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## Malaria in the Americas

### Introduction

In 1990 more than 40% of the world population was exposed to varying degrees of risk of contracting malaria<sup>1</sup>. Accurate information on the global incidence of malaria is difficult to obtain because reporting is particularly incomplete in areas known to be highly endemic. The global incidence of malaria is estimated to be approximately 120 million clinical cases each year, with nearly 300 million people carrying the parasite. Countries in tropical Africa are responsible for more than 80% of all clinical cases and more than 90% of all parasite carriers.

In recent years, reporting of malaria cases improved in Africa, although it remains fragmentary and irregular. In the other Regions of WHO, the total number of cases did not change much during recent years.

The variety and complexity of the technical, political, sociocultural, and economic factors that come together in order to maintain malaria transmission have demonstrated the need to change the simplistic approach of using a single control measure in all malarious areas without taking into account the risk factors that lead to

<sup>1</sup>Based on the XL Annual Report on the Status of Malaria in the Americas for the year 1991. This report also summarizes the world malaria situation for the year 1990. This document is available upon request from the Communicable Diseases Program, PAHO.

varying degrees of endemicity. The diversity of epidemiological situations demands organized control based on realistic goals that include the application of diversified and complementary measures in accordance with local conditions, resources, and levels of development. Among the main obstacles for the control and prevention of malaria in areas with high transmission are: a) inadequate sanitation and precarious living conditions; b) lack of economic resources; c) lack of knowledge about the biology, ecology, and the measures to control vectors; d) expansion of the agriculture and of the mining and forestry industries into new areas, leading to migration, and e) insufficient or nonexistent health infrastructure in these new settlements.

### Situation of Malaria in the Americas

In 1991 the population of the Region of the Americas was estimated at 721 million people, of whom 38.9% were living in areas in which ecological conditions were propitious for the transmission of malaria.

On the basis of the 1,230,671 reported cases of malaria confirmed parasitoscopically, an increase was recorded in morbidity from 375.4 cases per 100,000 exposed to malaria in 1990 to 437.8 cases per 100,000 in 1991.

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Since 1974 the epidemiological situation of malaria has continued to deteriorate, since in that year the Region registered an annual prevalence of 134.0 cases per 100,000.

In countries or territories without evidence of transmission, 1,144 cases of malaria were reported in an area with a total population of 440 million. The majority were imported cases.

In the 21 countries with evidence of malaria transmission, a potentially exposed population of 281 million live in originally malarious areas. Although the information is not complete for the entire year, 1,229,527 cases of malaria were registered, a figure that indicates an annual parasite index of 6.8 per 1,000 exposed in 1991. This pointed to an increase over 1990, in which the API was 5.1 per 1,000.

The relative stability of the maximum figure registered yearly of around 1 million cases brings to light certain questions that the malaria prevention and control programs are considering as part of the analysis and review of the structures and strategies for integrating the program into the local health services. The fact that the number of registered cases has reached a stable level suggests that the number of susceptibles exposed to transmission has been stabilized or that the capacity of the malaria control programs has reached its operational limits in carrying out parasitoscopic diagnosis and has not been able to overcome the current infrastructure conditions with regard to the human and material resources that would make complete coverage of transmission areas possible.

An argument in support of the first possibility is that the proportion of infections by *P. falciparum* diagnosed by the services was 33.0 per 1,000 in 1990 and 34.0 per 1,000 in 1991. This means that the measures taken to control transmission are not achieving their objective, either because of the opening of new areas of primary transmission or because transmission in existing areas are not being reduced. Furthermore, the fact that in 17 countries (except Haiti, French Guiana, Guyana, and Paraguay) with evidence of transmission a sufficient quantity of drugs has been consumed for complete treatment (1,500 mg of 4-aminoquinoline) of 5,600,575 cases of malaria infection. This figure might be taken as an indication that the parasitoscopically diagnosed cases represent only 21.9% of the cases treated. This means that the malaria prevention and control programs in the Americas used 4 to 6 times more 4-aminoquinoline than the number of confirmed cases would appear to require.

Considering that the excess 4-aminoquinoline used would have been consumed in part for *presumptive treatment* by administering 600 mg for every slide taken (8,502,259), there would still be excess administration of chloroquine sufficient for the complete treatment of 969,000 cases of malaria in the 17 reporting countries (Table 1).

Table 1. Antimalarial drugs used in 1991 in 17 reporting countries (in thousands of tablets).

Countries (by subregion)	4-aminoquinoline 150 mg base
Belize	65.0
Costa Rica	1,542.1
El Salvador	1,902.5
Guatemala	2,307.3
Honduras	2,235.0
Mexico	8,856.2
Nicaragua	8,000.0
Panama	427.0
Dominican Republic	1,378.5
Brazil	15,000.0
Suriname	86.0
Bolivia	1,060.0
Colombia	3,300.0
Ecuador	3,716.7
Peru	1,743.5
Venezuela	4,369.6
Argentina	12.7
Total	56,002.1

Since these figures do not include other malaria drugs used in the programs (fansidar, mefloquine, halofantrine, combined treatments, etc.) nor malaria drugs recorded in other units of the health sector or other sectors—including the private and military sector from which PAHO does not receive information that might provide a more accurate estimate—it could be concluded that the 1,230,671 registered cases represent only a small fraction of what might be at least 2.2 to 5.6 million cases (from 1.8 to 4.5 times as many) for the Region in 1991.

Another example of the operational limits of the national control programs is the case of Colombia, which in 1991 reported 184,156 cases, an increase of 85.1% in comparison with 1990 (99,489 cases). However, prior to 1991, the former Direct Campaigns Administration did not recognize the detection, diagnosis, and treatment of the cases carried out in the Department of Antioquia by the Sectional Health Service as reportable cases of malaria. Accordingly, the registration of almost twice the number of cases within a period of one year does not indicate a deterioration in the situation of malaria in the country; rather, it reflects the modernization of the program, which has been

achieved through the decentralization mandated by Colombia's new Constitution. (The cases reported by the Sectional Health Service of the provinces are now accepted).

In summary, the information contained in this report does not necessarily reflect the complete picture of the malaria distribution in the Region but rather the official reporting of cases of malaria that have been considered as such by the specialized programs in each country.

### Prevention and Control Programs

From the total of cases of malaria diagnosed in 1991 in the Americas Brazil showed the highest number, with 49.9%, followed by the Andean Area, with 27.6%, and Central America, Panama, and Belize with 14.0%. However, the estimated risk of becoming ill with malaria, or the annual parasite index (API), points to a different order, since the highest risk was observed in Guyana and French Guiana, with an API of 41.0 per 1,000; followed by Brazil, 9.8; Central America, Panama and Belize, 8.9; and the Andean Area, 6.3 for each 1,000 inhabitants exposed.

Furthermore, the risk of dying from malaria is greater as the risk of being infected with *P. falciparum* increases. The Caribbean area, (essentially Haiti), followed by Guyana, French Guiana, and Brazil, are the countries with the highest percentages of *P. falciparum*.

The proportion of infection by *P. falciparum* has diminished in six of the 20 countries (Brazil, Ecuador, Guyana, Paraguay, Suriname, and Venezuela). Haiti and the Dominican Republic continue with 100% and 97.3% of infections by *P. falciparum*. They are followed by Suriname with 94.1%, Guyana with 55.44%, and French Guiana with 48.8% of infections by this parasite.

Of the total number of infections by *P. falciparum* registered in the Americas (417,864), 63.6% were notified in Brazil.

### Status of the Sub Regions

#### *Mexico, Central America, Belize and Panama*

This sub region, which includes Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama--has a population of 60,347,000 living in areas considered to be malarious, a total of 21.5% of the population of the malarious area of the Region of the Americas.

Of the 199,037 cases registered 5,338 (2.8%) were diagnosed as *P. falciparum*; the remainder have been caused by *P. vivax*, the predominant species in the sub region. In Belize five infections were diagnosed as *P. malariae*.

Regarding the annual parasite index (API), great variability may be observed between the countries.

Panama has an API of 0.5 cases per 1,000 inhabitants, while Mexico, El Salvador, Costa Rica, and Nicaragua, have an API of as high as 6.82 per 1,000. Guatemala, Belize, and Honduras had the highest APIs in the sub region of 16.8, 17.6, and 20.6 per 1,000, respectively.

The most striking deterioration has been registered in Costa Rica and Honduras, where the annual parasitic index has increased from 1.4 per 1,000 and 11.5 per 1,000 in 1990 to 3.8 per 1,000 and 20.6 per 1,000 in 1991, respectively.

The situation of Costa Rica is characterized by difficult access and communication with the Province of Limón as a result of the earthquake that occurred there on 22 April 1991 and the ensuing persistent rains. This has been compounded by a relaxation of compliance with social protection laws as a result of the recruitment of temporary workers in banana-growing areas in this region, which reduced the coverage of the malaria program. In addition, during the process of integrating the malaria services into the local health services, field mobility was lost with a consequent reduction in the coverage of the original malaria program.

Of the eight administrative regions into which Honduras is divided, only one demonstrated a substantial improvement in its API, moving from 21.7 per 1,000 in 1990 to 7.6 per 1,000 in 1991. Among the other seven regions, three showed the same API, and in the four remaining regions (including the metropolitan region) there was substantial deterioration.

#### *The Caribbean Area*

This sub region is made up of 23 countries or territories<sup>2</sup>. In 1991 there was a total population of 36,814,000 or 5.11% of the total population of the Hemisphere.

Most of this population lives in malaria-free areas; however, the greatest concern is the introduction of imported cases from other countries. Guadeloupe reported 24 cases and Trinidad and Tobago 15. Cuba and Puerto Rico are considered areas free of transmission; however, of 509,674 blood samples examined in Cuba, 201 were diagnosed as positive (191 imported cases and 10 introduced cases).

Malaria transmission continues in Haiti and the Dominican Republic, with *P. falciparum* the predominant parasite. The total population of the island represents 1.9% of the Hemisphere total, while

<sup>2</sup>Anguila, Antigua, Bahamas, Barbados, Cuba, Dominica, Grenada, Guadeloupe, Haiti, Cayman Islands, Turks and Caicos Islands, Virgin Islands (USA), Virgin Islands (UK), Jamaica, Martinique, Montserrat, Puerto Rico, Dominican Republic, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, Trinidad and Tobago, Netherland Antilles.

infections by *P. falciparum* represent 7.11% of those registered in the Americas.

#### *Andean Sub Region*

This sub region includes Bolivia, Colombia, Ecuador, Peru, and Venezuela. The total population is 91,353,000, of whom 53,441,000 live in potentially malarious areas. In 1991 the sub region registered 339,118 cases of malaria, of which 94,208 (28%) were diagnosed as *P. falciparum* and 38.5% corresponded to Colombia, 23.3% to Ecuador, and 19.1% to Venezuela.

Transmission of malaria in the Andean sub region has traditionally been characterized by *P. falciparum* infections in the area of the tropical rain forest. However, a change is occurring in this serious form of infection which is concentrating toward the Pacific Coast. This has resulted in a high frequency of circulation of *P. falciparum* among the black population on the coasts of Colombia and Ecuador. In Bolivia, transmission continues in the jungle region along the borders with Brazil, northern Peru, and Paraguay, and transmission persists in the plains region between Colombia and Venezuela because of the increase in communication between the populations of these two countries.

#### *Amazon Sub Region*

This sub region is made up of the jungle transmission areas of Brazil, French Guiana, Guyana, and Suriname. It has a total population of 17,090,211, of whom 99.9% live in the Legal Amazon region of Brazil. Transmission in this sub region is influenced by the opening of new frontiers with the chaotic economic development occasioned mainly by the mining of surface gold. The highest APIs in the entire Hemisphere are found in the Guyanas, 32 per 1,000: French Guiana, with 49% of infections caused by *P. falciparum*; Guyana, with an API of 57 per 1,000, 55.5% of the infections caused by *P. falciparum*; and Suriname, with an API of 4.9 per 1,000, 94.1% of the infections caused by *P. falciparum*. An API of 30.7 per 1,000 was registered in the Legal Amazon region of Brazil, with 41% of the infections caused by *P. falciparum*.

#### *Southern Cone Sub Region*

This sub region, made up of northern Argentina, Paraguay and the Brazil border states of Sao Paulo, Paraná, Santa Catarina, Rio Grande do Sul and Mato Grosso do Sul, registered an API of 4.8 per 1,000, which represents 98,569 cases in a population of 20,719,935 living in endemic areas. In Argentina and Paraguay, at the end of the year, 803 and 2,983 cases respectively were reported (APIs of 0.2 and 0.8 per 1,000 inhabitants).

#### **Decentralization and Integration of Services**

The political situation in some of the Member Countries has increased the need for regionalization, and in many cases, the municipalization of political, administrative, and, occasionally, financial power. Malaria prevention and control programs have participated with variable vigor in this process of transformation and of political-administrative reorganization of the countries of the Region. In consequence, a brief analysis of the salient points relating to the programs is provided below.

The specialized health programs strengthened their regional units so that they could gradually assume responsibility for operational decision-making and thus be in a position to assume their functions fully when administrative decentralization took place. This resulted in the need for improving analytical methods and instruments to support a timely information-system capable of supporting operational decision-making at the local level. For this reason, in recognition of the focal nature of malaria transmission, an attempt was made to improve the epidemiological stratification process, (See *Epidemiological Bulletin*, Vol. 12, No. 4, 1991) which will be useful to the malaria prevention and control programs in decentralizing operations at the local level based on the epidemiological characteristics of each stratum. However, the great variability in local characteristics, have precluded the complete analysis to reach the decision-making at the local level. In part, because epidemiological surveillance and data processing have remained verticalized, in its organizational structure.

The evolution of the process, already in progress, is to achieve the characterization of each stratum, based on the ranking order of exposure to local determinants of becoming ill or dying of malaria. Thus, providing essential information for the prioritization of appropriated interventions to reduce or eliminate these risks factors in a rational way. Therefore, it will allow for the decision to be made at the local level with regard to the resources available in each locality.

In this process of decentralization, the integration of health care services at the local level, could be practical means for the dissemination of specialized knowledge in the general health services, in order to increase its resolute capability. Currently, the specialized health services represent a great *missed opportunity* for the delivery of comprehensive health services.

The reports of 22 countries indicated (Table 2) that active case-finding was carried out in 5,524,515 febrile individuals who had contact with the specialized service. This resulted in a diagnosis of 541,651 cases of malaria, which meant that 9.8% of the demand was provided with malaria treatment. On the other hand, some 4,982,864 febrile patients--that is, 90.2%--who

Table 2. Comparative results of passive and active case detection from malaria programs in the Americas, 1991.

Countries by geographical sub-regions)	PASSIVE CASE DETECTION General Health Services and hospitals				ACTIVE CASE DETECTION Voluntary collaborators, Evaluators, Epidemiological Investigations & follow-ups				TOTAL		
	Number of Inform. posts		Blood slides		Number of Inform. posts		Blood slides		Blood slides examined	Positives	Percentage
	Examined	%	Examined	%	Examined	%	Examined	%			
Cuba	...	...	...	...	509,874	201	0.04	509,874	201	0.04	
Chile	...	...	...	...	...	...	...	0	0	0	
Dominica	...	...	...	...	...	...	...	0	0	0	
United States of Am.	...	...	...	...	...	...	...	...	904	...	
Grenada	...	...	...	...	...	...	...	...	...	...	
Guadalupa	...	...	...	...	...	...	...	...	...	...	
Jamaica	231	0	0.00	...	50	0	0.00	281	24	0.00	
Martinique	...	...	...	...	...	...	...	...	...	...	
Saint Lucia	...	...	...	...	...	4	...	...	...	...	
Trinidad & Tobago	16,382	10	0.05	...	6,485	5	0.08	24,847	15	0.06	
Mexico	13,174	...	...	...	55,032	...	...	1,598,427	26,565	1.68	
Belize	41	3,792	133	3.51	...	3,184	14.82	25,281	3,317	13.12	
Costa Rica a)	37	737	876	118.88	177	2,397	2.74	86,324	3,273	3.71	
El Salvador	242	13,720	295	2.15	2,663	176,820	5.638	190,540	5,933	3.11	
Guatemala	116	54,261	8,674	15.99	2,027	307,482	49.155	161,743	57,829	16.99	
Honduras	...	23,440	3,668	15.65	5,924	445,371	69.664	466,811	73,352	15.85	
Nicaragua	156	122,905	6,717	7.09	2,628	241,681	18.936	364,786	27,653	7.58	
Panama	182	149,620	370	0.25	280	186,949	745	336,569	1,115	0.33	
Haiti b)	...	...	...	...	...	...	...	...	...	...	
Dominican Rep.	457	13,175	49	0.37	2,909	330,316	328	81,763	25,511	31.20	
French Guiana	...	30,012	3,071	10.23	...	25,230	502	55,242	3,573	6.47	
Guyana	73	114,492	...	...	98	26,554	...	141,046	42,204	29.92	
Suriname	108	13,334	1,100	8.25	45	5,065	390	18,399	1,490	8.10	
Brazil	3,673	1,076,668	355,419	33.01	15,144	2,206,348	259,012	9,283,016	614,431	18.72	
Bolivia	285	25,225	8,542	33.86	3,915	100,284	10,489	125,509	19,031	15.10	
Colombia	1,443	411,826	105,304	25.57	1,461	328,112	78,852	740,938	184,158	24.85	
Ecuador	682	166,131	37,445	22.54	2,202	180,334	21,955	346,465	59,400	17.14	
Peru c)	...	56,822	24,109	42.43	5,180	52,832	9,596	108,654	33,705	30.74	
Venezuela d)	381	102,682	25,843	25.17	761	148,788	7,676	375,473	42,828	11.41	
Argentina	20	4,742	390	8.22	73	12,102	413	18,844	803	4.77	
Paraguay	88	4,005	494	12.33	1,396	123,802	2,489	127,807	2,983	2.33	
Total	21,118	2,408,202	584,509	24.29	101,915	5,524,515	541,651	9,732,930	1,230,071	12.64	

... Information not available

a) (HAI) Provisional and incomplete information, b) (PERU) information up to November.

c) (VEN) Totals are for the whole year, information on passive and active case detection up to August.

were negative for malaria had contact with the specialized service. However, their demand remained *unsatisfied*, since they were not diagnosed and received no treatment or medical follow-up.

In spite of the limited resolute capability of the general health services in regard to the diagnosis and treatment of malaria (passive case-finding) and the prevailing limited coverage, it was possible to carry out 2,406,202 screenings of febrile patients, of whom 24.3% were confirmed parasitoscopically, resulting in 584,509 cases of malaria. However, the 1,821,693 febrile patients without malaria, were able to receive the services they demanded for; diagnosis, treatment, and follow-up of the disease they suffered.

The intent in combining these basic concepts of the organization of health care services--*missed opportunity* and *unsatisfied demand*--is to integrate the specialized services into the general health services by joining together the greater active penetration of the specialized services to the limited coverage of the

passive action of the general health services (reaction to the demand) and thus increase the coverage.

This could be visualized practically through a medical referral system using the resources of the malaria programs, which would standardize the discriminatory characteristics of malaria diagnosis in such a manner that each time a parasitoscopic examination is negative for malaria or when no improvement occurs from the use of malaria drugs (resistance to first-line drugs or mistaken clinical diagnosis), the patient would be automatically referred to the second level of care. Coverage would accordingly be expanded in areas in which the general health services are not equipped with formal infrastructure through the active penetration of the specialized malaria services, thereby improving the effectiveness of the general health services.

(Source: Communicable Diseases Program, PAHO.)

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## Cholera in Guyana

Guyana is the twentieth country in the Region of the Americas to report cases of cholera since the epidemic began in January 1991 in Peru.

As of 3 December, the Ministry of Health of Guyana had reported two hundred eighty-eight (288) cases of cholera with five (5) deaths. Less than twenty five percent of the reported cases had been hospitalized, and the disease had affected predominantly adults.

The laboratory at the Public Hospital in Georgetown isolated *V. cholerae* 01 El Tor Inaba from stools of six patients. These results were confirmed by the Caribbean Epidemiology Center (CAREC).

The first case of cholera was registered on 5 November. All cases were residents of the western border with Venezuela. The following areas recorded the disease as part of the initial outbreak: Mabaruma, Wauna, Coomaka, Brooms Hill, Koraibo, Imbotero, Kamwatta, Barima Hill and the Cabbage Factory up in the Barima river. These communities are located along the Barima river, which flows into the Orinoco Basin in Venezuela, where a cholera outbreak occurred last August. This Region has a population of approximately

15,000. The city capital is Mabaruma with 5,000 inhabitants.

Subsequently, the disease spread along the rivers and more recently cases have been reported from Suddie and nearby islands located less than one hour from Georgetown.

A case-control study was conducted in the Mabaruma region to identify modes of transmission. Results of this study were not available at the time of this publication.

Outbreak control measures have been implemented by a health team mobilized to the area by the Ministry of Health.

Initial cases were treated at the Mabaruma hospital (30 beds). A surveillance system is in place, community education is ongoing and steps are being taken to improve water and sanitation in the villages and towns. A CAREC epidemiologist assisted the national authorities in the affected area.

(Source: Ministry of Health, Guyana, CAREC and Health Situation and Trend Assessment Program, PAHO.)