

Malaria in Central Haiti: A Hospital-based Retrospective Study, 1982–1986 and 1988–1991¹

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A retrospective study conducted at central Haiti's Albert Schweitzer Hospital in the June 1991–January 1992 period sought to assess the numbers of malaria cases seen at the hospital in 1982–1991, the distribution of cases by age and sex in 1988–1991, and the validity of official reports indicating an overall decline in malaria cases.

Review of the hospital's laboratory records (1982–1986, 1988–1991), patient medical records (1989–1991), and patient discharge summary cards (1989–1991) revealed a total of 5 251 malaria cases identified through examination of approximately 65 000 blood smears. The largest numbers of cases were diagnosed in 1982 (1 150) and 1988 (980); the smallest numbers in 1990 (120) and 1991 (317). Peak case incidences occurred yearly in the November–January period, a few months after the rainy season.

*Of the 838 cases found in the 1989–1991 period, 53% occurred in females and 47% in males. Relatively high numbers of cases (averaging 41.1 cases per year of age) were found among children 0–6 years old, with the largest number of cases in any 1-year age group (54 cases) occurring among children 1 year old. (In general, the numbers of cases declined with increasing age.) Eight cases among hospital in-patients ended in malaria-related death, five of these deaths occurring among children 0–6 years old and six involving cerebral malaria (a common complication of *P. falciparum* infection). Overall, the results of this study support official reports showing a general decline in the number of malaria cases in this region of Haiti between 1982 and 1991.*

In recent years, reports around the globe have warned of a worldwide malaria resurgence (1). Historically, global attempts to eradicate the disease failed in the 1950s and 1960s, and malaria control therefore came to be recommended as an alternative to eradication because eradication was too hard to achieve (2–6).

This change to a control strategy has not managed to reduce the incidence of

the disease in the Americas. Indeed, in 1990 the World Health Organization (WHO) reported that the number of malaria cases detected in the Americas had been rising steadily since 1974—from 269 000 in 1974 to 1.1 million in 1988 (7).

Nevertheless, the reported malaria incidence declined in the late 1980s in the Caribbean, where endemic malaria is limited to the Island of Hispaniola. Specifically, the number of recorded cases in the Dominican Republic fell from 1 400 in 1986 to 1 100 in 1988 and 356 in 1990; and the number of officially reported cases in Haiti went from 17 000 in 1985 to 12 000 in 1987 and 1988 (8). Because reported malaria cases frequently lead to underestimation of malaria's true prevalence, one aim of the present study in Haiti was

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to corroborate official reports of malaria's decline.

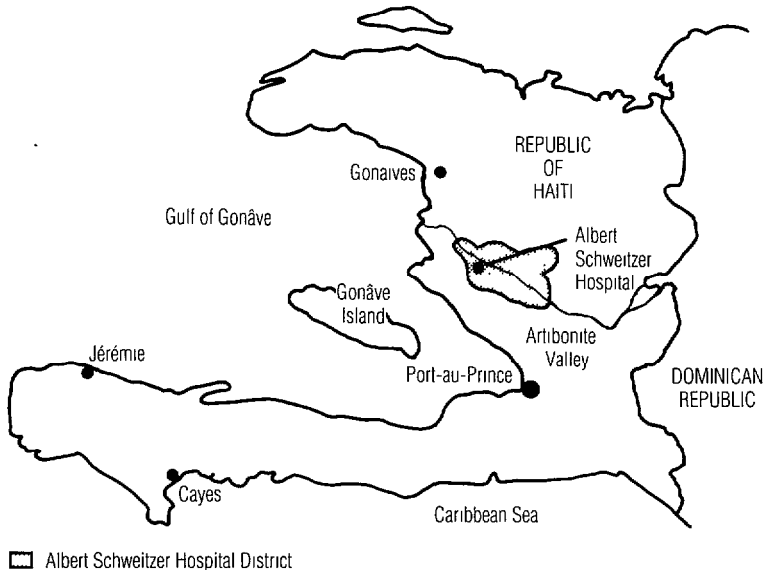
Garcia-Martín reported in 1972 that about 74% of the Haitian population was living in malarious areas (9). While no comparable current estimates are available, it is known that a substantial proportion of the country's population still lives in such areas. An aggressive distribution of antimalarial drugs during the years 1964–1968, combined with an irregular but high rate of house spraying (an average of 343.23 houses per 1 000 inhabitants, with a standard deviation of 133.3) in 1962–1966, reduced the annual parasite incidence (API) per 1 000 inhabitants from 5 in 1964 to 0.6 in 1968. As the vector control operations became more irregular between 1972 to 1984, however, the API rose from the 1968 figure of 0.6 to 12.6 in 1982 (10). The Pan American Health Organization (PAHO) reported a 2.9% annual parasite incidence in Haiti for 1986 but cautioned that these results might not

be comparable because of a modified case detection system. WHO reported a 31% to 37% rate of positive blood specimens between 1988 and 1990 (8, 10–12).

The agent of malignant tertian malaria, *Plasmodium falciparum*, causes most of the malaria cases in Haiti. However, Cavalie et al. (13) have reported some *P. vivax*, and PAHO has reported *P. malariae* (10). In addition, two basic facts have major epidemiologic and disease control implications on the island. First, chloroquine resistance has not emerged in *P. falciparum*, and recent clinical experience at the Albert Schweitzer Hospital (a tertiary referral hospital in the rural Artibonite Valley of central Haiti—see Figure 1) has indicated that this was still the case in 1993. Second, at one point it was found that there was little DDT resistance among vector mosquitoes on the island (9), an observation that remains to be updated.

The study reported here, which was conducted in the period June 1991–Janu-

Figure 1. A map of Haiti showing the location of the Albert Schweitzer Hospital, the district served by the hospital, and the Artibonite Valley dividing the northern and southern portions of the country.



ary 1992, had two primary goals. The first was to see whether official reports of an overall decline in malaria's prevalence could be confirmed by looking at the records of slide-confirmed cases registered between 1982 and 1991 at the Albert Schweitzer Hospital. The second was to assess the secular trend and cyclic occurrence of malaria cases over this time period, thereby providing an independent appraisal of official reports of a decline in malaria cases. In addition, the study had the secondary purpose of reporting the distribution of malaria cases by age and sex and determining the proportion of malaria cases requiring hospital admission, the length of hospital stays, and the rate of in-hospital malaria deaths in the period 1989–1991.

MATERIALS AND METHODS

The study used a hospital-based retrospective approach. It was conducted at the Albert Schweitzer Hospital, the major provider of medical care to approximately 190 000 people living in a district of 610 square miles. The hospital also provides limited medical care to people living outside of the district, though this practice is discouraged to help manage the hospital's patient load. Geographically, the district consists of the Artibonite Valley, adjoining foothills, and nearby mountains.

Most of the people served reside in simple thatch-roofed huts with one or two rooms, or in concrete, tin-roofed houses. Approximately 80% of the valley is irrigated for the cultivation of rice and other crops. In contrast, farming in the foothills and mountains depends on rainfall in June through August, when accumulation of standing water is fairly common.

At the hospital, 1989–1991 data on malaria patients were obtained by reviewing the facility's discharge summary cards, patient medical records, and laboratory

records. (The number of cases available for review in this period was large enough to provide stable estimates of patient characteristics.) However, for cases diagnosed in 1982–1986 and 1988, only the laboratory records of malaria patients were reviewed. (Data for 1987 were unavailable, most likely due to misfiling of the record book.) Both in-district and out-of-district patients were included in the study because laboratory records did not distinguish between patients by residence; however, few out-of-district patients are seen at the hospital.

A positive blood smear combined with appropriate clinical findings provided the basis for a positive malaria diagnosis. When malaria was suspected, the laboratory routinely performed thick and thin blood smears to look for the disease agent. For years the hospital has taken great pride in performing good laboratory work that is overseen by a well-trained department head. The procedures used by the laboratory to process and examine the thick and thin blood smears varied little, if at all, during the study period.

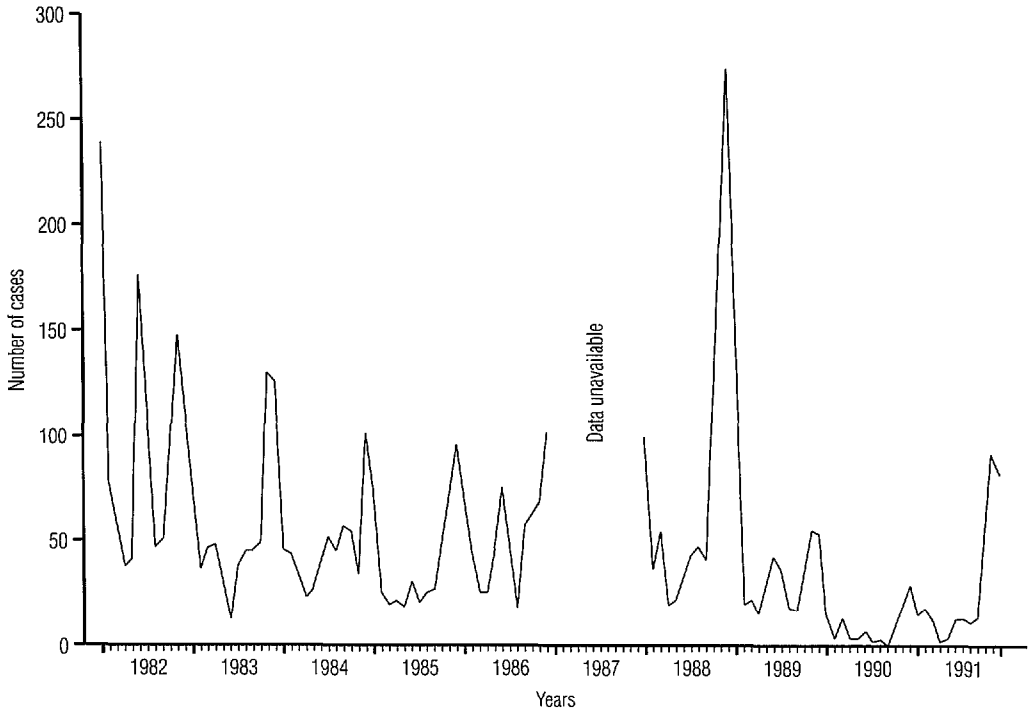
Patients treated for presumptive malaria in one of six rural primary health care clinics affiliated with the Albert Schweitzer Hospital were not included in the study because these clinics lacked the resources to collect and examine blood smears. However, the clinics routinely referred their very sick patients to the hospital for treatment.

RESULTS

Numbers of Cases Diagnosed, 1982–1991

The number of malaria cases per month that were found for the years 1982–1986 and 1988–1991 are shown in Figure 2. Overall, 5 251 cases were identified through examination of approximately 65 000 smears, the percentage of positive smears

Figure 2. The numbers of malaria cases found among patients attending the Albert Schweitzer Hospital, by month, in the years 1982–1986 and 1988–1991 (N = 5 251).



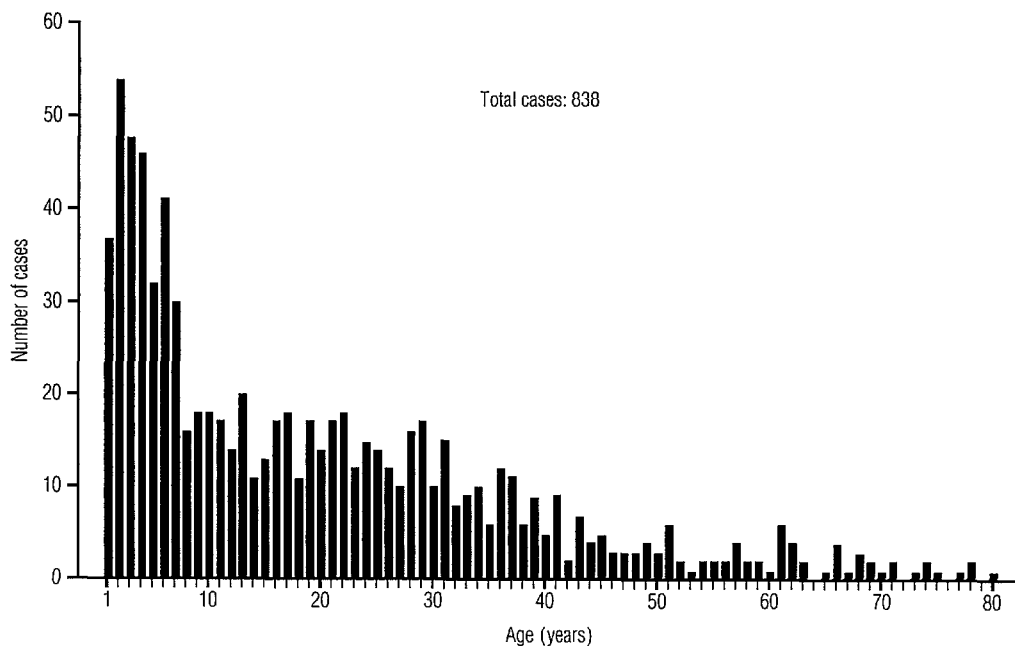
ranging from 14% in 1982 to 2% in 1990. The numbers of malaria cases diagnosed in specific years were highest in 1982 (1 150 cases) and 1988 (80 cases), being lowest in the last 2 years studied (120 cases in 1990 and 317 in 1991).

In every year, the months when the peak numbers of cases were diagnosed occurred in the November–January period, a few months after a rainy season lasting from June–August. (Smaller malaria case peaks typically occurred in the June–July period.) This consistent seasonal pattern occurred both in years with high numbers of cases (for example, 1982 and 1988) and in years with low numbers of cases (for example, 1990 and 1991), although the summer peak tended to be more pronounced in years with large numbers of cases.

Patient Characteristics, 1989–1991

Among the 838 patients with malaria cases diagnosed from January 1989 through December 1991, 53% were females and 47% males. Children 0–6 years old had the largest average number of cases of any age group, this average being 41.1 cases per year of age. In a similar vein, as Figure 3 shows, the largest number of cases (54) in any 1-year age group occurred among children 1 year of age. Beyond age 6, the average numbers of cases per age group were notably lower and tended to decline further with increasing age. Specifically, the average numbers of cases per year of age were 14.9 in the 7–31 year age group, 8.5 in the 32–41 year age group, and 2.4 in the 42–80 year age group.

Figure 3. The numbers of malaria cases, by patient age, found among patients attending the Albert Schweitzer Hospital in the 3-year period 1989–1991 (N = 838).



Most (78%) of these 838 malarious patients resided within the Albert Schweitzer Hospital's health district. Of the other 22%, 12% gave addresses outside the district; data regarding the residences of the remaining 10% were not available. Most of the malaria cases occurred among residents of the Artibonite Valley proper rather than among residents of the surrounding foothills.

The great majority (725, or 87%) of the 838 subjects were treated as outpatients; only 113 (13%) were felt to require in-hospital care and were admitted. The hospital stays of these 113 ranged from 1 to 13 days, the median length being 3.3 days. Over one-third (37%) of those admitted were children under 5 years old; 12% were children 6–10; 16% were children and young adults 11–20; and 35% were over 20 years old. Nearly one-half

(45%) of the 113 hospitalized patients were diagnosed as having cerebral malaria, a common consequence of *P. falciparum* infection, and were provided with appropriate treatment. Eight (7%) of the 113 died in the hospital as a result of malaria between 1989 and 1991. Five of these deaths occurred among children 0–6 years old, and six were attributed to cerebral malaria.

DISCUSSION AND CONCLUSIONS

The study findings suggest that malaria is endemic in the Artibonite Valley and surrounding foothills, producing seasonal outbreaks with a relatively slack period in February–September and increasing morbidity beginning in October. Most of the diagnosed malaria cases af-

fectured people residing in the valley proper, where canals provide water for cultivating rice and other crops. As previously noted, approximately 80% of the valley is irrigated; and the irrigated fields, used throughout the year, provide good breeding habitats for the *Anopheles* mosquito (14).

Infants and young children (under age 7) accounted for over one-third of the 838 malaria cases studied, and the largest number of cases in any one-year age group occurred among children 1 year old. These findings are consistent with the conclusions of a number of studies performed in other areas. Specifically, in 1952 Bruce-Chwatt (15) reported low-grade parasitemia occurring perinatally in endemic areas of Africa, together with mild symptoms believed to be related to a passive immunity acquired from the mother. Later work, also in Africa, demonstrated that the parasite rate increased substantially between 3 months and 1 year of age and remained high during early childhood, a period when death rates declined markedly (16). In 1969, Lucas and colleagues reported that in an area where asymptomatic parasitemia occurred in up to 75% of a group of 6-year-olds, school-age children developed a protective level of immunity (17). More recently, adults living in highly immune communities were found to have a prevalence of parasitemia in the range of 10%–25% with low parasitemia density levels and few illnesses (18, 19). However, in areas with low endemicity the population tended to have little immunity, resulting in more severe individual malaria cases (20, 21). In a similar vein, a study of antibody levels and spleen sizes by Jones et al. (Indonesia, 1991—22) found mean spleen size to correlate positively with increased prevalence and negatively with low resistance.

In the present study, most people diagnosed as having malaria were treated as outpatients. As a rule, those admitted

and given in-patient care were seriously ill. Cerebral malaria accounted for most of the complicated cases and deaths, a finding consistent with the high prevalence of *P. falciparum* in our area. (The literature identifies cerebral malaria as a frequent cause of mortality among young children and nonimmune adults—2, 20, 23, 24.)

Two possible sources of error merit attention. First, the estimated number of malaria cases in the region may have been underreported due to lack of data from the rural primary health clinics where patients are treated for presumptive malaria and only referred to the hospital when critically ill. Although the magnitude of any such underreporting is unknown, it could have introduced a case detection bias into the study.

Second, data concerning the numbers of people at risk by sex, age group, and area of residence were not available. Thus, it was not possible to estimate malaria prevalence. This is partly because the last national population survey was conducted in 1982, and the last updated population estimate was provided by the Population Institute in 1987. It is also because movements of the rural population in the Artibonite Valley and its surrounding foothills and mountains are hard to assess.

In times of political and economic hardship, people tend to go where they hope to better their lives. For example, between September 1991 and March 1992 a noticeable population influx from urban areas came to the small, isolated, mountain town of Hinche, a community within the hospital district.⁵ Haiti has experienced political instabilities since 1986, and various similar population shifts could have occurred from that time onward. (Despite political changes, the govern-

⁵Personal communication from Dr. Saintely Du-buisson of the Hinche health clinic, 1993.

ment clinics have tended to remain open to serve the people.)

In addition, there is daily migration, either into or out of the study region, to trade produce in the markets. Depending on their departure and return times, hospital district residents traveling outside the district might be exposed to the malaria parasite elsewhere. Such exposures would tend to make the study conclusion about malaria's decline in the district more conservative.

In 1983, WHO reported that Haiti appeared responsible for an increased malaria incidence in the neighboring Dominican Republic, due to ongoing emigration (25). (Large parts of the Dominican Republic had moved into the malaria maintenance phase in the 1970s, and in 1975 only 60 cases were reported.) Subsequently, the number of cases in the Dominican Republic increased, 3 600 being detected in 1981 and 4 700 in 1982. (This case count dropped back to 356 in 1990, possibly as the result of a drought in the Dominican Republic—8.)

The current investigation at the Albert Schweitzer Hospital supports official malaria case reports showing an overall decline in the number of malaria cases in the region of Haiti served by the hospital between 1982 and 1991. Primary health care may have contributed to the decline—because during the 1980s the hospital's Community Health Department developed a strong primary health care program at the six rural clinics in its district. These clinics implemented level one of WHO's proposed strategy for malaria control, a strategy that includes four levels (20). The level one measures emphasize prompt treatment of fevers, particularly in high-risk groups such as young children and pregnant women. (WHO's position, supported by a study in Thailand (26), is that prompt treatment of fever, even if such treatment results in overtreatment of some febrile illnesses,

interferes with the life cycle of the malaria parasite, thus contributing to reduction of malaria transmission and ultimately of malaria cases.) The chloroquine sensitivity of Haitian parasite strains (in contrast to the chloroquine resistance found in most African and Asian strains) would also have tended to support case reduction through treatment.

In addition to public health measures, the aforementioned 1990 drought in the Dominican Republic may have contributed to reduced malaria in the Artibonite Valley, because the Artibonite River receives its water from the mountains of the Dominican Republic (8). Low water levels in the Artibonite River reservoir may have reduced the acreage irrigated and, consequently, the vector mosquito habitat. Overall, the findings of this investigation support official malaria case reports showing a general decline in the number of malaria cases in the region served by the Albert Schweitzer Hospital during the study period.

Dedication. This article is dedicated to Mrs. William Larimer Mellon of the Albert Schweitzer Hospital.

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