0.29	3.90	752,620	160.20
	4,837	492,940	10.19	10,407	2.15	364	10,043	-	0.08	2.08	858,960	177.58
	4,966	521,336	10.50	10,494	2.11	209	10,284	1	0.04	2.07	687,708	138.48
1970	5,270	449,706	8.53	11,044	2.10	83	10,961	-	0.02	2.08	648,392	123.03
	5,420	332,531	6.14	8,280	1.53	34	8,245	1	0.01	1.52	476,143	87.85
	5,580	345,156	6.19	7,750	1.39	4	7,746	-	0.00	1.39	584,258	104.71
	5,740	386,026	6.73	6,182	1.08	3	6,179	-	0.00	1.08	674,310	117.48
	6,050	421,240	6.96	4,030	0.67	25	4,005	-	0.00	0.66	583,575	96.46
1975	6,023	418,749	6.95	4,979	0.83	100	4,879	-	0.02	0.81	518,531	86.09
	6,191	435,097	7.03	9,616	1.55	320	9,296	-	0.05	1.50	557,844	90.11
	6,364	472,297	7.42	34,907	5.49	2,159	32,748	-	0.34	5.15	0	0.00
	6,543	463,794	7.09	59,755	9.13	5,234	54,521	-	0.80	8.33	504,664	77.13
	6,727	440,712	6.55	69,039	10.26	6,631	62,408	-	0.99	9.28	605,403	90.00
1980	6,917	456,784	6.60	62,657	9.06	4,361	58,296	-	0.63	8.43	840,518	121.51
	7,113	475,777	6.69	67,994	9.56	5,718	62,276	-	0.80	8.76	407,716	57.32
	7,315	468,430	6.40	77,375	10.58	7,841	69,534	-	1.07	9.51	805,968	110.18
	7,524	442,745	5.88	64,024	8.51	4,356	59,668	-	0.58	7.93	695,933	92.50
	7,740	526,694	6.80	74,132	9.58	6,535	67,597	-	0.84	8.73	132,682	17.14
1985	7,963	441,757	5.55	54,958	6.90	3,125	51,833	-	0.39	6.51	494,653	62.12
	8,194	453,401	5.53	42,609	5.20	1,425	41,184	-	0.17	5.03	129,627	15.82
	8,433	511,445	6.06	57,662	6.84	2,804	54,858	-	0.33	6.51	175,161	20.77
	8,680	413,216	4.76	52,561	6.06	2,165	50,396	-	0.25	5.81	231,676	26.69
	8,935	331,675	3.71	42,453	4.75	1,155	41,298	-	0.13	4.62	260,681	29.18
1990	9,197	305,791	3.32	41,711	4.54	1,008	40,703	-	0.11	4.43	297,471	32.34

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
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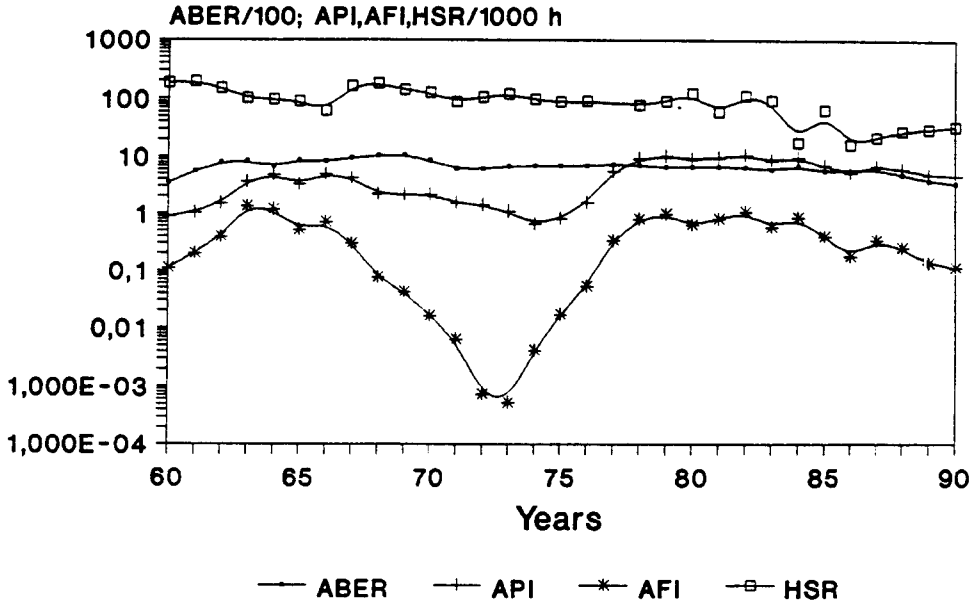
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

GUATEMALA - Malariometric Rates
1960-1990



In Guatemala, during the period 1959-1976, there were an average of 10,325 malaria cases annually; from 1977 to 1990 this number increased to 57,274 cases.

During 1990 total malaria cases came to 41,711, which represented a decrease of 742 cases (1.7%) with respect to the 42,453 diagnosed in 1989. The 305,791 blood examinations performed in 1990 declined by 26.01% and 8.0% with regard to those done in 1988 and 1989, respectively.

Annual parasite incidence (API) was 4.54 per 1,000 population in the country, very similar to that of 1989 (4.75 per 1,000). The distribution by parasitic species of the 41,711 cases was 40,703 (97.6%) cases due to P. vivax, 890 (2.1%) due to P. falciparum, and 118 (0.3%) mixed infections.

In regard to the distribution of cases by health regions, Regions II, VI, and VIII contributed 12,438 (30.1%), 7,986 (17.0%), and 5,567 (13.0%) cases, respectively. In sum, these three regions accounted for 25,991 cases, or 62.3% of the total registered in the country. These same regions contributed a similar percentage (59.0%) in 1989. Of the 22 departments, five (El Petén, Alta Verapaz, Escuintla, Izabal, and El Quiché) accounted for 67.6% of total cases in the country. In El Petén, Alta Verapaz, San Marcos, and El Quiché the APIs were above average.

With respect to the distribution of malaria by ecological areas, the northern ecological area registered 25,314 cases, or 60.6% of the total. This area encompasses 55,210 km^2, i.e. 50.7% of the national territory, and a population of 1,050,468 inhabitants (1967), or 11.7% of the country's total population. The high receptivity of this area is a consequence of favorable climatological factors, such as the abundant rainfall and average temperature of 25° C. An. albimanus is the principal vector, although An. pseudopunctipennis and An. vestitipennis are also present.

In addition to the ecological factors, there are migratory movements in connection with agricultural development in the region and this has led to disorganized land settlement with unprotected dwellings, mainly in the departments of Alta Verapaz and El Petén. There are sociopolitical problems in most of the northern departments that hinder the practice of adequate epidemiological surveillance and the implementation of appropriate control measures. There are also other factors, such as inaccessibility, remoteness, and lack of resources and suitable equipment.

The southern ecological area has conditions that are very propitious for malaria transmission, especially along the coast, where altitudes range from zero to 400 feet above sea level. The region, with an area of 11,471 km^2, or 10.5% of the national territory, is not very large, yet it is the most densely populated, with 1,109,158 inhabitants, or 12.05% of the total population. The topography is flat and there are many rivers. The principal vector in this area is An. albimanus.

During the last 10 years the malaria problem in this area has diminished considerably.

One possible explanations that has been advanced for this decline is the shift from cotton and banana to sugarcane as the primary crop. This has contributed to a reduction in internal rural migrations and the indiscriminate use of insecticides.

The eastern central ecological area encompasses 13,864 km^2, or 13.0% of the country's total area, and has a population of 1,269,601 (1987), or 14.0% of the total population. This area is characterized by high temperatures, little precipitation, and low relative humidity, as well as rugged terrain with sparse vegetation. Irrigation systems are the main factor contributing to the promotion and maintenance of An. albimanus breeding sites.

This area is highly vulnerable as a result of constant traffic to and from El Salvador. However, this epidemiological situation is offset by the area's low receptivity.

Epidemiological Stratification

The Malaria Division has undertaken a process of stratification, using the annual parasite incidence (API, per 1,000) as an instrument for identifying priority areas. The malarious area has thus been divided into two major groups of municipios: **(a)** those that account for 80.0% of the cases; and, **(b)** those that account for the remaining 20.0%.

The municipios in group (a), in turn, have been subdivided into three strata: a) places with an API over 100; b) places with an API from 50 per 1,000 to 99.9 per 1,000; c) places with an API under 49.9. This approach has led to improved use of available resources.

Once this stratification based on API has been accomplished, the next steps will be to a) identify and measure risk factors; b) determine the epidemiological strata; c) select the principal intervention measures; and, d) ensure the participation of health services in the implementation of the actions. For example, the services of the Ministry of Health performed only 0.5% of the 305,791 blood samples examinations. Of the samples, 99.4% were examined by voluntary collaborators, which is a reflection of the active involvement of the community. Only 204 positive results were reported by the hospitals. The limited participation of establishments at the first level of care in the epidemiological surveillance of malaria is noteworthy.

Causes Contributing to the Persistence of Malaria

Economic and administrative problems have been compounded by migration of the population. Migration among farm workers in Guatemala is not a new phenomenon. Owing to the lack of major mineral resources, the economy of the Central American region has been dependent on use of the land and work force. In Guatemala, coffee and then bananas became came to be major export crops. Later cotton-farming and livestock-breeding became important activities. In the 1960s and 1970s, sugar and safflower began to be grown as export products. By the late 1980s other new exports added to this list included sesame, okra, and several others. These products currently represent more than 60.0% of exports.

Migrant workers face several problems that affect their health. These include: (a) poor nutrition, (b) long working hours, (c) lack of medical services and environmental sanitation, and (d) lack of legal protection in general.

As a result, this population suffers health problems such as malnutrition, infectious diseases, respiratory and gastrointestinal diseases, work-related accidents and poisonings, and premature aging. The transmission of malaria and the persistence of endemic areas, as well as the high prevalence of the disease in the

northern part of the country, is closely related to internal migration.

Current and Potential Problems Posed by Development Projects

Development projects affect the surrounding ecology and consequently the biology and ecology of malaria transmitters. Vector receptivity is thus increased, as is vulnerability, due to growth of the work force, especially in rural areas. This results in an increase in the demand for the health services to serve these new population nuclei.

The country has 25 irrigation projects underway and 24 under study. The projects underway cover a population of 16,250, and those under construction or under study will cover a population of 51,252 inhabitants.

Malaria Control in International Border Areas

The 46 municipios that share borders with Honduras, El Salvador, Belize, and Mexico cover an area of 51,089 km^2, or 47.0% of the national territory, with a population of 1,134,300. During the 1985-1990 period these municipios registered an annual average of 19,528 cases of malaria. In 1990 the number of cases was 18,756, or 45.0% of total malaria cases.

The border area with Belize includes six municipios belonging to the departments of El Petén and Izabal. It encompasses an area of 9,346 km^2, with a population of 111,370. In the last six years the annual average has been 4,597 malaria cases. In 1990, 5,139 cases were registered; of these, the municipios of Dolores, San Luis, and Livingston accounted for 1,563, 1,169, and 1,007 cases, respectively, or 72.7% of total cases in the area.

Eleven municipios in the departments of Jutiapa and Chiquimula are located along the border with El Salvador. This area encompasses 2,418 km^2, with a population of 203,176 inhabitants. During the last six years the annual average number of cases has been 1,190. In 1990, 928 cases were registered. The municipios of Asunción Mita and Moyuta in the department of Jutiapa accounted for 57.0% of all cases.

The border area with the Republic of Honduras comprises seven municipios located in the departments of Chiquimula, Izabal, and Zacapa. It includes an area of 5,008 km^2 and a population of 351,849. The average number of malaria cases per year in the 1985-1990 period was 2,460; in 1990, 1,349 cases were registered, with the department of Izabal accounting for 83%.

The 23 municipios along the border with Mexico encompass 34,317 km^2 and 467,905 inhabitants. During the 1985-1990 period the average number of cases was 10,279; in 1990, 11,340 cases of

the average number of cases was 10,279; in 1990, 11,340 cases of malaria were registered, with the department of El Petén accounting for 67.0% of this total.

The Malaria Division has based its control efforts on house spraying, antilarval measures, and collective treatments. In other border areas spraying has been carried out in 25 of 75 municipios (33.3%), providing protection to 93,093 houses with 150,183 inhabitants. Fenitrothion, deltamethrin, and propoxur were the insecticides used for house spraying, with fenitrothion being used most frequently.

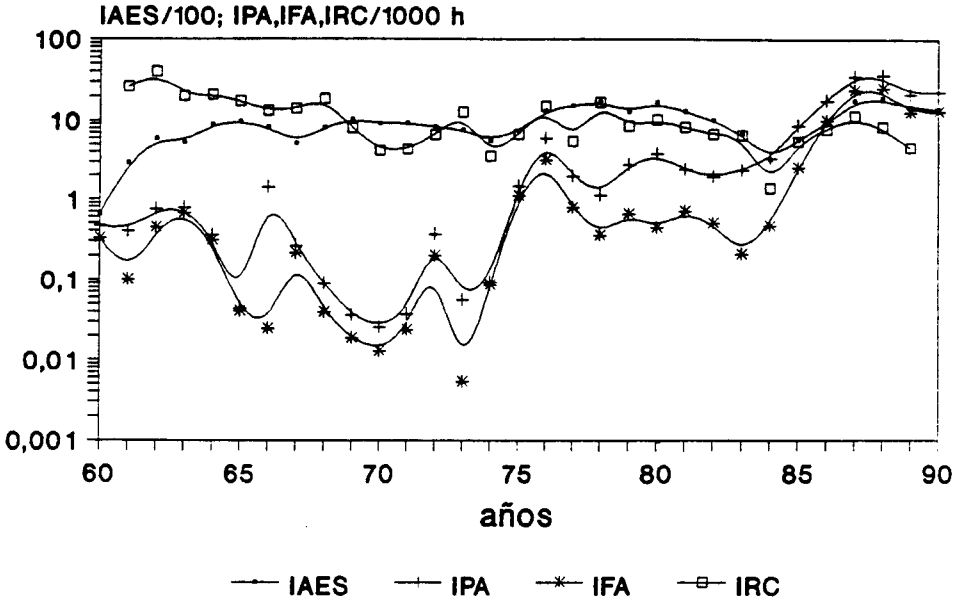
The fact that the municipios along the borders with Belize, El Salvador, Honduras, and Mexico accounted for 45.0% of all malaria cases in the country points up the need for health authorities from these countries to follow-up on the different border agreements, since to date, in regard to malaria, little has been done to implement these accords.

MALARIOMETRIC RATES - GUYANA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	550	3,754	0.68	176	0.32	63	100	13	0.11	0.18	...	...
1960	565	3,674	0.65	263	0.47	184	67	12	0.33	0.12	...	...
	585	16,889	2.89	231	0.39	58	168	5	0.10	0.29	15,107	25.82
	600	35,446	5.91	446	0.74	266	180	-	0.44	0.30	23,808	39.68
	617	32,255	5.23	476	0.77	418	58	-	0.68	0.09	12,231	19.82
	630	55,185	8.76	225	0.36	192	33	-	0.30	0.05	13,072	20.75
1965	643	61,507	9.57	28	0.04	26	2	-	0.04	0.00	11,121	17.30
	659	53,669	8.14	910	1.38	16	894	-	0.02	1.36	8,618	13.08
	674	34,163	5.07	175	0.26	145	29	1	0.22	0.04	9,242	13.71
	686	55,217	8.05	61	0.09	27	34	-	0.04	0.05	12,508	18.23
	694	70,121	10.10	25	0.04	13	12	-	0.02	0.02	5,477	7.89
1970	710	63,623	8.96	18	0.03	9	9	-	0.01	0.01	2,883	4.06
	725	65,967	9.10	27	0.04	17	9	1	0.02	0.01	3,049	4.21
	741	59,931	8.09	266	0.36	147	119	-	0.20	0.16	4,770	6.44
	758	56,420	7.44	42	0.06	4	38	-	0.01	0.05	9,343	12.33
	774	42,549	5.50	72	0.09	67	5	-	0.09	0.01	2,676	3.46
1975	780	55,758	7.15	1,116	1.43	854	262	-	1.09	0.34	5,137	6.59
	796	102,815	12.92	4,642	5.83	2,456	2,186	-	3.09	2.75	11,479	14.42
	812	121,075	14.91	1,563	1.92	640	923	-	0.79	1.14	4,364	5.37
	830	137,114	16.52	927	1.12	293	633	1	0.35	0.76	13,578	16.36
	847	107,232	12.66	2,294	2.71	564	1,730	-	0.67	2.04	6,974	8.23
1980	865	139,433	16.12	3,202	3.70	380	2,822	-	0.44	3.26	8,602	9.94
	882	110,993	12.58	2,065	2.34	620	1,443	2	0.70	1.64	7,025	7.96
	900	87,525	9.73	1,700	1.89	451	1,249	-	0.50	1.39	5,905	6.56
	918	59,940	6.53	2,102	2.29	188	1,912	2	0.20	2.08	5,777	6.29
	935	29,207	3.12	3,017	3.23	431	2,585	1	0.46	2.76	1,257	1.34
1985	953	53,276	5.59	7,900	8.29	2,336	5,564	-	2.45	5.84	4,982	5.23
	971	84,763	8.73	16,388	16.88	9,336	7,052	-	9.61	0.08	7,179	7.39
	989	165,230	16.71	34,142	34.52	22,638	11,504	-	22.89	0.07	10,668	10.79
	1,006	181,067	18.00	35,470	35.26	24,327	11,143	-	24.18	0.06	7,965	7.92
	1,023	143,599	14.04	20,822	20.35	12,390	8,432	-	12.11	0.06	4,490	4.39
1990	1,040	135,260	13.01	22,681	21.81	12,907	9,777	-	12.41	0.07	...	0.00

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

GUYANA - Indices Malariometricos
1960-1990



In 1990, 5,909 cases of malaria were registered, which represented a 6.0% reduction with respect to 1989. The areas with the highest rates of transmission continued to be the Maroni and Oyapock river basins, with an API of 204 per 1,000 and 546 per 1,000 population, respectively. Although in the Maroni river area there was a 45% reduction in cases registered as compared to the previous year, P. falciparum was the predominant species in the area, accounting for 50.7% of all cases registered during the year. In addition, 10 cases of P. malariae infection were detected, which is noteworthy, since this species had not been detected in this region since 1978.

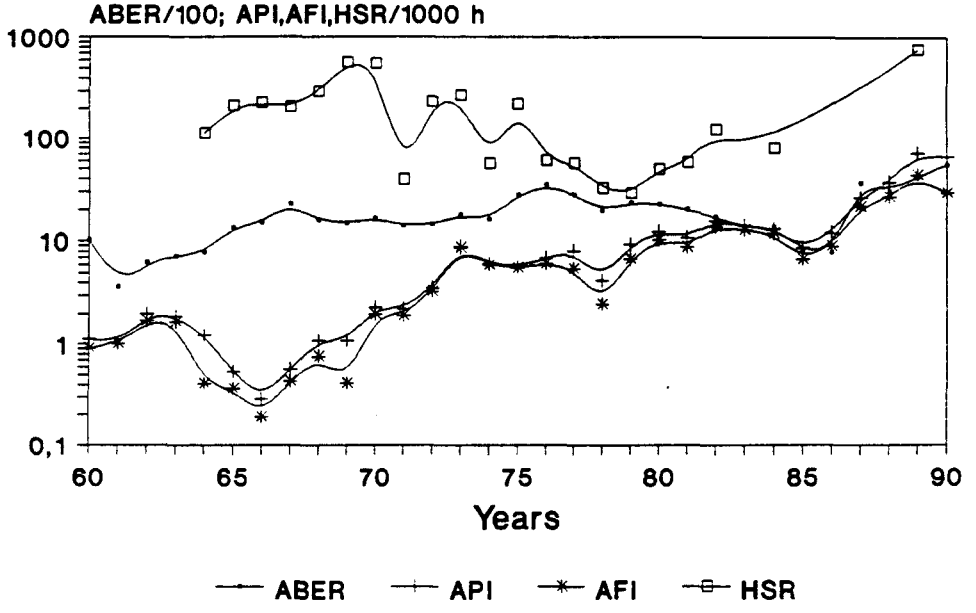
Transmission continues to increase in new settlements around Cayenne, where there was a 30% increase in case-finding from 1989 to 1990. In other areas, transmission continues to be limited.

MALARIOMETRIC RATES - FRENCH GUIANA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	31											
1960	33	3,343	10.13	37	1.12	30	6	1	0.91	0.18	-	-
	33	1,197	3.63	33	1.00	33	-	-	1.00	0.00	-	-
	35	2,183	6.24	70	2.00	60	10	-	1.71	0.29	-	-
	37	2,648	7.16	70	1.89	61	9	-	1.65	0.24	-	-
	39	3,025	7.76	48	1.23	16	32	-	0.41	0.82	4,298	110.21
1965	41	5,424	13.23	22	0.54	15	7	-	0.37	0.17	8,564	208.88
	42	6,180	14.71	12	0.29	8	4	-	0.19	0.10	9,432	224.57
	44	9,811	22.30	25	0.57	19	6	-	0.43	0.14	8,926	202.86
	46	7,132	15.50	50	1.09	35	14	1	0.76	0.30	13,464	292.70
	48	7,000	14.58	52	1.08	20	32	-	0.42	0.67	26,861	559.60
1970	51	8,237	16.15	117	2.29	101	16	-	1.98	0.31	27,967	548.37
	52	7,176	13.80	116	2.23	100	16	-	1.92	0.31	1,996	38.38
	54	7,597	14.07	192	3.56	178	14	-	3.30	0.26	12,361	228.91
	56	9,739	17.39	484	8.64	477	7	-	8.52	0.13	14,650	261.61
	58	9,153	15.78	351	6.05	343	8	-	5.91	0.14	3,160	54.48
1975	56	15,250	27.23	319	5.70	308	11	-	5.50	0.20	12,020	214.64
	58	19,854	34.23	394	6.79	354	40	-	6.10	0.69	3,400	58.62
	61	16,908	27.72	488	8.00	333	146	9	5.46	2.39	3,400	55.74
	63	12,147	19.28	266	4.22	156	102	8	2.48	1.62	2,000	31.75
	66	15,114	22.90	604	9.15	446	157	1	6.76	2.38	1,876	28.42
1980	69	15,462	22.41	831	12.04	700	131	-	10.14	1.90	3,315	48.04
	72	14,249	19.79	769	10.68	627	142	-	8.71	1.97	4,074	56.58
	74	12,319	16.65	1,143	15.45	997	145	1	13.47	1.96	8,925	120.61
	77	10,391	13.49	1,051	13.65	964	87	-	12.52	1.13	...	...
	80	10,587	13.23	1,021	12.76	919	102	-	11.49	1.28	6,240	78.00
1985	82	6,664	8.13	691	8.43	540	142	-	6.59	1.73	...	...
(*)	84	6,436	7.66	979	11.65	738	241	-	8.79	2.87	...	...
(*)	86	30,761	35.77	2,221	25.83	1,798	423	-	20.91	4.92	...	...
(*)	88	26,145	29.71	3,188	36.23	2,284	904	-	25.95	10.27	...	...
	90	35,993	39.99	6,284	69.82	3,831	2,391	-	42.57	26.57	68,000	755.56
1990	92	49,192	53.47	5,909	64.23	2,607	3,292	10	28.34	35.78	-	-

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fiml examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

FRENCH GUIANA - Malariometric Rates
1960-1990



The almost exponential annual growth of malaria cases registered from 1984 to 1988 has come to a halt. The successes achieved in 1989 were maintained in 1990.

Of the country's 10 administrative regions, Region I, along the southern border with Venezuela, continues to have the highest incidence of malaria. Its API of 417 remained practically unchanged from the previous year; 37% of the cases reported in the country were detected in this area. Regions VII, VIII, and IX contributed with 10%, 13%, and 12%, respectively, of total cases. The corresponding APIs were 251 per 1,000 population (for regions VII and VIII combined) and 168 per 1,000.

In Region IV, which includes the capital, Georgetown, 3,775 cases were registered (17% of the total). Epidemiological research revealed that 39% were imported from Region VII and 44% from Region VIII. The vast majority of these cases occurred among migrant gold and diamond prospectors.

Since the reduction in vector prevention and control measures, there has been much greater reliance on the diagnosis and treatment of malaria cases. Microscopy services had 54 individuals working in 39 stationary and six mobile laboratories for the diagnosis of malaria. Chemotherapy was administered by primary health care personnel, as well as personnel from the malaria campaign.

Causes Contributing to the Persistence of Malaria

Prospecting for gold and diamonds by migrant miners, especially in Regions VII and VIII, has had a considerable impact on the epidemiology of malaria in Guyana. Precarious housing conditions in camps alongside the rivers have furthered An. darlingi transmission. Difficult access in many remote areas causes delays in diagnosis and appropriate treatment. The situation has been aggravated by the absence of sprayable walls; the lack of vector protection measures; inappropriate self-administration of drugs in febrile patients; and resistance of P. falciparum to antimalarial drugs.

Spraying coverage has declined considerably from more than 11,000 houses in 1987 to less than 3,000 in 1990. This reduction, as well as the low coverage in rain forest settlements with indigenous populations, have contributed to the persistence of transmission. In some regions, mainly Rupununi (Region IX), seasonal agricultural practice requires the construction of provisional dwellings outside the villages. In these circumstances the factors previously described with regard to the gold prospectors are also present.

The local introduction of malaria in coastal areas caused by migrant mineral prospectors who come to obtain additional provisions, and/or visits to these areas by persons from the interior, provide a constant source of infection for the coastal vector, An. aquasalis. Nevertheless, in the coastal region only 36 autochthonous cases were reported in 1990.

Malaria Control in International Border Areas

An agreement signed by Guyana and Venezuela provides for a joint team that will collaborate in making routine visits to the remote border settlements to make diagnoses, administer treatments, spray dwellings, and promote self-care measures. No official cooperation program has been established in the border area with Brazil, although there is a some exchange of information between the two countries. The project for building roads from the northern border to Georgetown is increasing the population's mobility through malarious regions of the interior. Over time, as a result of improved access, there may be increased settlement in rain forest areas with a high potential for transmission.

A bilateral commission with Suriname holds periodic meetings to study cooperation mechanisms and promote the exchange of information on several health issues, including malaria, but there is no operational collaboration between the two countries.

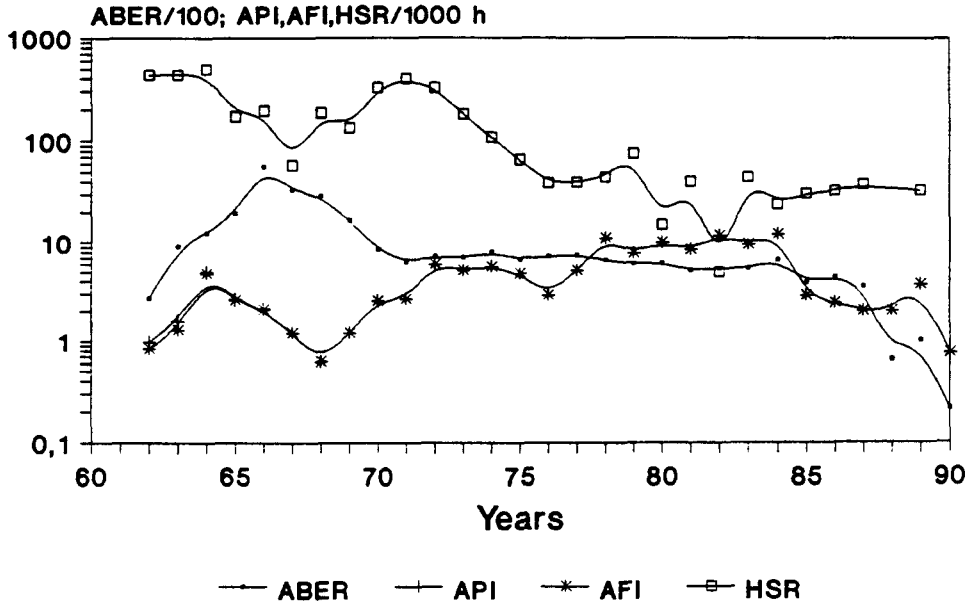
MALARIOMETRIC RATES - HAITI

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
1960	3,991	...	...	...	...	...	...	...	...	...	...	...
	4,067	...	...	...	...	...	...	...	...	...	...	...
	4,145	111,142	2.68	4,033	0.97	3,441	20	572	0.83	0.00	1,792,395	432.42
	4,226	386,657	9.15	6,662	1.58	5,464	12	1,186	1.29	0.00	1,817,027	429.96
	3,850	473,297	12.29	19,170	4.98	18,422	24	724	4.78	0.01	1,883,520	489.23
1965	3,910	752,284	19.24	10,304	2.64	9,997	20	287	2.56	0.01	664,572	169.97
	3,970	2,239,469	56.41	8,378	2.11	8,208	35	138	2.07	0.01	772,513	194.59
	4,030	1,343,796	33.34	4,871	1.21	4,840	3	28	1.20	0.00	233,513	57.94
	4,100	1,173,905	28.63	2,562	0.62	2,556	3	3	0.62	0.00	760,385	185.46
	4,160	686,167	16.49	5,005	1.20	4,999	1	5	1.20	0.00	549,869	132.18
1970	4,235	357,366	8.44	10,658	2.52	10,654	-	4	2.52	-	1,354,700	319.88
	4,315	270,695	6.27	11,347	2.63	11,345	2	-	2.63	0.00	1,697,187	393.32
	4,368	313,368	7.17	25,961	5.94	25,961	-	-	5.94	-	1,411,027	323.04
	4,440	309,482	6.97	22,858	5.15	22,857	-	1	5.15	-	801,247	180.46
	4,514	357,546	7.92	25,441	5.64	25,441	-	-	5.64	-	487,658	108.03
1975	5,157	346,934	6.73	24,733	4.80	24,732	1	-	4.80	-	337,874	65.52
	5,279	380,184	7.20	15,087	2.86	15,078	7	2	2.86	0.00	205,767	38.98
	5,405	400,024	7.40	27,679	5.12	27,646	28	5	5.11	0.01	213,796	39.56
	5,535	365,202	6.60	60,472	10.93	60,471	1	-	10.93	0.00	247,095	44.64
	5,295	321,456	6.07	41,252	7.79	41,252	-	-	7.79	-	396,595	74.90
1980	5,413	333,157	6.15	53,478	9.88	53,478	-	-	9.88	-	80,244	14.82
	5,509	283,978	5.15	46,703	8.48	46,703	-	-	8.48	-	219,512	39.85
	5,616	303,118	5.40	65,354	11.64	65,354	-	-	11.64	-	27,683	4.93
	5,723	308,075	5.38	53,954	9.43	53,954	-	-	9.43	-	253,177	44.24
	5,830	385,400	6.61	69,863	11.98	69,862	1	-	11.98	0.00	138,174	23.70
1985	5,922	226,887	3.83	16,662	2.81	16,662	-	-	2.81	-	179,230	30.27
	6,032	262,582	4.35	14,363	2.38	14,363	-	-	2.38	-	194,512	32.25
	6,146	212,989	3.47	12,134	1.97	12,120	14	-	1.97	0.00	227,813	37.07
(*)	6,263	40,321	0.64	12,306	1.96	12,306	-	-	1.96	0.00	0	0.00
1989	6,381	63,528	1.00	23,231	3.64	23,231	-	-	3.64	0.00	206,541	32.37
	6,504	13,743	0.21	4,806	0.74	4,806	-	-	0.74	0.00	0	0.00

(hs)

a) Estimated population, in thousands of inhabitants.
b) Number thick blood films examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.
* Information of 1988 is provisional and incomplete.

HAITI - Malariometric Rates
1962-1990



Malaria control is one of the priority programs of the Ministry of Health. The disease is endemic in the country and affects most of the territory, with perennial transmission in some coastal areas and seasonal transmission in others during the rainy seasons of April-May and of October-November. The collection of epidemiological information is a responsibility of the health services.

In 1989, 63,528 blood samples were examined, 23,231 of which were diagnosed as positive, yielding a SPR of 36.5 per 1,000 population.

The data available for 1990 cover only two of the fifteen districts in the country. Some 13,743 blood samples were examined and 4,806 of these were positive (35.0% SPR).

Under the control strategy adopted by the health authorities, malaria is considered to be a high priority public health problem. Responsibility for control of the disease has been delegated to the health services, which are expected to incorporate it into their regular plans for providing health care to the population. This strategy requires that all health, governmental, and nongovernmental institutions (NGOs) offer the community curative services using the appropriate antimalarial drugs. The health

promotion services provide information on methods of personal protection and control methods for the implementation of preventive measures at the community level. During 1990, a total of 1,250,000 chloroquine tablets (150 mg bases) and 14,000 primaquine tablets (15 mg bases) were distributed to the health institutions in malarious areas.

P. falciparum is currently the only parasite prevalent in the country and there is no evidence of any chloroquine-resistant strains. The regular and periodic use of insecticides as a means of vector control is not part of the control strategy. The Ministry of Health has no personnel specialized in this type of activity.

A unit of specialists in malaria, including three physicians, one sanitary engineer, one entomologist, and one technical expert in vector control is responsible for analyzing the epidemiological situation and providing technical direction to the health institutions in relation to the implementation of the most appropriate control strategy (strategies).

Decentralization

Malaria control has been decentralized since 1988; responsibility for this activity has been delegated to the General Health Services. The semi-autonomous institution that previously was in charge of malaria control was abolished in 1988. In late 1990, the Government, with **PAHO/WHO** assistance, obtained **UNDP** approval for a US$ 1,000,000.00 project, which will be carried out by PAHO/WHO. This project makes available to the Ministry of Health the resources needed to train personnel for the general health services, including NGO personnel, in order to ensure successful implementation of the strategy (strategies) selected. AID/USA contributes the equivalent of approximately US$ 250,000 for malaria control in problem areas. The Japanese International Cooperation Agency (JICA) has donated equipment and vehicles.

Malaria Control in International Border Areas

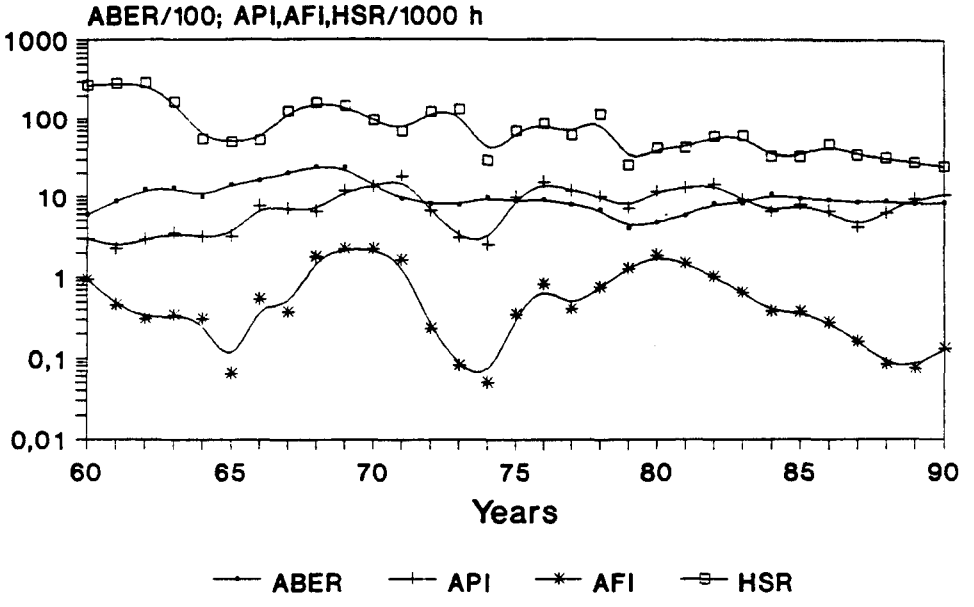
During the year no special activities were undertaken in border areas. However, preparations are underway to renew the agreement with the Dominican Republic for carrying out certain joint border activities, especially follow-up on sensitivity of the vector to insecticides.

MALARIOMETRIC RATES - HONDURAS

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	1,880	66,391	3.53	6,675	3.55	3,170	3,504	1	1.69	1.86	236,963	126.04
1960	1,849	109,677	5.93	5,517	2.98	1,737	3,780	-	0.94	2.04	496,758	268.66
	1,910	164,965	8.64	4,334	2.27	861	3,472	1	0.45	1.82	543,766	284.69
	1,973	239,655	12.15	5,750	2.91	597	5,153	-	0.30	2.61	575,450	291.66
	2,040	264,131	12.95	7,077	3.47	688	6,389	-	0.34	3.13	336,144	164.78
	2,109	207,000	9.82	6,673	3.16	641	6,032	-	0.30	2.86	115,153	54.60
1965	2,181	310,301	14.23	6,952	3.19	141	6,811	-	0.06	3.12	109,162	50.05
	2,256	360,760	15.99	17,127	7.59	1,204	15,923	-	0.53	7.06	118,142	52.37
	2,333	465,598	19.96	16,144	6.92	872	15,272	-	0.37	6.55	288,253	123.55
	2,413	584,696	24.23	15,666	6.49	4,281	11,385	-	1.77	4.72	382,068	158.34
	2,495	591,544	23.71	29,584	11.86	5,528	24,056	-	2.22	9.64	360,416	144.46
1970	2,640	357,436	13.54	34,537	13.08	5,875	28,662	-	2.23	10.8[illegible]	248,440	94.11
	2,720	255,773	9.40	48,586	17.86	4,444	44,142	-	1.6[illegible]	16.23	184,027	67.66
	2,810	226,578	8.06	18,651	6.64	652	17,999	-	0.23	6.41	340,011	121.00
	2,900	226,231	7.80	8,862	3.06	239	8,621	2	0.08	2.97	376,655	129.88
	2,990	287,842	9.63	7,[illegible]03	2.51	150	7,353	-	0.05	2.46	86,626	28.97
1975	3,093	266,923	8.63	30,289	9.79	1,078	29,210	1	0.35	9.44	213,792	69.12
	3,202	295,128	9.22	48,804	15.24	2,603	46,201	-	0.81	14.43	276,375	86.31
	3,318	264,233	7.96	39,414	11.88	1,355	38,059	-	0.41	11.47	202,920	61.16
	3,438	236,650	6.88	34,554	10.05	2,539	32,013	2	0.74	9.31	389,642	113.33
	3,563	143,485	4.03	25,297	7.10	4,505	20,792	-	1.26	5.84	90,500	25.40
1980	3,691	175,591	4.76	43,009	11.65	6,789	36,220	-	1.84	9.81	154,362	41.82
	3,822	221,822	5.80	49,377	12.92	5,667	43,710	-	1.48	11.44	160,536	42.00
	3,957	322,802	8.16	57,482	14.53	4,019	53,463	-	1.02	13.51	233,702	59.06
	4,094	336,879	8.23	37,536	9.17	2,640	34,896	-	0.64	8.52	243,669	59.52
	4,232	452,184	10.68	27,332	6.46	1,589	25,743	-	0.38	6.08	138,174	32.65
1985	4,383	410,720	9.37	33,828	7.72	1,616	32,212	-	0.37	7.35	140,793	32.12
	4,531	411,150	9.07	29,130	6.43	1,238	27,892	-	0.27	6.16	211,214	46.62
	4,680	388,509	8.30	19,095	4.08	743	18,352	-	0.16	3.92	158,386	33.84
	4,830	421,474	8.73	29,737	6.16	405	29,332	-	0.08	6.07	148,736	30.79
	4,982	391,250	7.85	45,922	9.22	367	45,555	-	0.07	9.14	134,593	27.02
1990	5,138	418,513	8.15	53,095	10.33	659	52,436	-	0.13	10.21	123,963	24.13

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

HONDURAS - Malariometric Rates
1960-1990



Malaria is endemic in Honduras; in 1990 it was third among reportable communicable diseases, with a morbidity rate of 1,072.5 per 100,000 population.

The country has an area of 112,088 km² and a population of 4,950,633, with a density of 44.2 inhabitants per km². The area that ranges in altitude from zero to 1,000 meters above sea level is considered the malarious area; it encompasses 100,071 km² (89%) and 4,620,633 inhabitants (93.3%). It is estimated that this area includes 11,000 localities. Some 62% of the population resides in rural areas.

The parasite formula is 98.8% P. vivax and 1.2% P. falciparum. The mosquito vectors are A. Albimanus, A. darlingi, and A. pseudopunctipennis. The case-finding network comprises 5,604 posts staffed by voluntary collaborators and 822 health service posts.

In 1990, of the 418,513 blood samples examined, 53,095 were positive; of these, 52,436 (98.8%) were P. vivax infections and 659 (1.2%) were due to P. falciparum and related agents.

Since 1989 there has been an upward trend in the number of cases, with the API increasing from 9.22 per 1,000 population in 1989 to 10.33 per 1,000 in 1990. The same has occurred with P. falciparum infections, with the annual P. falciparum incidence (AFI) rising from 0.07 to 0.13 per 1,000 population. This

situation might be attributable to heavy floods that occurred from October to December 1990, especially in the Sula and Aguan valleys, and to operational measures that were incomplete and non-uniform.

The departments with the highest incidence of malaria during the year were: Yoro, 13,562 cases (3.8 API); Choluteca, 8,339 cases (2.7 API); Colón, 7,483 cases (4.8 API); Cortés, 7,165 cases (1.0 API); Valle, 3,166 cases (2.5 API); and Atlántida, 1,930 cases (0.8 API). Total cases numbered 41,644 (82.3 per 1,000 population).

Most of these departments include tropical rain forest areas characterized by heavy rainfall, temperatures above 28ºC, and average altitudes of 200 meters above sea level. Malaria affects all age groups and both sexes equally.

In general, 51.4% of the cases occurred in persons under 15 years of age, and 52.7% of the patients were males. Of the total samples taken in 1989, 75% were obtained by voluntary collaborators, who detected 84.7% of total cases.

Causes Contributing to the Persistence of Malaria

Biological, environmental, social, and economic factors directly and indirectly affect the transmission of malaria. In most of the Honduran territory, environmental conditions are favorable for transmission of the disease. These conditions include rain forests, numerous bodies of water, climate, heavy rainfall, and high relative humidity. Among the social and economic factors that are currently contributing to increased incidence of the disease are internal and external migratory movements, the presence of displaced persons and refugees as a result of wars in neighboring countries, seasonal internal migrations in the planting and harvest seasons, and the appearance of squatter settlements with makeshift shelters and poor living conditions.

The operational and technical factors that favor the transmission of malaria in the country are the existence of places in the malarious area that have received no attention for several years, the result being lack of knowledge regarding the epidemiological situation; erratic and incomplete application of control measures; low coverage of house spraying with insecticides; physiological resistance of the mosquito vector to insecticides; delay in the diagnosis of blood samples; and insufficient and low-quality field supervision.

Decentralization

Beginning in 1990, the Division of Vector Control (DCV) began to operate as the Division of Vector-Borne Diseases (DETV). The purpose of this change was to simplify the organization of this new

Division, which has been assigned, at the central level, the role of serving as a technical and normative unit to provide support for the health regions. The structure was transformed, and resources were decentralized.

This marked the beginning of the process of decentralizing and incorporating activities for the control of malaria and other vector-borne diseases (dengue, Chagas' disease, and leishmaniasis) into the local health services.

At the central level, the DETV was restructured in such a way that it maintains adequate levels of communication with the health regions so as to be able to advise them on the control of vector-borne diseases. Since some of the personnel in the health regions were not sufficiently informed or familiarized in regard to malaria prevention and control activities, it was necessary to update their knowledge and train them to carry out comprehensive health activities. At the same time a great deal of emphasis was placed on ensuring community participation in the prevention and control of malaria and other vector-borne diseases, as well as on expanding the network of voluntary collaborators, especially in localities where access is difficult.

The Ministry of Health facilities as of 1990 consist of 724 establishments, distributed as follows: 23 hospitals, two maternal and child health clinics, 178 health centers with physicians, and 521 health centers without physicians. In addition, there are 5,664 voluntary collaborators for malaria control, community health workers, trained midwives, and others. To support diagnosis, there is a network of 72 clinical laboratories, with a national reference laboratory in the capital, offering microscopy, hematology, clinical chemistry, bacteriology, virology, and other services. In addition, the DETV has 37 microscopists located in the service-providing units who perform microscopic examination of the blood samples taken by voluntary collaborators and Division personnel. It has been established that the general health services should take at least 10 blood samples daily, which would represent 35% of the planned number. It is hoped that integration will lead to greater productivity among health personnel in the epidemiological surveillance of malaria.

Epidemiological Stratification

The malarious areas of the country include coastal areas, valleys, and areas at medium altitudes. Malaria is present in 256 (88.9%) of the country's 288 municipios; the remaining 32 municipios are considered non-malarious (11%). The risk to the inhabitants is not uniform, as there are some municipios where 100% of the population is at risk, while in others less than 10% of the inhabitants are exposed.

In 1989 stratification criteria were established in order to classify the municipios by their malariogenic potential during the six years of the 1984-1989 period. This made it possible to group the 288 municipios into three strata in accordance with the mean API values for this period.

The stratum considered to be at high-risk for malaria includes 64 municipios whose API during the six years ranged from 8.0 to 51.9 cases per 1,000 inhabitants, with a population in 1989 of 1,200,000. These municipios accounted for 79.5% of all cases in the country.

The stratum considered to be at average risk includes 58 municipios with an average API over the six years ranging from 3.0 to 7.9 per 1,000 population, with a population estimated at 1,000,000, i.e. 25% of the national population. These municipios accounted for 15.4% of all cases.

The third group, the low-risk stratum, includes 166 municipios whose API ranged from 0.0 to 2.9 cases per 1,000 population, with an estimated population of 2,300,000. This group includes the 32 municipios considered non-malarious, with a population of 838,200, including the Metropolitan Region. This group registered 5.1% of all cases in the country.

High-risk Stratum. The environmental characteristics of these areas, which include the coastal plains of the Atlantic and Pacific, low valleys, and tropical rain forests are: warm climate, temperatures above 26ºC, relative humidity of over 70%, rainfall of more than 2,000 mm^3 per year, and numerous bodies of water. In this stratum malaria has a tendency to become epidemic. There is high endemicity from continuous malaria transmission, abundant untreated carriers, an API of more than eight per 1,000 population, and prevalence of P.vivax (99%), with P.falciparum (1%); the vectors are A. albimanus and A. darlingi. The 64 municipios of this stratum (22.2% of the total) include 27% of the population.

The social and economic characteristics of this stratum are those typical of a region that is undergoing development in the agroindustrial and livestock sectors. There is limited urban development in these areas and basic services such as water, refuse collection, and excreta disposal are deficient. There are extensive farm areas with banana, African palm, rice, and sugarcane crops and frequent migrations of farm workers, especially during the planting and harvest seasons.

Average-risk Stratum. The environmental characteristics of this stratum, which comprises mountainous regions with numerous medium and small interior valleys located from 800 to 1,200 meters above sea level and subtropical rain forests, are: temperate climate, temperatures varying from 18ºC to 20ºC, rainfall of 2,000 mm^3 to 3,000 mm^3 per year, usually between May and October,

relative humidity of 60% to 70%, and numerous tributaries and rivers that make up the country's major rivers. The epidemiological characteristics include unstable malaria, with frequent outbreaks limited to small interior valleys, an abundant migrant reservoir that has not received adequate treatment, an API from 3.0 per 1,000 to 7.9 per 1,000 population, and P.vivax infection in 99.9% of the cases. The vectors are A. pseudopunctipennis and A. albimanus. The 58 municipios of this stratum account for 20.2% of the total, with 22.5% of the population and 15% of malaria cases.

The social and economic characteristics include the cultivation of tobacco, coffee, and grains; livestock raising; and frequent migration among rural farm workers.

Low-risk Stratum. The environmental characteristics of this stratum, which comprises mountainous regions with abundant high and narrow valleys at over 1,000 meters above sea level and subtropical rain forests, are: subtropical climate, temperature of 16ºC to 24ºC, relative humidity of 50%-70%, rainfall of 1,000 mm^3 to 2,000 mm^3 per year, usually occurring between May and October, and numerous bodies of water.

Malaria transmission is sporadic, but numerous cases are imported from the high- and average-risk strata. The API is less than 2.9 cases per 1,000 population; 99.9% are P. vivax. The vector is the A. albimanus. The 166 municipios in this stratum constitute 57.6% of the total number; the population is 50.5% of the national figure; and malaria positivity is 5.1% of the total for the country.

The social and economic characteristics are those of a rural population in hilly terrain at high altitudes, with grain production and livestock raising. There is also an urban population engaged in industrial and commercial activity in the urban areas. There is considerable migration of the population.

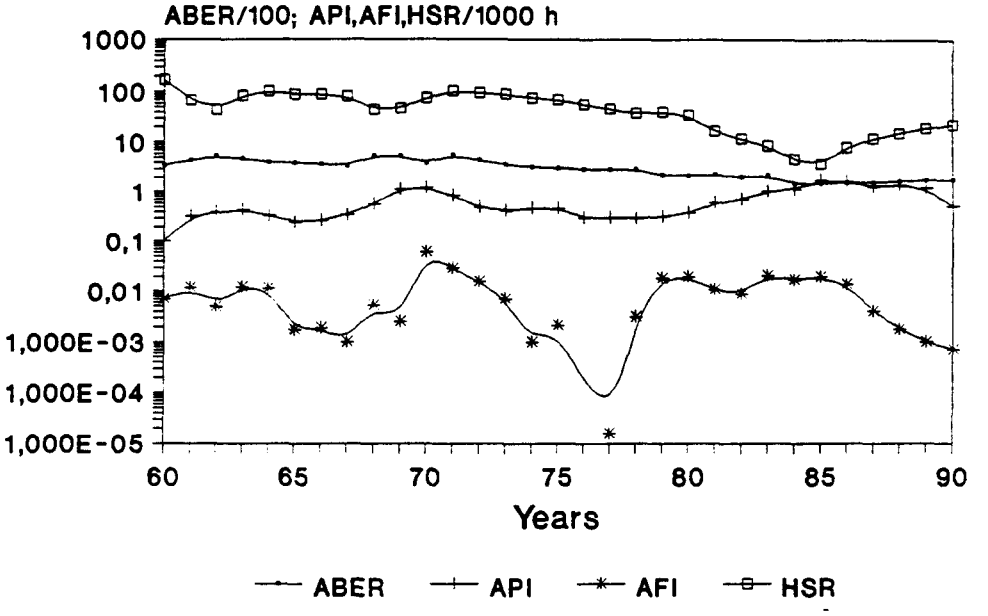
The process of epidemiological stratification of malaria with a view to its control has not yet been fully implemented. Studies are currently underway for this purpose in two health regions (4 and 6), and the process will be initiated during the second half of 1991, depending on the results obtained.

MALARIOMETRIC RATES - MEXICO

Year	Total population	Blood slides examined								Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	34,851	821,598	2.36	3,202	0.09	443	2,705	54	0.01	0.08	6,560,183	188.24
1960	34,994	1,212,770	3.47	3,569	0.10	245	3,251	73	0.01	0.09	5,918,572	169.13
	36,158	1,574,267	4.35	11,849	0.33	428	11,287	134	0.01	0.31	2,434,790	67.34
	37,367	1,967,392	5.27	14,279	0.38	182	14,027	70	0.00	0.38	1,608,147	43.04
	38,623	1,832,551	4.74	16,741	0.43	462	16,215	64	0.01	0.42	3,182,640	82.40
	39,928	1,595,323	4.00	13,405	0.34	454	12,929	22	0.01	0.32	4,068,291	101.89
1965	41,284	1,595,503	3.86	10,113	0.24	70	10,033	10	0.00	0.24	3,580,140	86.72
	42,694	1,572,042	3.68	11,212	0.26	80	11,121	11	0.00	0.26	3,714,522	87.00
	44,161	1,471,843	3.33	15,163	0.34	44	15,110	9	0.00	0.34	3,515,375	79.60
	45,686	2,406,837	5.27	26,040	0.57	236	25,669	135	0.01	0.56	1,973,112	43.19
	47,274	2,524,060	5.34	52,126	1.10	119	51,958	119	0.00	1.10	2,136,772	45.20
1970	50,695	1,889,877	3.73	61,158	1.21	3,026	58,083	49	0.06	1.15	3,666,055	72.32
	52,452	2,859,253	5.45	42,978	0.82	1,501	41,432	45	0.03	0.79	5,350,655	102.01
	54,273	2,329,667	4.29	26,216	0.48	852	25,324	40	0.02	0.47	4,965,198	91.49
	56,161	1,959,139	3.49	23,176	0.41	393	22,760	23	0.01	0.41	4,836,154	86.11
	58,118	1,822,307	3.14	26,800	0.46	57	26,718	25	0.00	0.46	4,293,265	73.87
1975	60,153	1,805,782	3.00	27,925	0.46	126	27,784	15	0.00	0.46	4,053,426	67.39
	61,990	1,749,778	2.82	18,153	0.29	-	18,139	14	0.00	0.29	3,397,260	54.80
	63,827	1,804,367	2.83	18,851	0.30	1	18,842	8	0.00	0.30	2,817,470	44.14
	65,668	1,845,554	2.81	19,080	0.29	200	18,865	15	0.00	0.29	2,354,162	35.85
	67,522	1,446,946	2.14	20,983	0.31	1,208	19,760	15	0.02	0.29	2,609,171	38.64
1980	69,393	1,467,695	2.12	25,734	0.37	1,329	24,402	3	0.02	0.35	2,298,366	33.12
	71,281	1,593,697	2.24	42,104	0.59	762	41,336	6	0.01	0.58	1,141,083	16.01
	73,184	1,440,806	1.97	49,993	0.68	637	49,242	114	0.01	0.67	828,311	11.32
	75,103	1,595,180	2.12	75,029	1.00	1,554	73,472	3	0.02	0.98	613,268	8.17
	77,040	1,093,953	1.42	85,501	1.11	1,283	84,214	4	0.02	1.09	338,538	4.39
1985	79,376	1,156,831	1.46	133,698	1.68	1,537	132,160	1	0.02	1.66	276,765	3.49
	81,204	1,237,260	1.52	131,014	1.61	1,105	129,909	-	0.01	1.60	612,395	7.54
	83,040	1,275,010	1.54	102,984*	1.24	332	102,651	1	0.00	1.24	927,461	11.17
(m)	84,884	1,385,626	1.63	116,238	1.37	152	116,086	-	0.00	1.37	1,219,319	14.36
1989	86,737	1,484,565	1.71	101,241	1.17	85	101,127	-	0.00	1.17	1,583,090	18.25
1990	88,598	1,503,208	1.70	44,513	0.50	62	44,451	-	0.00	0.50	1,857,765	20.97

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.
m) Estimated figures.
* In 1989 29 cases without diagnostic specie are included.

MEXICO - Malariometric Rates
1960-1990



In Guerrero, Michoacán, and Oaxaca the Plan of Simultaneous Intensive Actions was launched during the second half of 1989. In 1990 this plan was strengthened through the addition of human resources, materials, and financial resources, which contributed to a reduction in transmission and a decrease in the number of cases and the number of positive localities. The foregoing made it possible to contain the trend that the disease had shown up to 1988. In 1990, 44,513 cases were registered in 11,008 localities which, compared with 101,241 cases and 16,102 localities in 1989, represented a reduction of 56% and 31%, respectively. The number of blood samples examined rose from 1,484,565 in 1989 to 1,503,208 in 1990.

The API for the entire country decreased from 1.17 per 1,000 in 1989 to 0.50 per 1,000 population in 1990. The SPR, which had been 6.8% in 1989, declined to 2.9% in 1990. The ABER remained at 1.71 per 100 inhabitants both years.

In 1990, 62 P. falciparum cases were diagnosed in the states of Tabasco, Chiapas, Quintana Roo, and Yucatán. The case diagnosed in Yucatán had been imported from Angola. The outbreak registered in the state of Tabasco in 1990 was associated with migration from the Central American countries, which points up the necessity of strengthening international coordination in order to improve control.

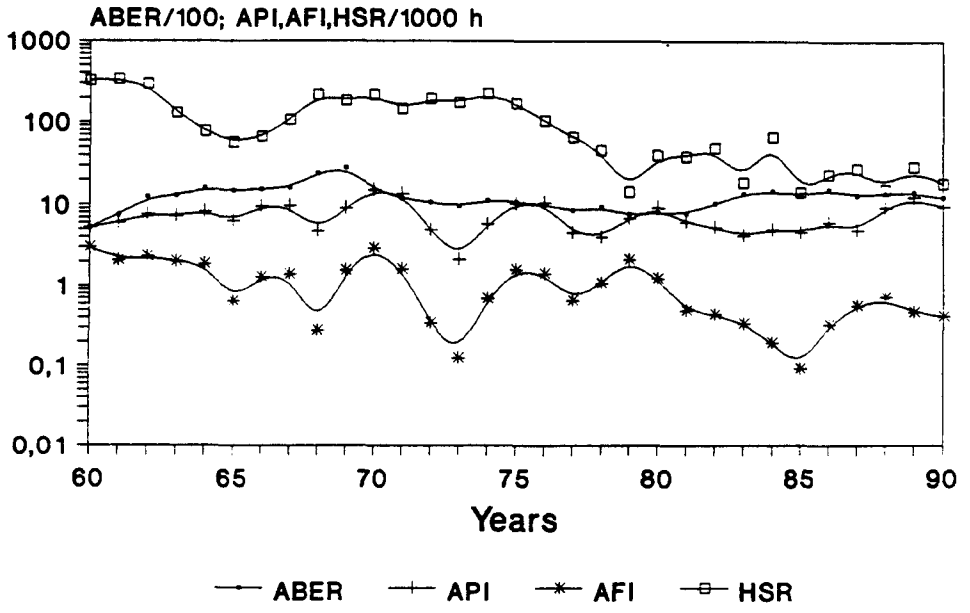
The feasibility and outcome of the program will depend to a great extent on strengthening the quantity, timeliness, and quality of resources, as well as on improving the training of personnel, whose role in the program has been of utmost importance.

MALARIOMETRIC RATES - NICARAGUA

Year	Total population	Blood slides examined: Number	ABER	Positive	API	P.falc. & Assoc.	Other species: P.vivax	Other species	AFI	AVI	Sprayings: Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	1,370	38,965	2.84	1,907	1.39	649	1,258	-	0.47	0.92	425,575	310.64
1960	1,411	74,074	5.25	7,528	5.34	4,217	3,311	-	2.99	2.35	460,554	326.40
	1,453	109,283	7.52	8,722	6.00	3,001	5,721	-	2.07	3.94	490,912	337.86
	1,496	181,727	12.15	11,359	7.59	3,454	7,904	1	2.31	5.28	435,155	290.88
	1,541	194,087	12.59	11,155	7.24	3,034	8,121	-	1.97	5.27	197,715	128.30
	1,579	247,611	15.68	13,016	8.24	2,908	10,108	-	1.84	6.40	122,046	77.29
1965	1,619	238,467	14.73	10,275	6.35	1,039	9,236	-	0.64	5.70	91,614	56.59
	1,660	254,497	15.33	15,647	9.43	2,128	13,519	-	1.28	8.14	109,931	66.22
	1,701	269,395	15.84	16,321	9.59	2,353	13,968	-	1.38	8.21	177,422	104.30
	1,744	411,544	23.60	8,250	4.73	479	7,771	-	0.27	4.46	374,418	214.69
	1,788	498,119	27.86	16,050	8.98	2,732	13,318	-	1.53	7.45	322,777	180.52
1970	1,833	281,386	15.35	27,260	14.87	5,348	21,912	-	2.92	11.95	390,083	212.81
	1,889	223,098	11.81	25,303	13.39	3,041	22,262	-	1.61	11.79	269,794	142.82
	1,954	208,232	10.66	9,595	4.91	666	8,929	-	0.34	4.57	376,056	192.45
	2,015	191,361	9.50	4,246	2.11	251	3,989	6	0.12	1.98	348,622	173.01
	2,084	233,941	11.23	12,167	5.84	1,452	10,715	-	0.70	5.14	463,391	222.36
1975	2,408	259,675	10.78	24,692	10.25	3,798	20,894	-	1.58	8.68	408,839	169.78
	2,478	250,582	10.11	26,228	10.58	3,513	22,715	-	1.42	9.17	253,158	102.16
	2,546	215,093	8.45	11,584	4.55	1,671	9,913	-	0.66	3.89	167,367	65.74
	2,616	243,450	9.31	10,633	4.06	2,798	7,835	-	1.07	3.00	118,468	45.29
	2,690	203,475	7.56	18,418	6.85	5,669	12,749	-	2.11	4.74	37,887	14.08
1980	2,771	222,427	8.03	25,465	9.19	3,424	22,041	-	1.24	7.95	108,157	39.03
	2,860	223,473	7.81	17,434	6.10	1,396	16,038	-	0.49	5.61	107,362	37.54
	2,955	300,001	10.15	15,601	5.28	1,291	14,310	-	0.44	4.84	142,931	48.37
	3,056	412,858	13.51	12,907	4.22	1,018	11,889	-	0.33	3.89	56,271	18.41
	3,162	451,943	14.29	15,702	4.97	615	15,087	-	0.19	4.77	205,494	64.99
1985	3,272	424,681	12.98	15,130	4.62	298	14,840	-	0.09	0.03	45,356	13.86
	3,385	510,289	15.08	20,308	6.00	1,096	19,212	-	0.32	0.04	77,423	22.87
	3,502	448,314	12.80	17,011	4.86	1,928	15,083	-	0.55	0.03	93,573	26.72
	3,622	490,145	13.53	33,047	9.12	2,575	30,472	-	0.71	0.06	54,267	14.98
1989	3,745	523,700	13.98	45,982	12.28	1,720	44,262	-	0.46	0.08	105,454	28.16
	3,871	465,830	12.03	35,785	9.24	1,568	34,217	-	0.41	0.07	68,348	17.66

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

NICARAGUA - Malariometric Rates
1960-1990



A total of 35,785 malaria cases were registered with laboratory confirmation. The annual parasite incidence for the country as a whole was 9.3 cases per 1,000 population, down from 1989, when it had been 12.3 per 1,000 population. The SPR was 7.7% and the ABER, 12%. The parasite formula remained at 5% P. falciparum and 95% P. vivax.

Region II is the source of 60% of malaria cases in the country. It encompasses an area of 9,686 km^2 and has 695,000 inhabitants. This Region includes two departments (León and Chinandega) and 23 municipios. Those with the highest incidence are:

Municipio	Population	Area	Cases/90	A.P.I./90 x1000
El Viejo	68,900 H.	1,271 Km2.	4,937	71.7
León	150,100	852	3,144	20.9
Chinandega	108,800	625	2,817	25.9
Chichigalpa	48,800	252	1,960	40.2
La Reynaga	30,300	834	1,140	37.6
Somotillo	25,600	928	1,069	41.8

These six municipios account for 70% of the cases in the Region.

Malaria Control in International Border Areas

The activities carried out in the border areas with Honduras and Costa Rica centered around on epidemiological surveillance, which involves case-finding. Most cases were detected by voluntary collaborators, who took 60% of the blood samples obtained. The treatment of positive malaria cases was carried out by the personnel program, with an average coverage of 80% (radical treatments). In 1990 no spraying cycle was programmed, and antilarval actions were very erratic. In addition, intercountry coordination meetings were not held. Although most of these localities do not have a high incidence of malaria, there is a potential danger of an increase in cases due to migration and new settlements.

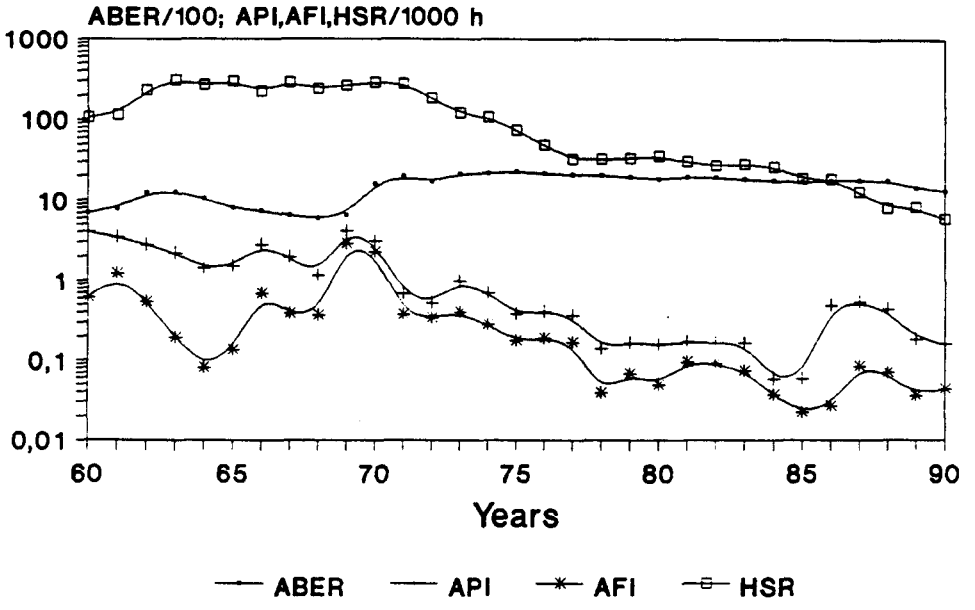
Region II, León and Chinandega, is the region that has achieved greatest success in integrating the malaria control program with the health services. This progress came about as a result of the need to solve the problem. In the other border regions, there is not yet a defined and stable integration of the malaria program with the health services.

MALARIOMETRIC RATES - PANAMA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	1,073	80,471	7.50	5,066	4.72	583	4,481	2	0.54	4.18	142,848	133.13
1960	1,104	77,141	6.99	4,464	4.04	670	3,793	1	0.61	3.44	115,948	105.03
	1,137	88,961	7.82	3,911	3.44	1,378	2,531	2	1.21	2.23	128,200	112.75
	1,175	145,012	12.34	3,249	2.77	631	2,618	-	0.54	2.23	271,260	230.86
	1,217	152,898	12.56	2,670	2.19	236	2,433	1	0.19	2.00	373,953	307.27
	1,259	131,634	10.46	1,804	1.43	101	1,703	-	0.08	1.35	331,795	263.54
1965	1,288	102,996	8.00	1,929	1.50	172	1,757	-	0.13	1.36	383,552	297.79
	1,327	97,525	7.35	3,664	2.76	906	2,757	1	0.68	2.08	292,251	220.23
	1,366	88,612	6.49	2,646	1.94	527	2,119	-	0.39	1.55	392,532	287.36
	1,407	83,211	5.91	1,625	1.15	512	1,113	-	0.36	0.79	333,764	237.22
	1,448	94,596	6.53	5,937	4.10	4,104	1,833	-	2.83	1.27	379,549	262.12
1970	1,504	237,477	15.79	4,584	3.05	3,405	1,179	-	2.26	0.78	429,829	285.79
	1,545	301,030	19.48	1,041	0.67	573	467	1	0.37	0.30	427,499	276.70
	1,595	269,098	16.87	819	0.51	543	276	-	0.34	0.17	293,971	184.31
	1,636	344,315	21.05	1,595	0.97	651	944	-	0.40	0.58	197,897	120.96
	1,705	368,820	21.63	1,184	0.69	481	703	-	0.28	0.41	180,910	106.11
1975	1,748	394,995	22.60	666	0.38	307	359	-	0.18	0.21	130,241	74.51
	1,790	384,941	21.51	727	0.41	337	390	-	0.19	0.22	86,915	48.56
	1,831	377,059	20.59	674	0.37	308	365	1	0.17	0.20	60,340	32.95
	1,873	382,942	20.45	263	0.14	73	190	-	0.04	0.10	60,954	32.54
	1,914	369,775	19.32	316	0.17	129	187	-	0.07	0.10	64,250	33.57
1980	1,957	360,172	18.40	304	0.16	97	207	-	0.05	0.11	69,954	35.75
	2,000	387,276	19.36	340	0.17	189	151	-	0.09	0.08	60,330	30.17
	2,044	392,458	19.20	334	0.16	186	148	-	0.09	0.07	55,737	27.27
	2,089	380,135	18.20	341	0.16	154	187	-	0.07	0.09	59,328	28.40
	2,134	373,072	17.48	125	0.06	78	47	-	0.04	0.02	56,516	26.48
1985	2,180	367,839	16.87	126	0.06	48	78	-	0.02	0.04	40,802	18.72
	2,227	388,485	17.44	1,060	0.48	59	1,001	-	0.03	0.45	40,392	18.14
	2,274	403,305	17.74	1,195	0.53	189	1,006	-	0.08	0.44	29,046	12.77
	2,322	404,320	17.41	1,000	0.43	161	839	-	0.07	0.36	18,367	7.91
	2,370	338,473	14.28	427	0.18	84	343	-	0.04	0.14	19,361	8.17
1990	2,418	315,359	13.04	381	0.16	105	276	-	0.04	0.11	13,955	5.77

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

PANAMA-Malariometric Rates
1960-1990



Malaria persists in the province of Darién, the San Blas comarca, and eastern Panama (Bayano region). These areas make up 3.4% of the national population, distributed in 32.3% of the national territory and have a population density of 3.5 per km^2. Cases have been detected in 84 localities. Local infections were registered in 72 of them, accounting for 0.74% of the localities existing in the malaria area. With 23,114 blood samples less than 1989, 46 malaria cases (10.8%) were discovered. Since 1985 there has been no registered mortality due to malaria; morbidity has declined in the last five years from 47.6 to 15.8 with a slight increase in 1987.

Control activities have consisted of house spraying with Fenitrothion as the only intervention measure aimed at preventing the disease. In 1990 spraying coverage was 21.7% of what was considered necessary.

The origin of 90% of the cases nationwide was investigated and 83.2% were found to be autochthonous. The health services detected 32.8% of the malaria cases by taking blood samples. Medication with chloroquine/primaquine for P. vivax infections and Fanasil for P. falciparum cases were used for disease control, in accordance with current standards. Radical curative treatment was administered in 90.3% of the cases. The remaining cases occurred in persons who were in the country temporarily.

In 1990 an Interinstitutional Committee on Water, Sanitation, and the Environment (CIASMA) was created. This committee includes the participation of the Ministry of Health (MS), National Water Supply and Sewerage Institute (IDAAN), the Metropolitan Sanitation Board (DIMA), the Institutes of Renewable Natural Resources (INRENARE), the National Commission on the Environment (CONAMA), the Ministry of Planning and Economic Policy (MIPPE), and the Bayano Development Corporation. This Committee was formed to facilitate the coordination of disease prevention and control actions in the context of the environment and health.

Causes Contributing to the Persistence of Malaria

In the San Blas comarca the indigenous population has close commercial and political-tribal relations with indigenous groups in the Caño Caimán region of Colombia on the Urabá Gulf and religious-social ties with the reserves of Madugandí, Wala, Nurra, and Mortí in the inland part of the comarca, and this has contributed to persistence of the disease. The situation is exacerbated by the frequent entry of non-indigenous Colombian merchants into the country without any migration control (imported cases), and incomplete and untimely intervention measures, both for cultural reasons and due to lack of resources (NMES).

In the province of Darién, there is migration from Juradó, Chocó, and Antioquía, Colombia (Pacific Coast) and from the area around the Urabá Gulf. Other factor that have contributed to transmission are the failure to complete treatments owing to mobility of the population; insufficient intervention measures; and asymptomatic carriers.

In eastern Panama (Alto Bayano), the persistence of malaria can be traced to uncontrolled colonization by highly susceptible populations from malaria-free regions (the central provinces); culture shock between the traditional medicine of the Kunas and traditional control methods; the relocation of indigenous Kuna populations owing to construction of the Bayano hydroelectric plant and the resulting ecological changes; and lumbering. Moreover, there are movements of indigenous population between San Blas and Colombia (Urabá Gulf).

Malaria Control in International Border Areas

There is close border coordination with Costa Rica in the Pacific and Atlantic regions, where joint actions and exchange of information have been carried out and supplies have been exchanged when either of the countries has had shortages owing to late delivery. In contrast, the agreement with Colombia, the source of most imported cases, is inoperative the upper levels, although there is an exchange of information at the local level.

MALARIOMETRIC RATES - PARAGUAY

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	1,728	11,379	0.66	641	0.37	1	640	-	0.00	0.37	161,261	93.32
1960	1,751	47,045	2.69	1,165	0.67	5	1,159	1	0.00	0.66	171,086	97.71
	1,801	27,995	1.55	1,528	0.85	9	1,519	-	0.00	0.84	56,656	31.46
	1,850	48,184	2.60	5,756	3.11	313	5,443	-	0.17	2.94	0	0.00
	1,910	92,806	4.86	3,443	1.80	313	3,130	-	0.16	1.64	0	0.00
	1,969	103,169	5.24	8,851	4.50	961	7,889	1	0.49	4.01	0	0.00
1965	2,030	82,848	4.08	6,732	3.32	115	6,616	1	0.06	3.26	5,709	2.81
	2,070	131,293	6.34	33,026	15.95	717	32,309	-	0.35	15.61	6,993	3.38
	2,130	164,444	7.72	50,304	23.62	6,636	43,668	-	3.12	20.50	1,519	0.71
	2,180	113,770	5.22	20,743	9.52	794	19,949	-	0.36	9.15	138,627	63.59
	2,240	129,509	5.78	10,307	4.60	1,591	8,716	-	0.71	3.89	625,145	279.08
1970	2,300	157,587	6.85	1,429	0.62	155	1,274	-	0.07	0.55	600,198	260.96
	2,360	169,448	7.18	423	0.18	194	229	-	0.08	0.10	513,048	217.39
	2,430	185,659	7.64	94	0.04	11	83	-	0.00	0.03	374,865	154.27
	2,500	145,879	5.84	41	0.02	2	39	-	0.00	0.02	189,875	75.95
	2,600	124,803	4.80	101	0.04	6	95	-	0.00	0.04	156,857	60.33
1975	2,687	125,132	4.66	217	0.08	11	206	-	0.00	0.08	127,295	47.37
	2,778	152,410	5.49	140	0.05	46	94	-	0.02	0.03	144,286	51.94
	2,872	85,613	2.98	156	0.05	11	145	-	0.00	0.05	120,511	41.96
	2,696	63,070	2.34	156	0.06	37	119	-	0.01	0.04	68,169	25.29
	3,068	57,225	1.87	116	0.04	46	70	-	0.01	0.02	86,845	28.31
1980	3,169	93,899	2.96	140	0.04	23	117	-	0.01	0.04	78,576	24.80
	3,269	101,979	3.12	73	0.02	4	69	-	0.00	0.02	91,664	28.04
	3,370	94,348	2.80	66	0.02	19	47	-	0.01	0.01	51,793	15.37
	3,472	84,630	2.44	49	0.01	10	39	-	0.00	0.01	45,656	13.15
	3,576	107,662	3.01	554	0.15	19	535	-	0.01	0.15	66,354	18.56
1985	3,693	131,196	3.55	4,568	1.24	19	4,549	-	0.01	1.23	55,989	15.16
	3,808	102,912	2.70	4,329	1.14	10	4,319	-	0.00	1.13	46,813	12.29
	3,923	97,532	2.49	3,741	0.95	73	3,667	1	0.02	0.93	40,632	10.36
	4,040	77,081	1.91	2,884	0.71	24	2,859	1	0.01	0.71	39,202	9.70
	4,157	89,263	2.15	5,247	1.26	18	5,229	-	0.00	1.26	55,249	13.29
1990	4,277	98,417	2.30	1,660	0.39	56	4,516	-	0.01	1.06	29,047	6.79

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fiels examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
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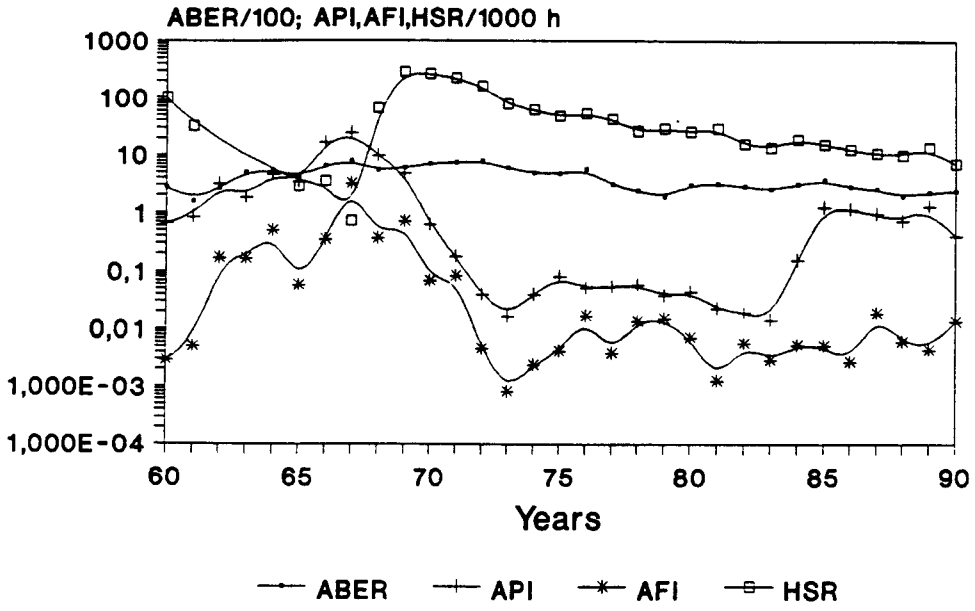
PARAGUAY - Malariometric Rates
1960-1990



The situation of malaria in Paraguay has evolved favorably. During the year semiannual spraying was carried out in several areas, while in others the localities with highest positivity were covered.

In 1990, 98,417 blood samples were examined, 9,154 more than in 1989. The number of positive slides declined considerably, from 5,247 in 1989 to 1,660 in 1990, which resulted in a reduction of the API from 1.26 to 0.39 per 1,000 population.

MALARIOMETRICS RATES - PERU

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	9,741	149,791	1.54	4,658	0.48	342	4,265	51	0.04	0.44	669,140	68.69
1960	10,022	349,780	3.49	3,906	0.39	256	3,560	90	0.03	0.36	682,491	68.10
	10,322	417,528	4.05	3,056	0.30	185	2,805	66	0.02	0.27	559,042	54.16
	10,630	470,639	4.43	2,216	0.21	82	2,052	82	0.01	0.19	627,527	59.03
	10,947	490,568	4.48	1,747	0.16	116	1,484	147	0.01	0.14	500,218	45.69
	11,272	502,744	4.46	1,934	0.17	302	1,538	94	0.03	0.14	379,184	33.64
1965	11,607	452,097	3.90	1,877	0.16	126	1,664	87	0.01	0.14	240,003	20.68
	11,952	424,993	3.56	2,049	0.17	32	1,915	102	0.00	0.16	186,109	15.57
	12,307	341,937	2.78	2,772	0.23	105	2,591	76	0.01	0.21	162,433	13.20
	12,675	247,116	1.95	2,010	0.16	52	1,911	47	0.00	0.15	153,893	12.14
	13,055	263,344	2.02	3,168	0.24	22	3,105	41	0.00	0.24	173,975	13.33
1970	13,447	310,237	2.31	4,494	0.33	135	4,282	77	0.01	0.32	188,723	14.03
	13,830	354,765	2.57	4,128	0.30	12	4,092	24	0.00	0.30	218,566	15.80
	14,220	341,084	2.40	9,270	0.65	5	9,236	29	0.00	0.65	229,605	16.15
	14,630	339,566	2.32	12,033	0.82	1	12,007	25	0.00	0.82	285,606	19.52
	14,750	317,522	2.15	12,485	0.85	0	12,485	-	0.00	0.85	383,405	25.99
1975	15,161	225,114	1.48	14,338	0.95	1	14,324	13	0.00	0.94	366,828	24.20
	15,573	243,675	1.56	18,462	1.19	4	18,448	10	0.00	1.18	187,410	12.03
	15,991	275,827	1.72	32,410	2.03	3	32,385	22	0.00	2.03	120,235	7.52
	16,415	201,489	1.23	20,376	1.24	43	20,312	21	0.00	1.24	192,877	11.75
	16,849	174,565	1.04	17,127	1.02	4	17,117	6	0.00	1.02	37,997	2.26
1980	17,295	150,407	0.87	14,982	0.87	138	14,805	39	0.01	0.86	117,684	6.80
	17,754	189,164	1.07	14,812	0.83	47	14,752	13	0.00	0.83	156,963	8.84
	18,224	211,100	1.16	20,483	1.12	3	20,480	-	0.00	1.12	132,393	7.26
	18,705	224,650	1.20	28,563	1.53	51	28,511	1	0.00	1.52	95,441	5.10
	19,197	214,213	1.12	33,724	1.76	51	33,655	18	0.00	1.75	269,129	14.02
1985	19,698	213,487	1.08	35,026	1.78	17	35,009	-	0.00	1.78	201,473	10.23
	20,208	184,636	0.91	36,866	1.82	68	36,783	15	0.00	1.82	216,665	10.72
	20,727	151,276	0.73	39,136	1.89	12	39,122	2	0.00	1.89	202,160	9.75
	21,254	125,430	0.59	32,359	1.52	0	32,211	148	0.00	1.52	147,702	6.95
	21,790	...	0.00	32,114	1.47	65	32,049	-	0.00	1.47	...	...
1990	22,332	90,040	0.40	28,882	1.29	131	28,693	58	0.01	1.28	41,564	1.86

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fiels examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
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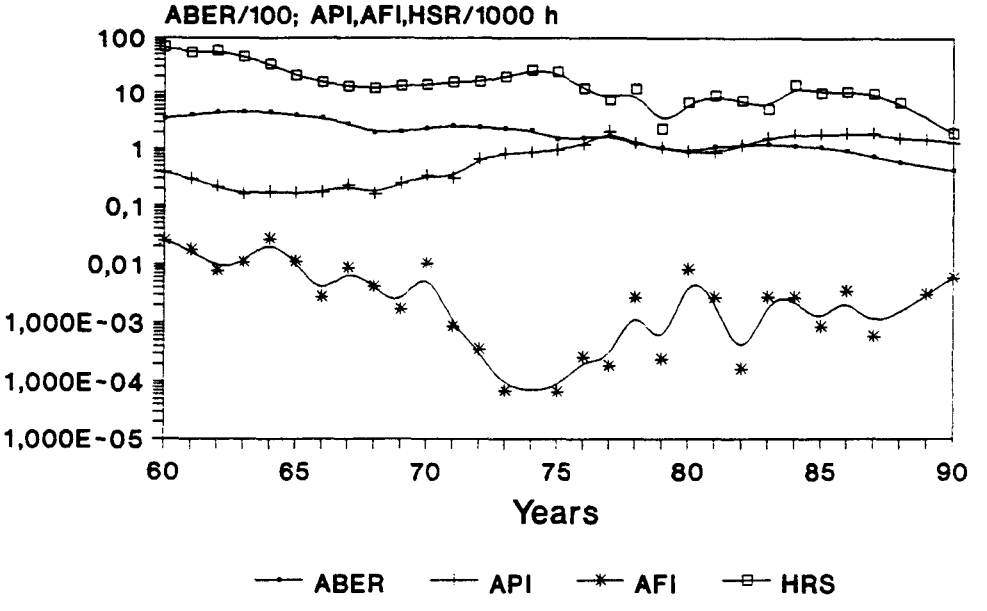
l) HSR = House spraying rate, per 1000 inhabitants.

PERU - Malariometric Rates
1960-1990



As of October 1990, 90,040 blood samples had been examined; 28,882 were diagnosed as positive. Of these, 99.35% were P. vivax infections, 0.45% were P. falciparum infections, and 0.20% were P. malariae infections. However, the number of P. falciparum cases increased considerably, rising from zero in 1988 to 65 in 1989 and 131 in 1990.

MALARIOMETRIC RATES - DOMINICAN REPUBLIC

Year	Total population	Blood slides examined							Sprayings			
		Number	ABER	Positive	API	P.falc. & Assoc.	Other P.vivax species		AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	2,927	28,721	0.98	3,743	1.28	1,976	1,767	-	0.68	0.60	393,896	134.57
1960	3,038	20,337	0.67	5,540	1.82	3,591	1,949	-	1.18	0.64	309,716	101.95
	3,128	21,946	0.70	2,523	0.81	1,165	1,358	-	0.37	0.43	231,127	73.89
	3,220	19,742	0.61	548	0.17	277	271	-	0.09	0.08	201,109	62.46
	3,315	73,352	2.21	386	0.12	130	256	-	0.04	0.08	549,554	165.78
	3,412	121,211	3.55	321	0.09	120	201	-	0.04	0.06	891,727	261.35
1965	3,513	205,836	5.86	84	0.02	43	41	-	0.01	0.01	911,536	259.48
	3,616	505,130	13.97	429	0.12	216	213	-	0.06	0.06	288,765	79.86
	3,723	702,520	18.87	127	0.03	66	61	-	0.02	0.02	234,656	63.03
	3,833	655,202	17.09	21	0.01	18	3	-	0.00	0.00	140,220	36.58
	3,946	629,695	15.96	124	0.03	123	1	-	0.03	0.00	136,189	34.51
1970	4,062	628,221	15.47	161	0.04	161	-	-	0.04	0.00	120,812	29.74
	4,182	514,596	12.31	277	0.07	276	1	-	0.07	0.00	41,059	9.82
	4,305	329,394	7.65	261	0.06	261	-	-	0.06	0.00	23,078	5.36
	4,480	374,880	8.37	569	0.13	569	-	-	0.13	0.00	12,793	2.86
	4,610	360,782	7.83	520	0.11	520	-	-	0.11	0.00	10,825	2.35
1975	4,945	374,478	7.57	159	0.03	159	-	-	0.03	0.00	12,301	2.49
	5,070	436,068	8.60	586	0.12	585	1	-	0.12	0.00	11,992	2.37
	5,191	364,800	7.03	745	0.14	745	-	-	0.14	0.00	12,788	2.46
	5,311	489,095	9.21	1,531	0.29	1,531	-	-	0.29	0.00	29,965	5.64
	5,432	478,832	8.82	3,080	0.57	3,080	-	-	0.57	0.00	28,647	5.27
1980	5,558	390,770	7.03	4,780	0.86	4,779	1	-	0.86	0.00	84,501	15.20
	5,688	273,498	4.81	3,596	0.63	3,596	-	-	0.63	0.00	11,868	2.09
	5,823	251,542	4.32	4,654	0.80	4,653	1	-	0.80	0.00	33,206	5.70
	5,961	321,589	5.39	3,801	0.64	3,801	-	-	0.64	0.00	37,048	6.22
	6,101	413,416	6.78	2,370	0.39	2,370	-	-	0.39	0.00	113,717	18.64
1985	6,416	404,575	6.31	816	0.13	815	1	-	0.13	0.00	-	-
	6,566	427,694	6.51	1,360	0.21	1,359	-	-	0.21	0.00	-	-
	6,716	391,345	5.83	1,206	0.18	1,204	2	-	0.18	0.00	-	-
	6,867	360,101	5.24	1,072	0.16	1,064	8	-	0.15	0.00	54,670	7.96
	7,018	293,093	4.18	1,275	0.18	1,243	32	-	0.18	0.00	13,788	1.96
1990	7,170	297,599	4.15	356	0.05	334	22	0	0.05	0.00	17,342	2.42

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
c) ABER = Annual Blood Examination Rate, per 100 inhabitants.
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
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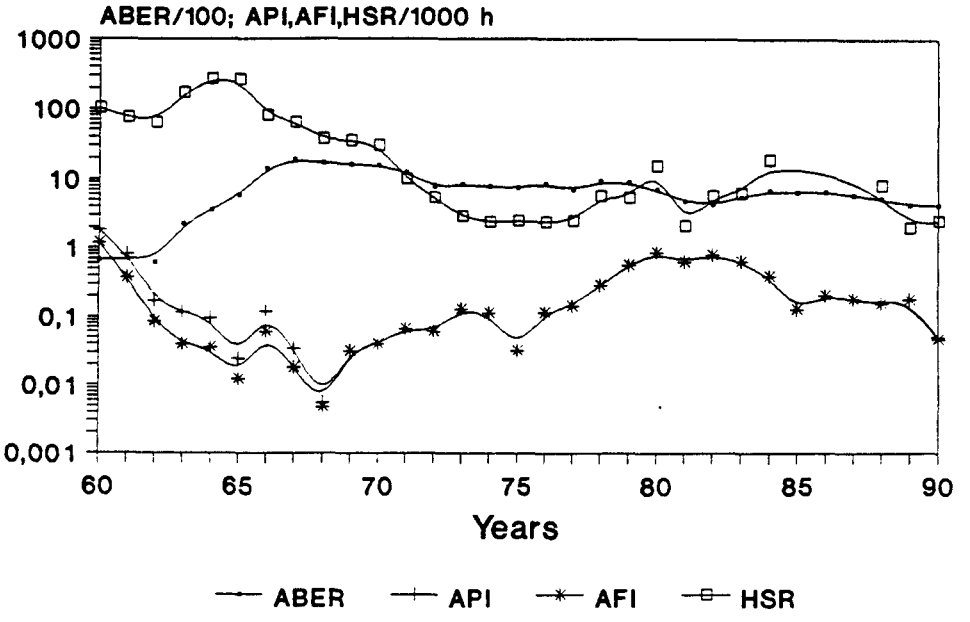
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.

DOMINICAN REP - Malariometric Rates
1960-1990



In 1990, the malaria situation considerable improvement. The number of cases was barely 27% of the number registered the previous year. A drought from January to May, traditionally rainy months with high malaria transmission, may have helped to limit cases by bringing about a decline in anopheline density in areas that had a higher incidence during the 1980-1985 period (eastern region of the country).

The age group that was most affected by malaria, accounting for 63.8% of all cases, was the group between 15 and 49 years of age (which is basically the economically active population). Of all cases, 21.4% occurred in children between the ages of 5 and 14, a phenomenon that can be partially explained by the rural preference of the pathology (73.9% of all cases). In rural areas children participate in agricultural work from a very early age.

An important factor in the incidence of malaria was Haitian immigration, which is linked to sugarcane production. This migration has played a major role in the transmission of malaria, especially since the malaria program in Haiti was discontinued in March 1988. In 1990, at the start of the harvest season, the National Malaria Eradication Service coordinated with the State Sugar Council (CEA) joint antimalarial measures to be carried out

in border areas and sugar mill camps, with a view to avoiding increased incidence of malaria. There was a mass entry of Haitians during the month of December, which obliged the Malaria Program to expand coverage of epidemiological surveillance nationwide in order to ensure that the immigrants received treatment with combined antimalarial drugs and were registered by the NMES field staff.

MALARIOMETRIC RATES - SURINAME

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	275	46,687	16.98	2,703	9.83	2,343	30	330	8.52	0.11	92,468	336.25
1960	290	45,396	15.65	997	3.44	912	3	82	3.14	0.00	72,444	249.81
	299	36,424	12.18	646	2.16	596	50	-	1.99	0.00	35,338	118.19
	308	37,819	12.28	716	2.32	693	-	23	2.25	0.00	19,381	62.93
	308	67,696	21.98	1,882	6.11	1,845	10	27	5.99	0.00	25,079	81.43
	328	76,555	23.34	1,681	5.13	1,650	5	26	5.03	0.00	17,598	53.65
1965	338	47,744	14.13	4,311	12.75	4,282	7	22	12.67	0.00	21,791	64.47
	348	35,785	10.28	2,933	8.43	2,878	11	44	8.27	0.00	24,519	70.46
	359	25,479	7.10	1,786	4.97	1,766	1	19	4.92	0.00	9,596	26.73
	370	35,339	9.55	1,555	4.20	1,541	2	12	4.16	0.00	15,282	41.30
	381	38,194	10.02	741	1.94	734	1	6	1.93	0.00	6,892	18.09
1970	371	48,702	13.13	1,019	2.75	1,009	10	-	2.72	0.00	6,519	17.57
	370	52,306	14.14	1,546	4.18	1,545	-	1	4.18	0.00	4,423	11.95
	370	59,600	16.11	800	2.16	753	47	-	2.04	0.00	487	1.32
	370	59,448	16.07	1,948	5.26	1,925	23	-	5.20	0.00	2,565	6.93
	370	80,239	21.69	3,984	10.77	3,982	2	-	10.76	0.00	10,096	27.29
1975	365	79,327	21.73	2,741	7.51	2,740	1	-	7.51	0.00	9,335	25.58
	361	79,564	22.04	537	1.49	419	118	-	1.16	0.00	4,033	11.17
	358	67,501	18.86	993	2.77	945	48	-	2.64	0.00	2,379	6.65
	356	61,358	17.24	876	2.46	858	16	2	2.41	0.00	1,243	3.49
	355	80,060	22.55	903	2.54	786	116	1	2.21	0.00	2,198	6.19
1980	355	91,141	25.67	4,445	12.52	4,250	195	-	11.97	0.00	3,611	10.17
	357	61,880	17.33	2,479	6.94	2,228	251	-	6.24	0.00	3,384	9.48
	360	53,257	14.79	2,805	7.79	2,519	286	-	7.00	0.01	17,191	47.75
	365	58,538	16.04	1,943	5.32	1,604	339	-	4.39	0.01	98,761	270.58
	370	66,609	18.00	3,849	10.40	3,665	184	-	9.91	0.00	15,488	41.86
1985	375	56,953	15.19	1,635	4.36	1,380	255	-	3.68	0.00	7,855	20.95
	380	50,969	13.41	1,316	3.46	1,002	314	-	2.64	0.01	4,790	12.61
	386	29,368	7.61	2,044	5.30	1,678	366	-	4.35	0.01	-	0.00
	392	33,564	8.56	2,691	6.86	2,296	395	-	5.86	0.01	729	1.86
1989*	398	23,364	5.87	1,704	4.28	1,585	119	-	3.98	0.01	176	0.44
1990	403	18,594	4.61	1,608	3.99	1,584	21	3	3.93	0.00	3,959	9.82

a) Estimated population, in thousands of inhabitants. (hs)
b) Number thick blood fimls examined during the year.
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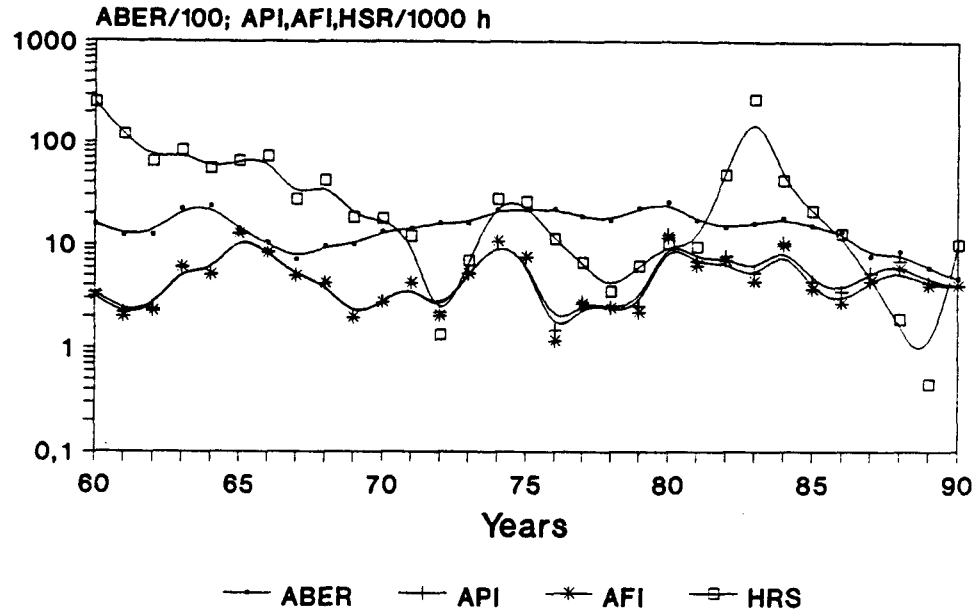
d) Number of positive slides, i.e.,showing Plasmodium in at least 100 microscopic fields.
e) API = Annual Parasite Incidence, per 1000 inhabitantes.
f) Number of slides showing P. falciparum and other associated plasmodia.
g) Number of slides showing P. vivax.
h) Number of slides showing P. malariae and/or P. ovale.
i) AFI = Annual P. falciparum Incidence during the year, per 1000 inhabitants.
j) AVI = Annual P. vivax Incidence during the year, per 1000 inhabitants.
k) Number of house sprayings during the year, regardless of cycles and insecticides.
l) HSR = House spraying rate, per 1000 inhabitants.
* Emergency spraying only.

SURINAME - Malariometric Rates
1960-1990



Due to hostilities in the interior of the country, where transmission of malaria continues to be high, the control program that had been planned was not carried out. Activity was limited to a series of house sprayings in areas where the hostilities diminished in intensity.

During the year, 18,594 blood samples were examined, 1,608 of which were positive, while the previous year 23,364 blood samples had been examined, yielding 1,704 positive slides.

MALARIOMETRIC RATES - VENEZUELA

Year	Total population	Blood slides examined									Sprayings	
		Number	ABER	Positive	API	P.falc. & Assoc.	P.vivax	Other species	AFI	AVI	Number of sprayings	HSR
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
	7,086	503,777	7.11	911	0.13	126	762	23	0.02	0.11		
1960	7,365	564,669	7.67	1,674	0.23	194	1,468	12	0.03	0.20		
	7,627	600,511	7.87	1,754	0.23	98	1,630	26	0.01	0.21		
	7,926	548,240	6.92	1,210	0.15	86	1,107	17	0.01	0.14	540,069	68.14
	8,225	499,944	6.08	2,853	0.35	124	2,707	22	0.02	0.33	479,865	58.34
	8,525	518,313	6.08	5,884	0.69	471	5,406	7	0.06	0.63	490,884	57.58
1965	8,824	545,035	6.18	5,364	0.61	237	5,100	27	0.03	0.58	522,616	59.23
	9,123	667,540	7.32	5,481	0.60	518	4,916	47	0.06	0.54	611,665	67.05
	9,423	650,682	6.91	5,257	0.56	1,020	4,215	22	0.11	0.45	623,926	66.21
	9,620	527,453	5.48	5,735	0.60	1,531	4,144	60	0.16	0.43	505,452	52.54
	9,940	468,158	4.71	8,740	0.88	2,017	6,652	71	0.20	0.67	492,476	49.54
1970	10,280	271,449	2.64	15,288	1.49	1,803	13,465	20	0.18	1.31	397,766	38.69
	10,612	268,615	2.53	23,626	2.23	3,762	19,860	4	0.35	1.87	343,936	32.41
	10,939	262,955	2.40	18,062	1.65	6,447	11,608	7	0.59	1.06	403,867	36.92
	11,280	245,733	2.18	11,687	1.04	3,213	8,470	4	0.28	0.75	390,822	34.65
	11,632	240,547	2.07	7,648	0.66	2,109	5,535	4	0.18	0.48	407,293	35.01
1975	12,665	275,048	2.17	5,952	0.47	1,502	4,448	2	0.12	0.35	436,744	34.48
	13,124	274,308	2.09	4,768	0.36	1,017	3,747	4	0.08	0.29	358,814	27.34
	13,595	266,052	1.96	5,304	0.39	1,246	4,047	11	0.09	0.30	326,600	24.02
	14,074	226,546	1.61	5,065	0.36	1,025	4,032	8	0.07	0.29	405,717	28.83
	14,552	272,409	1.87	4,722	0.32	928	3,789	5	0.06	0.26	279,186	19.19
1980	15,024	241,953	1.61	3,901	0.26	862	3,035	4	0.06	0.20	377,080	25.10
	15,487	239,051	1.54	3,377	0.22	562	2,801	14	0.04	0.18	241,749	15.61
	15,944	236,380	1.48	4,269	0.27	660	3,591	18	0.04	0.23	239,213	15.00
	16,397	226,229	1.38	8,400	0.51	929	7,465	6	0.06	0.46	180,940	11.03
	16,853	259,099	1.54	12,242	0.73	3,823	8,416	3	0.23	0.50	179,645	10.66
1985	17,317	276,020	1.59	14,305	0.83	3,447	10,854	4	0.20	0.63	257,598	14.88
	17,790	289,504	1.63	14,361	0.81	3,139	11,221	1	0.18	0.63	257,688	14.48
	18,270	311,055	1.70	17,988	0.98	6,851	11,137	-	0.37	0.61	359,731	19.69
	18,756	346,616	1.85	45,827	2.44	14,579	31,233	15	0.78	1.67	328,823	17.53
	19,245	352,784	1.83	43,374	2.25	13,094	29,794	486	0.68	1.55	322,089	16.74
1990 *	19,736	277,164	1.40	35,082	1.78	9,135	25,944	3	0.46	1.31	208,803	10.58

a) Estimated population, in thousands of inhabitants. (hs)
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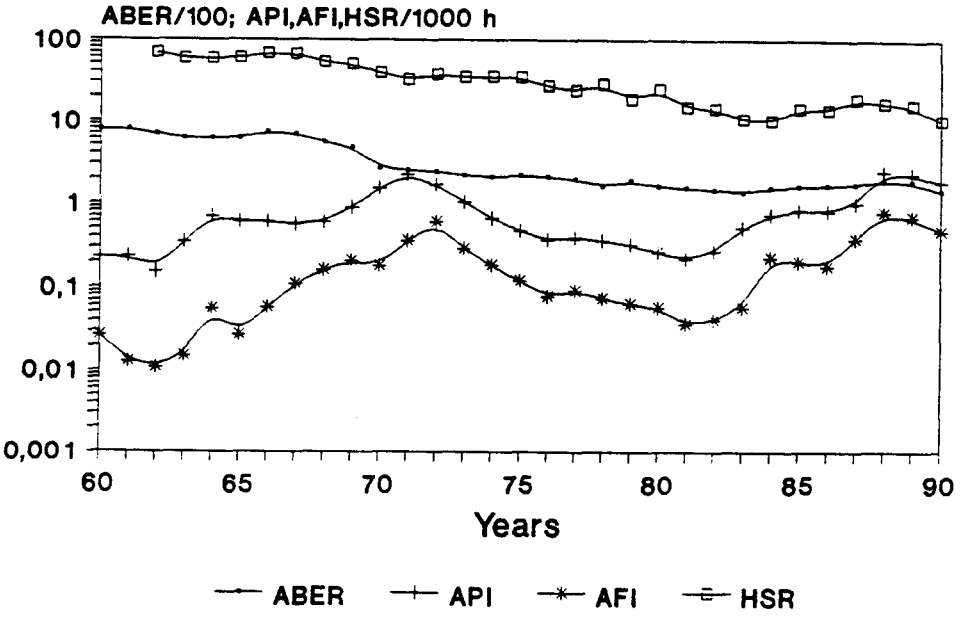
l) HSR = House spraying rate, per 1000 inhabitants.

VENEZUELA - Malariometric Rates
1960-1990



Of the 46,910 malaria cases registered in Venezuela in 1990, 26,602 (56.7%) originated in the state of Bolívar, for an annual parasite incidence in that state of 29.5 per 1,000 population. Of the malaria cases diagnosed in the state of Bolívar, 85% were from the rain forest areas, where mining activities are under way. In these areas the presence of the vector is permanent, housing is makeshift, access is difficult, and health services infrastructure is lacking. Preliminary data obtained in four indigenous and four mining communities located in the mining region of the state of Bolívar indicated a general prevalence of parasitemia of 4.1% (5.9% among the indigenous population and 2.9% in the miners); nearly 70% of the 1,353 persons interviewed had a history of malaria in the last two years; one-third of the people who became ill with malaria received treatment through the national control service. The others were not treated, or received treatment by consulting with pharmacists, healers, neighbors, or private physicians.

The state of Sucre accounts for 14.6% of malaria cases in the country; it has an API of 10.1 per 1,000 population. Incidence is still high because there are persistent operational and administrative problems that stand in the way of proper application of antimalarial measures throughout the state. The largest proportion of cases come from the municipio of Santa Fe.

The federal territory of Amazonas accounted for 10.6% of the cases; it registered a 71.4% increase in the number of cases from the previous year, and an annual parasite incidence of 89.1 per 1,000 population. This is a largely unreachable malarious area owing to problems of communication and access to the jungle.

The state of Apure (API of 6.5 per 1,000 persons), with 3.9% of the cases, had an increase of 67.4% over the previous year, mainly as a result of the establishment of new settlements in the southwest Andean region, in the municipios of San Camilo and Urdaneta. The respective percentages for the states are: Táchira 2.7%, API=1.6; Monagas 1.7%, API=1.7%; Anzoátegui 1.7%, API=0.9; and federal territory of Delta Amacuro 1.1%, API=5.9.

It should be noted that a large proportion of the cases diagnosed in states in the maintenance phase have generally been imported cases from the states of Bolívar and Sucre.

The treatment routinely provided by the program consists of chloroquine plus primaquine for P.vivax infections and amodiaquine plus primaquine for P. falciparum infections. Resistant P. falciparum are treated with sulfadoxine plus pyrimethamine or quinine.

Causes Contributing to the Persistence of Malaria

A series of biological, social, and administrative factors have contributed to the continued transmission of malaria. Among the biological aspects are the following:

- The vector An.nuñeztovari, with exophilic and exophagic habits, avoids contact with the insecticide administered through house spraying, resulting in partially refractory malaria (northern Apure, Barinas, and Táchira).

- An. darlingi is present in the jungle. It is found both within and outside of dwellings, which makes it less vulnerable to insecticides.

- The An. aquasalis vector mosquito in the state of Sucre is refractory to traditional spraying measures.

- The presence of P. falciparum infections that are resistant to the four aminoquinolines, and to combinations of sulfa drugs and pyrimethamine.

The social aspects that warrant mention are:

- Large volumes of migration in the western part of the country, along the border with Colombia (Cúcuta-San Cristóbal and Táchira and also Puerto Carreño-Puerto Ayacucho) among day laborers who carry parasites from malarious areas.

- Inaccessible malaria foci with rudimentary housing and a nomadic population, which hampers any measures aimed at ensuring protection with insecticides or drugs (southern malarious area). The entry of infected and susceptible population groups produces explosive outbreaks.

- Unstable and uncontrolled settlements in the southwest Andean region (western malarious area). Rejection by the community of house spraying measures.

- Limited community participation in the control program. The program does not have any voluntary collaborators.

The primary administrative aspects are:

- Labor problems have had a negative impact on the pace, quality, and coverage of actions.

- There is a need to broaden the agreement between the Ministry of Health, the Venezuelan Corporation of Guayana, and the governments of the two federal territories in order to bring about increased surveillance and control actions, which are limited owing to lack of resources, materials, and equipment.

- Limited national budget for malaria control. The amount allocated for the malaria program in 1987 was 207,887,802 bolivars and in 1990, 225,529,312 bolivars. This was an 8.5% increase during a period in which inflation was approximately 90%.

- There is a need for collaboration from the regional health offices, Armed Forces, and the regional governors in order to make control measures more effective.

Malaria Control in International Border Areas

The agreement signed in November 1988 for a joint operational program between the governments of Venezuela and Guyana remains in force. The objectives are to prevent mortality from malaria, reduce morbidity, strengthen health infrastructure, and improve awareness of socioeconomic conditions in the affected areas. The area of action is delimited by the Barima River, from the Orinoco Delta to the mouth of the Kaituma River, and from the mouth of the Kaituma River to Port Kaituma; the Sedai river; the Aruka River, from its mouth to the Kumuca River; the Amacuro and Yarabita Rivers. The Venamo River, from Kaikan to the Cuyuni River; and from this point to Corotoko. In 1990, the Second Technical Meeting on Malaria Control was held in Georgetown, Guyana.

A Colombian-Venezuelan border meeting was also held in Cúcuta, Colombia, to discuss strategies for the control programs. In addition, an informal cooperation arrangement along the border with

Colombia, mainly in Cúcuta and the state of Táchira, has facilitated the supply of drugs and insecticides.

IV. PROBLEMS HINDERING MALARIA PREVENTION AND CONTROL IN THE AMERICAS

A. Socioeconomic Problems in Malaria Vector Control and Management of Man-Vector Contact

During 1990 control programs continued to be hampered by sociocultural and socioeconomic forces which contributed to the persistence and expansion of malaria in the countries of the Americas.

There is recognition of the importance of health education and community participation in vector and malaria control. The affected communities need a better understanding of the ways in which malaria is transmitted through mosquitoes, as well as greater familiarity with simple measures for controlling both adult mosquitoes and larvae. Experience in the Americas and other regions indicates that vector and disease control efforts usually have limited long-term success unless there is active and substantial community participation. Participation can include the use of vector control aides who are members of the community (for example, technical personnel for spraying or eliminating sources), participation in personal protection from vectors (for example, use of mosquito nets), or the active selection of workers from the community for primary health care, with an emphasis on malaria surveillance and control.

Medical anthropologists have noted that human behavior is based on belief systems, and that such behavior can both intentionally and unintentionally improve or worsen health. Social and behavioral factors play an important role in the use of residual spraying, personal protection, environmental management, community participation in vector control and surveillance, prophylaxis, and treatment of malaria.

B. Use of Residual Spraying

In the Americas, most national malaria control programs use residual insecticides. However, in several countries of the region sprayers continue to be rejected by the residents of dwellings and by the community in general. This rejection persists for several reasons: problems caused by the odor of the insecticide; social problems, such as language barriers and sociocultural conflicts between the communities and the sprayers; conflicts over the available time of community members; and local beliefs and practices in regard to diseases and their control that conflict with those of the malaria control services.

Social anthropologists and rural sociologists have pointed out that, contrary to common belief, women in the rural communities do not have much free time during the day (for example, to be able to respond immediately to requests from the spraying teams, which arrive in the communities suddenly and without prior notification). In reality, the women are very busy with routine activities such as trade, gathering water and fire-wood, working in the kitchen, performing manual work (for example, weaving), and caring for children. In some rural economies, when poverty increases so does the pressure to participate in multiple activities necessary for family subsistence. As a result, women's time becomes very valuable and less available. A similar situation exists in the community for working men. Under such conditions, there is a very real risk that the community will reject spraying team.

The odor of the insecticide, which both adults and children sometimes find unpleasant, also leads to rejection. Similarly, the necessity of removing stored food, drinking water, and other items from houses prior to spraying may be perceived, to a greater or lesser extent, as a drawback by the family or the community. Particularly in remote rural communities, it is difficult to notify residents in advance of the visit by the spraying team, yet it is necessary to do so. In any event, it is possible to modify behavior towards and negative perceptions of the sprayers through health education, explaining the purpose and effect of spraying with residual insecticides.

C. Use of Mosquito Nets, and Metal Curtains and Screens

People have various methods of protecting themselves from mosquito bites. Some burn herbs and other substances to repel mosquitoes in infested houses; they cover their arms and legs with repellents made from local plants or plants purchased commercially; and they impregnate their clothes and mosquito nets with insecticides. In Suriname it has been shown that two communities, the Maroons and the Amerindians, used mosquito nets over long periods. Although the impact of mosquito nets in the transmission of malaria varies from community to community and season to season, their use has caused a major reduction in vector-man contact in housing. Moreover, some gold prospectors use homemade mosquito nets in the Amazon region in Brazil. However, as yet there is no clear and organized information on which other communities and populations in the Americas use mosquito nets, curtains, screens, or some other method of personal protection.[2]

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[2] See Rozendaal. *Trop Dis Bull* 86: R1 and R41, 1989. Rozendaal and Curtis. *J Am Mosq Cont Ass* 5:500, 1989. Rozendaal et al., *Med Vet Entomol* 3:353, 1989.

Distribution of mosquito nets, treated or not, is a potential tool for integrated vector control in the Americas. Some communities that have no previous experience with mosquito nets were prepared to pay for mosquito nets after a community with only a few inhabitants was provided with mosquito nets for personal protection and found them useful. The risk of rejection by the community is reduced by the use of such a strategy. Rejection can also be reduced by adapting local materials and designs and making the mosquito nets in appropriate sizes (Rozendaal and Curtis, 1989). Community participation can be used to impregnate the curtains with insecticides or repellents.[3]

D. Environmental Management and Community Participation in Vector Control

Prior to the use of insecticides, malaria control was accomplished through the drainage and filling in of breeding sites, installation of screens in houses, use of larvicide oils, and control of water flow. However, since 1950 the developing countries in the Americas have limited their use of environmental management for malaria vector control. Often when this is done, it is directed and promoted in a centralized and vertical form, with minimal community participation.

E. Problems in Surveillance and Control of Malaria Parasites in the Human Reservoir

At times routine and special malaria surveillance activities in a community run up against or give rise to social barriers. The beliefs of several communities in the Region hinder the taking of blood samples from community members as part of antimalarial activities. Fortunately, these community behaviors can be modified through careful education and the establishment of confidence and credibility in malaria control personnel. In addition, it is necessary to overcome deficiencies in some programs, such as failure to inform local communities about malaria (for example, through demonstrations with the microscope of the presence of malaria parasites in the red corpuscles), and failing to report the results of blood samples.

Control program personnel must avoid the pitfall of ridiculing those who hold such beliefs and engage in such behaviors, and must not try to eliminate such views and practices. Rather, they should patiently create a new explanation of the belief structure in the community, in which traditional beliefs are modified and brought

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[3] See Rozendaal. *Trop Dis Bull* 86: R1 and R41, 1989. Rozendaal and Curtis. *J Am Mosq Cont Ass* 5:500, 1989. Rozendaal et al., *Med Vet Entomol* 3:353, 1989.

into line with current knowledge on disease prevention and treatment through health education.

In an attempt to increase the coverage of malaria services, some countries have recently integrated government antimalarial activities into the local health systems. If this strategy is to be successful, it will be necessary to win the trust and cooperation of local communities for residual spraying, case detection, and treatment.

F. Economic Development and Infrastructure Projects and their Impact on Malaria

The countries in the Region of the Americas continue to develop and expand their economies through new investment in traditional and nontraditional economic sectors. Projects in the traditional sectors often include, or are accompanied by, the building of new dams and reservoirs, settling of new lands, and construction of roads, ports, and sewerage projects. However, national development policies and sector-based development projects are often give rise to a number of public health problems. Some of the main adverse effects of development projects include the breakdown of local ecosystems, displacement of human populations, incomplete or delayed provision of primary health care, and new or increased resistance to insecticides.

The alteration of local ecosystems that is brought about by development projects may result in the introduction or worsening of malaria and other vector-borne diseases. New breeding sites may be accidentally created, especially as a result of road and dam construction. The movement of persons susceptible to or infected by malaria into and out of the project area (for example, workers, merchants, settlers), together with changes in the vector populations, may create a risk of introduction and increase of unstable malaria transmission within and around the area. This phenomenon has been observed particularly, but not exclusively, in projects aimed at the development of water resources, especially in their initial years.

Urban and rural development projects may also cause displacement and compel communities to relocate to new lands, with the subsequent risk of exposure to malaria and other diseases. Many displaced communities are made up of economically marginal populations to begin with, and their economic and health conditions worsen as a result of displacement.

The lack of intersectoral and inter-ministerial cooperation in the planning and implementation of development projects has increased the incidence of malaria in displaced and resettled communities, where vector control services, primary health care, and basic water supply and sanitation are inadequate. Appropriate coordination among the Ministries, including those responsible for

water supply, electricity, rural and agricultural development, housing, etc., with the Ministry of Health, might help to prevent the malaria epidemics associated with development projects.

The use of agricultural insecticides continues to increase in the Americas. In areas where malaria is transmitted and where farming is based on irrigation, there is a risk of inducing or aggravating the resistance of malaria vectors to insecticides, since their breeding sites receive surface water contaminated with insecticides used in agriculture. The resistance of An. albimanus in Central America and An. quadrimaculatus in the United States and Mexico has been linked with the use of insecticides in irrigated cotton and rice fields.

G. Environmental Degradation and Malaria Problems

The developing countries of the Americas continue to experience very high rates of population growth, which creates increased demands on limited local resources, such as drinking water, fire-wood, food with high caloric or protein content, fertile land, and water. The economies of the region continue to grow in response to the social forces of the market, and governments are working to stabilize their debts and inflation. There have been frequent structural adjustments in the economies, which have resulted in temporary or long-term displacement of the urban and rural work force. These populations, displaced from their livelihood (work, lands), also lose access to capital, and are sometimes obliged to compete with other poor people for critical government services, such as health care. Economically displaced populations may return to a system of subsistence, thereby creating a new generation of migrants and squatters, gold prospectors and migrant workers, who struggle to survival. Those who migrate to rural areas to secure and establish new lands, or to work as farmers and miners, may not be immune to the disease and so will be very susceptible if they migrate to areas of malaria transmission. There is also the possibility that will introduce malaria into new areas.

H. Malaria Problems in an International Context

International migrations have been linked to malaria problems in sugarcane-growing areas of the Dominican Republic and to malaria epidemics in the area around San Diego, California, in the United States. In the Dominican Republic, migrant workers from the neighboring Republic of Haiti are assumed to have introduced malaria into the sugarcane fields. In California, most cases of malaria have occurred among migrant workers from Mexico who live outside provisional shelters near breeding sites, while a few cases have also been found in communities of permanent residents who live near provisional camps.

In the 1980s, political instability and internal civil disturbances in countries such as Guatemala, Nicaragua, and El Salvador led to the establishment of refugee camps in Honduras and Mexico, as well as to the migration of refugees to the neighboring countries of Central America, Mexico, and the United States. Malaria has become a major problem in some refugee camps. Nicaragua registered greater incidence of malaria in areas of conflict than in other areas. In Peru and Guatemala, internal civil strife has limited or prevented access of malaria control personnel to the areas of conflict.

Problems stemming from the illegal production of cocaine and related international drug trafficking have made it difficult, if not impossible, for governmental agencies in certain regions to carry out actions for malaria prevention and control.

V. ADVANCES IN MALARIA RESEARCH

This chapter summarizes only a small part of the studies done or published during 1990 in or outside the Region by investigators from the Americas. This information was selected because of its actual or potential importance for the prevention and control programs. As in previous years, laboratory or clinical research on malaria was more common than field research.

Funds for malaria research from countries of the Region or funds from International agencies for research in the Region are shown in the following table. (Table 20)

A. Epidemiology

Imported malaria continues to be a problem in the Region. From Cuba[1], in which it is fairly common because of the country's strong ties with African countries that have a high prevalence of malaria, to the USA and other countries of the Region.

A large outbreak of induced malaria that occurred in the U.S.A. in 1986 was reported in 1990. Between June 18 and September 20, 1986, 28 cases of Plasmodium vivax malaria were documented in Carlsbad, California, a coastal town north of San Diego. Malaria occurred in one local resident who had no exposure to risk factors; a second local resident who had traveled to a malarious area nine months earlier; and 26 Mexican migrant workers (MWs). Among the 28 cases, 27 lived in a square mile marshy area where Anopheles hermsi, a newly described American species of the Anopheles maculipennis group, was known to exist. An investigation of MWs residing in the affected area was done to determine the extent of the outbreak and to identify risk factors for acquiring malaria. Interviews and blood drawing were taken from 304 healthy MWs and 17 (65%) of the MWs with malaria. Fluorescent antibody titers to P. vivax greater than or equal to 1:256 occurred in 14 (82%) of the 17 MWs with malaria tested, and nine (3%) of the 304 healthy MWs. The

Table 20

FUNDS FROM COUNTRY AND INTERNATIONAL AGENCIES FOR MALARIA RESEARCH IN THE AMERICAN REGION, 1985-1990 *

Agency	1985	1986	1987	1988	1989	1990
International Development Research Center, Canada x,a)	38,433	---	---	364,157	53,831	254,264
Board on Science and Technology for International Development, Institute of Medicine/National Academy of Science, USA x, b)	244,176	228,900	187,604	97,012	44,132	28,004
National Institute of Allergy and Infectious Disease, National Institutes of Health, USA +, c)	5,708,000	5,993,424	6,122,927	6,803,213	7,842,896	7,783,157
Agency for International Development, USA +, d)	12,500,000	9,900,000	12,000,000	10,000,000	8,500,339	8,550,000
USA Army and USA Navy +, e)	5,220,000	8,240,000	8,611,000	8,631,000	6,303,000	6,014,000
Pan American Health Organization World Health Organization (PAHO/WHO)x)	334,500	488,125	741,400	998,803	454,000	490,614
Special Programme for Research and Training in Tropical Diseases UNDP/World Bank/WHO (TDR) x)	1,756,432	1,364,449	1,446,211	1,746,119	2,120,128	2,519,634
Brazil ** x)	---	250,000	759,248	50,000	532,930	30,000
Colombia ** x)	---	25,000	80,000	---	---	---
Mexico ** x, d)	---	50,000	270,000	339,337	812,528	426,546

* In USA dollars, except otherwise indicated.
x) Calendar year, 1989. +) Fiscal year, Oct 1988-Oct.1989.
a) Canadian Dollars.
b) Field Research on mosquitoes.
c) Funds for institutions in the USA.
d) Most of the funds for Institutions in the USA
e) Most of the funds for Institutions in the USA.
** Funds converted into USA dollars, according to the average official exchange rate for the year.

principal risk factor identified for contracting malaria was sleeping outside on a hillside adjacent to the marshy area. Malaria in a local resident with no exposure to known malaria risk factors, and the clustering in time and place of 26 cases suggest that P. vivax malaria was introduced and local transmission was sustained through several generations of mosquitos, producing the largest outbreak of introduced malaria in the United States since 1952.[2] Later studies also indicated that the situation persisted during 1988-1989.[3]

In Colombia studies were conducted in order to determine the nutritional status of children under six years of age and to study the relation with malaria and intestinal parasitism. A cross sectional epidemiological study was carried out in Córdoba, Buenaventura Municipality in the Colombian Pacific Coast. One hundred and twenty eight children were studied using questionnaires, thick smear examination, and serological tests through the indirect immunofluorescence assay. Coproparasitoscopic examinations were also done in addition to medical and clinical anthropometric examinations, the latter consisting of the measurements of weight and height. The results of this investigation showed a prevalence of nutritional status; according to the Waterlow classification, of 0.81 percent, 17 percent and 2 percent for malnutrition of the first, second and third degree respectively. Instead, according to the Gómez classification it was 49 percent, 14 percent and 2 percent for the slight, moderate and severe degrees of malnutrition. When the geometric mean of the antibody titers for P. falciparum and for P. vivax were compared using the methodology of the Waterlow classification, statistical associations were discovered, and it was found that the geometric mean for P. falciparum was higher in children who were not malnourished. Nevertheless, the geometric mean for P. vivax was higher for those children with certain degree of malnutrition. When the intensity of infection of the intestinal helminths, the quality of the dwelling, and the breast-fed time duration were compared, no significant differences were detected. Therefore it is believed to be convenient to continue with this type of investigation, specially with longitudinal-type studies, so as to detect causal association in the relation nutrition/malaria.[4]

Research was also conducted in Venezuela[5] on the acquisition of antibodies to P. falciparum in various age groups was studied in 51 Amerindians inhabiting the north of the Venezuelan Amazon. The overall prevalence by ELISA was 91.2% and antibodies were acquired early in life. Seropositivity was 69.6% in the age group two to five years and reached 86% at 10 years of age; 96.9% of the adults aged 31-40 years exhibited high ELISA values to P. falciparum. The high prevalence of malaria antibodies among Amazonians, from early on in life, reflects the high level of malaria transmission in that part of the world.

Studies on malaria incidence and prevention were conducted

among travellers departing from Nairobi Airport to determine the use of malaria prevention measures and assess the risk for malaria while travelling. Among 5489 European and North American travellers, 68 different drug regimens were used for prophylaxis, and 48% of travellers used both regular chemoprophylaxis and more than one antimosquito measure during travel; 52% of 3469 travellers who used chemoprophylaxis did so without interruption during their travel and for 4 weeks after departure. Compliance was lowest among travellers who visited friends and relatives, who were young, or who stayed more than 3 weeks. Sixty-seven (1%) travellers experienced symptoms of malaria, but the diagnosis could be verified only on 16 travellers. Long-stay travellers appeared to be at higher risk for malaria than short-stay travellers, and health information needs to be targeted especially to the former. Similar investigations are needed among international travellers to other malaria-endemic countries. With comparable data available, consistent and effective malaria prevention guidelines can be developed.[6]

B. Social and Economic Research****

The Latin American Small Grants Programme for Social and Economic Research on Tropical Diseases, administered in the Laboratorio de Investigaciones Sociales, Universidad Central de Venezuela, and financed by TDR, is currently funding 11 projects on various aspects of malaria in Ecuador, Colombia, Venezuela, Guatemala and México. The projects range from studies of social factors related to the transmission of malaria to studies of how to improve disease control and surveillance. Studies of disease transmission are focussing on understanding different beliefs, attitudes and lifestyles, including those of specific ethnic groups, and how these factors affect risk of infection. Others are investigating temporary migration processed which may be responsible for spreading malaria to non-immune indigenous populations, or risk behavior of particular occupational groups such as miners. Research on disease control programmes includes a study of the history of successful campaigns in the 1940's and lessons for modern control programmes; the psychosocial impact of malaria control programmes on the communities they served; and how the behavior of employees in the Ministry of Health affected these campaigns. Another study is examining health education programmes in order to recommend improvement in the training of disease control personnel.

Assessing the demand for health services in highly mobile frontier populations presents formidable problems of population coverage. A rapid assessment method - malaria self-reports - was

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**** Information kindly provided by Dr. C. Vlasov, Secretary of the Steering Committee on Socioeconomic Research, Special Programme for Research and Training on Tropical Diseases (TDR).

used in 1987 in a TDR-funded study on the impact of malaria on migrant populations in the Brazilian Amazon. As shown below an in-depth analysis of the methodology[7] clearly supports the superiority - for health service demand assessments - of both direct and indirect verbal reports of perceived malaria illness over serological and parasitological analysis of thick blood films.

Two non-immune migrant populations to frontier areas of the Brazilian Amazon were studied: A 1984 sample of 887 households (4826 individuals) in Tucuma and Ourilandia in the State of Para, and a 1985 sample of 358 households (1777 individuals) in two tracts of the Machadinho Project in Rondonia. Within the Para sample there is a group of gold miners who are heavily exposed to malaria transmission. Over half of them will not volunteer for a direct blood film diagnosis. Occurrence/exposure rates based on parasitological examination of thick blood films from gold miners, self-selecting for diagnosis and treatment differed by a factor of 2 from rates calculated from malaria self-reports. The self-reports were not biased by undercoverage of this high risk group. The occurrence/exposure rates based on blood film parasitological assessments differed less from those based on self-reports for persons in less mobile occupational groups (e.g. farming and urban occupations) relative to gold miners. To a greater extent parasitological examinations are subject to false negative classifications than either serological assessments or self-reports. Their poor sensitivity is the result of the irregular availability and often uncontrolled use of anti-malarial drugs on the Amazon frontier and the fact that the parasitological examination only assesses current parasitemia.

Support for retrospective malaria self-reports as a reliable indicator of potential demand for malaria-specific treatment services is derived from a comparison of these responses with the serological assessment using immunofluorescence with anti-P. falciparum antigen in 1257 volunteers from Para.

Using serology (a measure of immunological memory) as the basis for comparison, the self-reports had a sensitivity of 80.8% and a specificity of 66.8%. The serological assessment is sensitive to malaria which may have been present at any time during the prior 4-5 month period. Therefore, it is more comparable to retrospective self-reports than parasitological examination of thick blood films.

Although the matching rate of 70.7% indicates a good correspondence between serology and self-reports, traditional methodological advice in biology and epidemiology would favor serological assessments. However, it must be emphasized that any assessment scheme requiring blood samples suffers from pervasive undercoverage of the most mobile and often most intensively exposed sub-populations - e.g. gold miners - which would also place the most severe burden on the local health care system.

For non-immune and highly mobile populations where knowledge of malaria as a disease - but not necessarily knowledge of the full details of transmission - is substantial, retrospective malaria reports provide a simple, rapid and trustworthy method of ascertaining the demand for health services.(7)

An evaluation of the use of illiterate community volunteers for malaria case detection and treatment was done in Guatemala. Volunteer workers, known as "volunteer medicators," were selected by members of their communities and were trained and supervised by the National Malaria Service (NMS) staff. Their responsibility included recording basic demographic data and administering a three-day course of chloroquine (25 mg kg-1) to all febrile patients who visited their homes. Patient information was recorded on a special form which consisted of stick-figure drawings. During a one-year evaluation period, no differences were noted between literate and illiterate volunteer with respect to the length of time required for their training or supervision, the average number of patients they treated per month, the frequency of errors in recording data or administering medication, or their acceptance by the community residents.(8)

As malaria becomes more prevalent in the Amazon frontier, despite increased expenditures by disease control authorities, national and regional tropical disease control strategies are being questioned. The current crisis involving traditional control eradication methods has broadened the search for feasible and effective malaria control strategies--a search that necessarily includes an investigation of the roles of a series of individual and community-level socioeconomic characteristics in determining malaria prevalence rates, and the proper methods of estimating these links. In addition, social scientists and policy makers alike know very little about the economic costs associated with malarial infections. In this paper, survey data was used from several gold mining areas in Brazil to (a) test the general reliability of malaria-related questionnaire response data, and suggest categorization methods to minimize the statistical influence of exaggerated responses, (b) estimate three statistical models aimed at detecting the socioeconomic determinants of individual malaria prevalence rates, and (c) calculate estimates of the average cost of a single bout of malaria. The results support the general reliability of survey response data gathered in conjunction with malaria research. Once the effects of vector exposure were controlled for, individual socioeconomic characteristics were only weakly linked to malaria prevalence rates in these very special miners' communities. Moreover, the significant socioeconomic and exposure links did not depend on the measure of malaria adopted. Finally, individual costs associated with malarial infections were found to be a significant portion of the miners' incomes.(9)

C. Diagnosis

The standard method for malaria diagnosis is the detection of parasites by examination of thick stained blood films. This method is sensitive (limits of detection are 10-20 parasites/ul blood) when performed by a skilled microscopist, but labor intensive. On the other hand, serological methods, are easiest to perform but are unable to distinguish between active and previous infections and in general are useful only for certain epidemiological studies.

Encouraging reports were made on previous years on the use of a rapid diagnostic test for malaria based on acridine orange staining of centrifuged parasites in a microhaematocrit tube ("QBC" tube). It has been proposed as a device that promises to replace the well established procedures for diagnosing malaria in clinical practice. The method is simple, sensitive, and rapid.*****

In a study conducted outside the Region, the QBC, the Field-stained thick blood film and giemsa stained thin blood film were compared. Eventhough the QBC detected all cases, the authors expressed reservations on using the technique except in sophisticated settings.(10) This opinion confirms the fact that a well stained thick smear is the most reliable and economic tool for diagnosis of malaria.(11)

D. Immunology

The identification of antigens of parasite origin associated with the altered membrane of Plasmodium vivax-infected erythrocytes was undertaken. The 125I-lactoperoxidase catalyzed surface radiolabeling of trophozoite-infected erythrocytes revealed new bands of 95 and 70 kDa not labeled in normal erythrocytes. Erythrocyte membrane-enriched preparations from (35S) methionine biosynthetically labeled-infected erythrocytes also indicated that in addition to bands at 95 and 70 kDa, several other parasite proteins were, possibly, membrane associated. Five monoclonal antibodies (Mabs) reactive with P. vivax produced an immunofluorescent pattern of numerous small dots scattered over the entire infected erythrocyte. This pattern mimics that of Schuffner's stippling; small red dots seen in Giemsa-stained P. vivax infected erythrocytes, which represent accumulations of dye in caveola-vesicle complexes (CVC). Four of the monoclonal antibodies immmunoprecipitated a Triton X-100 detergent-insoluble 95-kDa parasite protein which was localized by immunofluorescent assay and immunoelectron microscopy exclusively to CVC. Two of these Mabs were immunofluorescence reactive with the surface of intact infected erythrocytes in suspension. The fifth Mab, which

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*****Reviewed in Status of Malaria Programs in the Americas, Reports No. XXXVI (1988) and No. XXXVII (1989).

was also localized exclusively to the CVC structures, immunoprecipitated a Triton X-100 extractable protein of 70 kDa. Two other monoclonal antibodies reacted exclusively with the numerous membranous cleft structures found in the cytoplasm of infected erythrocytes. This cleft-associated parasite antigen was 28 kDa in size. Some of these Mabs recognized epitopes and produce similar IFA patterns on erythrocytes infected with P. cynomolgi, P. knowlesi, and P. ovale parasites, but not with P. falciparum- or P. brasilianum-infected erythrocytes.[12]

Several studies were done exploring the humoral or cellular response in individuals infected with plasmodia. In one of them, the relationship between exposure to malaria, the use of long-term chemoprophylaxis with chloroquine, and the prevalence of sporozoite antibodies was studied in 446 expatriates who had lived in 7 West African countries for 6 months to 41 years. Filter-paper blood samples from 12% of the subjects had antibodies to the repeat region of the Plasmodium falciparum circumsporozoite protein, with a positive correlation between enzyme-linked immunosorbent assay (ELISA) absorbance and years of exposure (r=0.32, P = less than 0.01). Development of sporozoite antibodies did not correlate with reported use of chloroquine. Ten samples from expatriates with the highest ELISA titers and 10 samples from West african nationals, which were matched for ELISA titer and duration of exposure, were characterized more fully. All 20 samples reacted strongly with sporozoites by immnunoflourescence. The 10 samples from nationals reacted strongly with liver-stage antigens by immunofluorescence and with blood-stage antigens by immunofluorescence and immunoblotting. In contrast, the 10 samples from expatriates were negative or only weakly positive in the liver- and blood- stage assays. These results imply that sporozoite antibodies are generally not cross-reactive with blood-stage antigens, and suggest that protective immnunity to malaria does not develop during long-term malaria chemoprophylaxis against the erythrocytic stage. [13]

The sera of 100 Colombians of African origin living in a malaria-endemic areas of the Pacific coast were studied with regards to their capacity to inhibit Plasmodium falciparum cultures in vitro. Antimalarial antibody levels determined by indirect immnufluorescence were higher in the group of infected individuals than in the non-infected individuals, and inhibitory activity assessed by the inhibition of parasite incorporation of 3H-hypoxanthine in vitro was present in the sera of both the infected and non-infected patients. It was believed that the non-infected patients were probably immune. The sera of some of the infected patients had high inhibitory capacities for the P. falciparum FCB-1 isolate. When the inhibitory effects of some of the sera were tested by using four parasite isolates from different regions of the world, it was found that some sera were inhibitory for all isolates while others inhibited only one or two. Thus, there appears to be isolate variations in the susceptibility to

inhibition by a given serum or a variability in the effects of the different sera on a single isolate 24.[14]

Malaria crisis activity was also studied in Colombia. Sera of negroes of African origin and of indians, living in a malaria endemic village on the Pacific Coast of Colombia, were analyzed to see if they could block intraerythrocytic Plasmodium falciparum growth in vitro. A group of mestizos from a malaria-free city in Colombia was used as a negative control. Blood of each individual was studied for the presence of circulating parasites by thick and thin smears and their sera for antimalarial antibodies by IFAT and IRMA techniques. The inhibition of the intraerythrocytic growth induced by these sera was assessed by (3H) Hypoxanthine incorporation. All groups showed inhibitory activity independent of their exposure to malaria. Negro sera had the highest inhibitory activity even following the removal of antibody, and also the highest antimalarial antibody titers. The group of indians had reduced inhibitory activity and lower antibody titers compared to the negro sera. In the group of mestizos, who reported no malaria exposure, 14% had antibodies to asexual blood forms of P. falciparum and 60% induced significant inhibition.[15]

The geographical distribution of P. falciparum erythrocyte rosetting and the frequency of rosetting antibodies in human sera isolated from 75 infected individuals from Africa, South América and Asia were reported. Non-infected erythrocytes bind spontaneously to those infected with certain strains of Plasmodium falciparum. This is known as spontaneous erythrocyte rosetting. Rosetting was present in 49% of the isolates tested; the frequency of rosetting red blood cells (RBC) in individual isolates was 0-75% when scored during the first cycle of in vitro growth. Rosetting antibodies were found in 15 out of 73 (21%) Liberian sera as measured by disruption of rosettes in vitro. However, antibodies able to inhibit CD36 dependent cytoadherence of P. falciparum-infected RBC were not detected in these sera. Erythrocyte rosetting is a geographically widespread phenomenon. Rosetting antibodies seem to be induced by natural infection, and the molecular mechanism of rosette formation seems distinct from that of endothelial cytoadherence.[16]

The kinetics of indicators of lymphocyte activation were determined in non-immune and semi-immune patients with uncomplicated Plasmodium falciparum infection and in control subjects in Acre, Brazil. Delayed type hypersensitive (DTH) to seven recall antigens was weakest in nonimmune patients. Both patient groups differed significantly from controls on admission (p less than 0.001 for both) and improved considerable after clindamycin therapy. Total serum IgG and IgM, but not antimalarial antibodies, were highest in nonimmune patients compared with semiimmnune patients and controls during acute malaria. Immunoglobulin levels normalized after chemotherapy. A striking decrease of CD4+ peripheral blood lymphocytes, normalizing after

chemotherapy, was seen in both patient groups, and was more pronounced in nonimmune patients. A slight increase in interleukin-2 receptor (IL-2R)-bearing cells was found in nonimmune patients. In addition, soluble plasma IL-2R was significantly elevated in them (P less than .001) and to a lesser extent in semi-immune patients. These findings were paralleled by significantly decreased IL-2 concentrations in plasma (p less than .001) during the acute phase of malaria, suggesting pronounced general immunosuppression in non-immune malaria patients.[17]

Studies on possible immunizing candidates capable of preventing malaria continues to be high priority in the Region. An effective and novel approach to engineer peptide-based vaccines using a chemically defined system, known as multiple peptide antigen systems (MAPs), was shown to protect an inbred mouse strain from infection against rodent malaria. Ten mono-epitope and di-epitope MAP models containing different arrangements and stoichiometry of functional B and/or T helper cell epitopes from the circumsporozoite protein of Plasmodium berghei were used to immunized mice. While these mice did not respond to the mono-epitope MAP bearing only the B or T epitope, very high titers of antibody and protective immunity against sporozoite challenge were elicited by di-epitope MAPs, particularly those with the B and T epitopes in tandem and present in equimolar amounts. These results, obtained in a well-defined rodent malaria model, indicate that MAPs may overcome some of the difficulties in the development of synthetic vaccines, not only for malaria but also for other infectious diseases. [18,19]

Research also continues to be done in vaccine studies in owl monkeys. The minimal infective dose of the P. falciparum FVO strain, the kinetics of the immune response induced by vaccination with the synthetic peptide mixture (S7 + S122 + S17) or the synthetic hybrid polymeric protein SPf66, and the induction of protective immunity against the experimental challenge with 2 P. falciparum strains was determined. A clear boosting effect was observed, determined by the increased antibody titers against synthetic peptides S7, S12, S17, and Spf66, and by improvement in the protective immune response against the challenge was determined. These studies suggest that either the peptide mixture, or the synthetic hybrid polymeric protein are excellent choices for the development of a vaccine against P. falciparum.[20]

Unfortunately another study on the same subject as above was not a success. A mixture of three synthetic peptides (35.1, 55.1, and 83.1) corresponding to portions of the 35 kDa, and 83 kDa proteins from the asexual blood stages of Plasmodium falciparum and a polymer of synthetic peptide incorporation of the three individual peptides (SPf66) were tested as candidate malaria vaccine antigens in Aotus nancynmai. Monkeys were immunized with combinations of the three peptides from two separate sources (Center for Disease Control [CDC], Atlanta, GA or Colombia) or with

the synthetic polymer. Animal immunized with a combination of the three peptides from CDC had higher antibody titers to the 35.1 and 55.1 peptides than to the 83.1 peptide. Monkeys immunized with a combination of the three peptides produced in Colombia developed higher levels of antibody to the 55.1 than to the 83.1 and 35.1 peptides. Animals immunized with the polymer produced detectable antibodies to the 55.1 peptide alone. Following challenge with P. falciparum, no differences were observed between the three vaccine groups and two control groups with respect to the number of animals with parasitemias greater than or equal to 10%. The inconsistency of serologic response to all three peptides in these animals contrasted with precious trials performed in Colombia where the monkeys developed high antibody titers against the 3 peptides and were protected against the experimental infection.[21]

Studies were also made using sera from human volunteers immnunized with either synthetic peptide (NANP)3-TT or recombinant protein R32tet32 Plasmodium falciparum CS vaccines. Samples were tested in the inhibition of spozoite invasion (ISI) assays using human hepatoma (HepG2-A16) cells or primary human hepatocytes. Sera or purified immunoglobulin (Ig) from volunteers who were completely protected against P. falciparum sporozoite challenge had higher ISI activity than sera from non-protected volunteers, or the highest titre endemic serum. However, Ig from protected and non-protected volunteers did not block sporozoite invasion of human hepatocytes, suggesting that P. falciparum sporozoites invaded hepatocytes by mechanism which differ from those concerned with invasion of HepG2-A16 cells.[22]

The proliferation of different candidate vaccines, some of which will reach the field testing stage, has stimulated a computer simulation study of malaria vaccines. It was compared the behavior of common measures of association derived from case-control studies in the context of a malaria vaccine programme administered under complex transmission conditions. Several simplifying assumption of previous workers have been relaxed and the simulated conditions are endemic rather than epidemic. The common estimators of association used in case-control studies remain unbiased only in limited circumstances. The term dependent happenings, first defined by Ross in 1916, is resurrected. Since the number of people becoming infected is dependent on the number of people already infected, control programmes of infectious diseases produce direct as well as indirect effects. Three different study designed with different pairs of comparison populations are defined. The choice of comparison population can be used to differentiate direct from indirect effects. In order to clarify the direct effects of a vaccination programme the comparison groups must be subjected to identical transmission intensities. In contrast, the referent group must remain unaffected by consequences of the intervention to determine indirect effects.[23]

E. Chemotherapy

The ability of the malaria parasite Plasmodium falciparum to adapt to changing environment, drug pressure, and immune response may well play an important part in the success or failure of malaria control. Knowledge of the nature and extent of genetic diversity within the species becomes increasingly relevant as control measures become more sophisticated and more selective, targeted towards the molecular components of the parasite. A study of that sort was done with sixty Plasmodium falciparum isolates, 20 each from Thailand, Zimbabwe, and Brazil, which were characterized for 20 variant genetic markers, including the enzymes glucose phosphate isomerase, adenosine deaminase and peptidase, 11 other proteins detected by 2-dimensional electrophoresis (2D-PAGE), 2 merozoite surface antigens (MSA-1 and MSA-2), one exported antigen (Exp-1), and sensitivity to the drugs chloroquine, pyrimethamine, and mefloquine.

The enzyme, 2D-protein, and antigen markers chosen were ones which in genetic crossing studies appear to segregate independently during meiosis. The variant forms of each marker represent allelic forms of each respective gene, and clones of the haploid blood forms of the parasite are characterized by only 1 form of each marker. Using the 20 markers, it was possible to determine a profile of characteristics for each isolate that would not only identify it and distinguish it from others, but would also show whether it contained >1 phenotypically distinct parasite.

The extend of diversity between individual isolates and the differences in the frequency of certain variants of the markers between the 3 countries was examined. The principal conclusions to be drawn from the study were that there is an extensive polymorphism in many of the genetically determined characters of this parasite, multiple infections with >1 genetically distinct parasite are common, and there are geopraphical variations in the frequencies with which variant forms of certain markers occur.[24]

F. Entomology

Research on the biology and ecology of Anopheles albimanus made on the Pacific coast of Belize, Guatemala, El Salvador, Honduras, Nicaragua and Panamá has been concluded and will be submitted for publication shortly. This project was built around a regional network that stimulates scientific exchange with regard to malaria control in Central America. The network will provide an opportunity for coordinated research to embrace the diversity of geographic conditions, breeding habitats, and human settlements in the region. Results confirm some previous finding but also show some striking differences in specific localities compared to what has been shown in previous studies. An. albimanus continues to be the more abundant vector. However, other anophelines not yet

identified may be playing also a role in malaria transmission. There are also indications of a close relationship between agricultural practices, social characteristics of the population and the existence of breeding sites for mosquitoes.

The effectiveness of permethrin-impregnated bed-nets and curtains as malaria control measures was evaluated in Kenya by researchers from the Region. One hundred five families were randomly assigned to one to three study groups (control, bed-net, or curtain). All participants were cured of parasitemia with pyrimethamine/sulfadoxine. Selective epidemiologic and entomologic parameters were measured weekly, while knowledge, attitude, and practices surveys were conducted at the beginning and end of the 15 week study. Plasmodium falciparum infections per person/week at risk were significantly higher in the control group than in either the curtain group (5.42 vs. 2.35 cases/100 person weeks risk) or the bed-net group (5.42 vs.3.77 cases/100 person weeks risk). A difference was found in clinical malaria among the groups: 45% of person in the bed-net and curtain groups vs. 30% of those in the control group reported no episodes of fever and chills (chi 2, P less than 0.05). Indoor resting Anopheles gambiae or An. funestus were found on 94 occasions in the control houses, but only twice in the treated houses during weekly visits to each house over the study period (chi 2 P. less than 0.001). The pyrethrum knockdown method produced similar results with a total of 195, 23, and three An. gambiae and An. funestus collected in the control, bed-net, and curtain houses during the same period, respectively.[25]

The use of an Immunoasay for the detection of Plasmodium falciparum and P. vivax circumsporozoite (CS) antigens in anophelines has recently incriminated other malaria vectors besides Anopheles darlingi in the Brazilian Amazon. Recently were analyzed 12,336 field-collected anophelines from endemic areas in Rondonia for plasmodial infection. Sixty-one specimens from 6 species were positive: 47 An. darlingi, 5 An. triannulatus, 4 An. albitarsis, 2 An. braziliensis, 2 An. strodei, and 1 An. oswaldoi. As concerns the species, 41 anopheles harbored P. falciparum and 20 were infected with P. vivax. An. darlingi was the most important local vector, as it was the one most frequently found infected, and the only one clearly related to areas where malaria transmission was being recorded.[26]

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VI. PERSONNEL TRAINING

Personnel training continues to be a priority component for most of the countries of the Region, not only in relation to malaria but also in efforts to control other vector-borne diseases. This has pointed up the necessity of preparing a strategic plan of action, with the participation of the countries, aimed at overcoming the problems that have traditionally caused the results in this area to be modest.

Each year fewer than 20 individuals receive advanced or master's degrees oriented toward the teaching, research, or control of priority communicable diseases. These include those who receive training grants from the Special Program for Research and Training in Tropical Diseases (TDR). Unfortunately, most often success is the result of individual plans and efforts, sometimes with the support of health sector institutions and, more commonly, universities, institutes, and research centers.

In summary, in 1990 the following training activities on malaria and related subjects were held:

Table 21

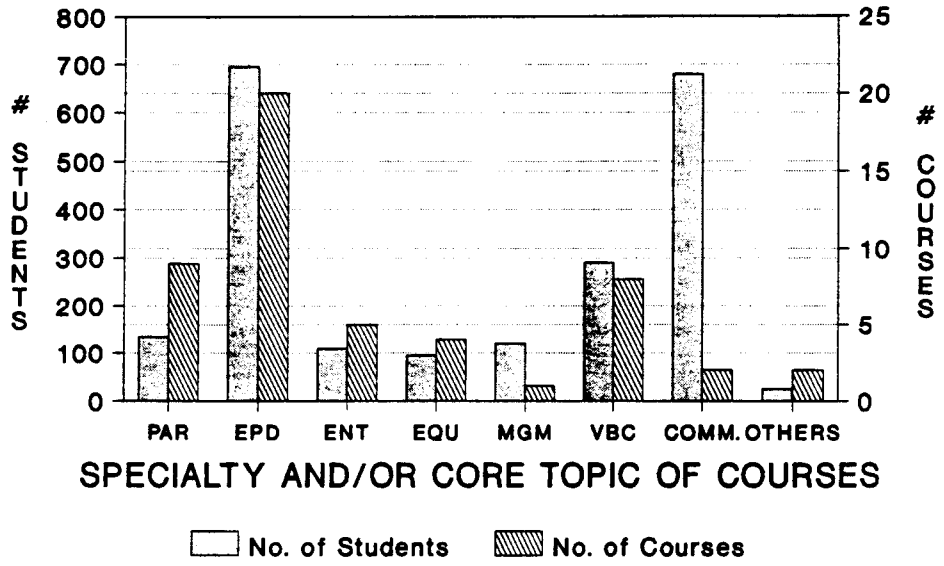
TRAINING MALARIA ACTIVITIES, 1990

ACTIVITIES	NUMBER	COUNTRIES	ESTIMATED
Courses of short duration	49	MEX,COR,ELS, GUT,HON,NIC, PAN,HAI,BRA, BOL,VEN,ARG, PAR	2,135
Workshops and/or Seminars	17	MEX,USA,COL, BRA,PAR,VEN	170
Post-Grade Courses	13	BRA,COL,CUB, MEX,PER,VEN, USA	18
Training Grants	19 (TDR)	ARG,BOL,BRA, COL,CUB,GUT, HON,MEX,PAR, VEN	APPROVED IN 1990

Figure 5 also summarizes the data received in regard to courses offered in the countries on the subject areas of greatest interest. It is apparent that interest in the training of human resources in epidemiology, biology, vector control, and parasitological diagnosis is on the rise. In addition, there is interest in training the personnel who are engaged in control activities to use strategies and methods that will make it possible to achieve active community participation in their work.

FIGURE 5

DISTRIBUTION OF 2,150 STUDENTS IN 1990 BY SPECIALTY / CORE TOPIC (51 courses)

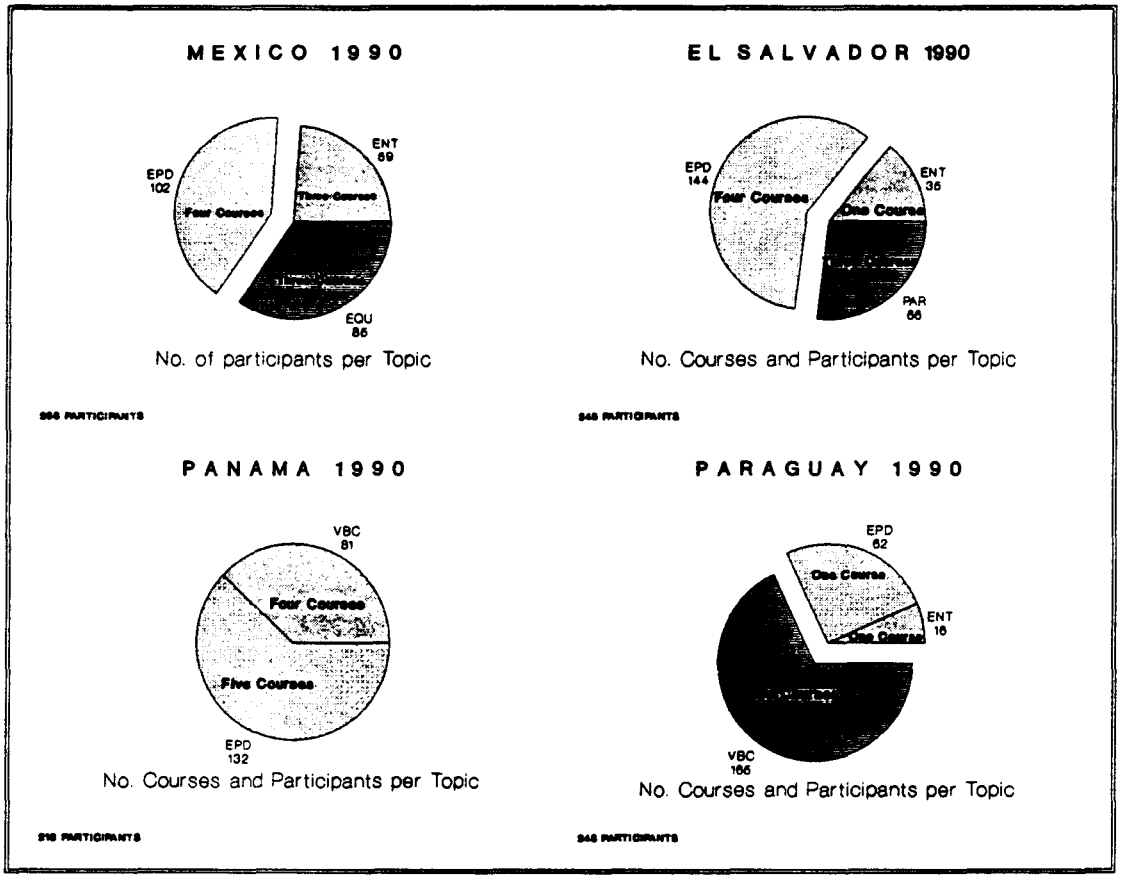


MALARIA SITUATION IN THE AMERICAS

Key: **PAR** = Parasitology **EPD** = Epidemiology
ENT = Entomology **EQU** = Control Equipment
MGM = Management **VBC** = Vector Biology & Control
P. COM. = Community Participation

In addition, as an example of what is occurring in a large number of countries where malaria continues to be a serious public health problem, **Figure 6** illustrates the distribution of students, by course, in the above-mentioned subject areas. It is evident also that, in the countries indicated, there is considerable interest in the training of personnel in epidemiology. This will no doubt make it possible to achieve an approach in the countries that is both more rational and better suited to the particular epidemiological circumstances of each country.

FIGURE 6


MEXICO 1990
EPD
102
ENT
69
Four Courses
Three Courses
EQU
86
No. of participants per Topic
EL SALVADOR 1990
EPD
144
ENT
36
Four Courses
One Course
PAR
66
No. Courses and Participants per Topic
PANAMA 1990
VBC
81
Four Courses
Five Courses
EPD
132
No. Courses and Participants per Topic
PARAGUAY 1990
EPD
62
One Course
ENT
16
VBC
166
No. Courses and Participants per Topic