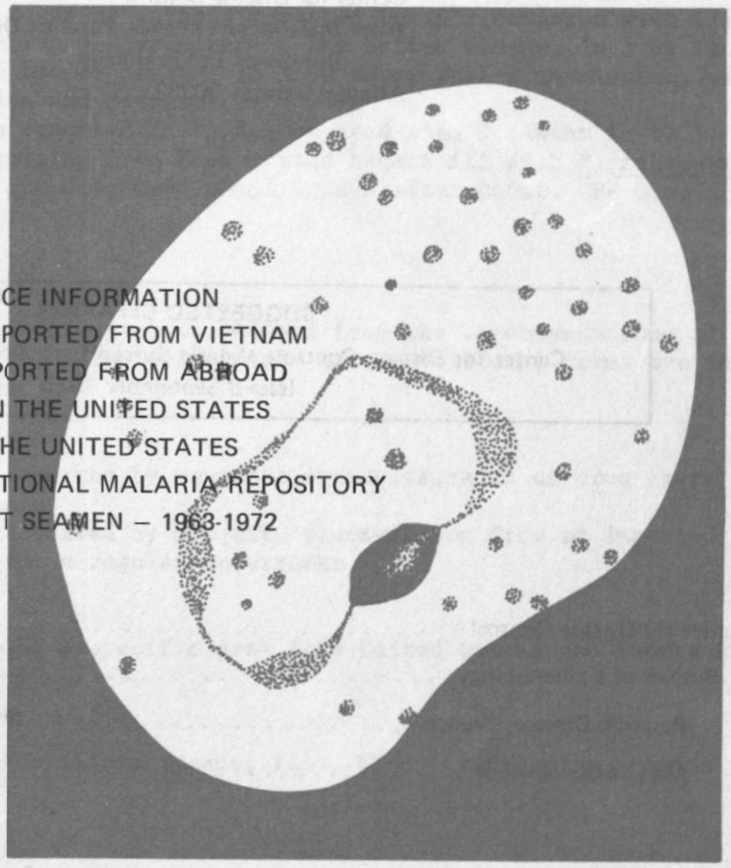
CENTER FOR DISEASE CONTROL

ANNUAL SUMMARY 1972
Issued September 1973

MALARIA

SURVEILLANCE



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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

PREFACE

This report summarizes information received from State Health Departments, Medical Departments of the Armed Forces, and other pertinent sources. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Surveillance Report are most welcome. Please address them to:

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I. SUMMARY

In 1972, 588 cases of malaria were reported in the United States. This represents a 80.7% decrease, compared with the 3,047 cases reported for a similar period in 1971. This decline was due almost entirely to decreasing numbers of military cases imported from Vietnam. Army personnel accounted for 87.4% of the military malaria from Vietnam and Marine Corps personnel for 3.5%. In 1972, 435 cases (74.0% of all cases reported in the United States) were acquired in Vietnam, the smallest number since 1965. As in previous years, imported Plasmodium vivax infections were more common than P. falciparum (77.0% vs. 11.7%).

There were 146 civilian cases of malaria reported in 1972, compared with 191 cases for 1971. In 7 cases, infection was acquired in the United States, in 3 by blood transfusion, in 2 by illicit use of heroin, in 1 by congenital transmission, and in 1 case the source of infection was cryptic.

Only 1 malaria death was reported in 1972, compared with 9 deaths in 1971. A European merchant seaman returning from West Africa became ill with P. falciparum malaria, and his illness was not diagnosed until 6 days after onset. He died 1 day later.

II. TERMINOLOGY

The terminology used in this report is derived from the recommendations of the World Health Organization (1,2). The definitions of the following terms are included for reference purposes.

1. Autochthonous

a. Indigenous - malaria acquired by mosquito transmission in an area where malaria is a regular occurrence.

b. Introduced - malaria acquired by mosquito transmission from an imported case in an area where malaria is not a regular occurrence.

2. Imported

Malaria acquired outside of a specific area (the United States and Puerto Rico in this report).

3. Induced

Malaria acquired through artificial means, i.e., blood transfusion, common syringes, or malariotherapy.

4. Relapsing

Renewal of clinical activity occurring after an interval from the primary attack greater than that due merely to periodicity.

5. Cryptic

An isolated case of malaria not associated with secondary cases as determined through appropriate epidemiological investigation.

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III. GENERAL SURVEILLANCE INFORMATION

Between January 1, 1972, and February 28, 1973, 588 cases* of malaria with onset of illness in 1972 in the United States and Puerto Rico were reported to the Parasitic Diseases Branch of the Center for Disease Control; this represents a 80.7% decrease with respect to a similar period in 1971 when 3,047 cases were reported. In addition to the 588 first attacks, reports were also received on 53 in individuals who developed 1 or more relapses of malaria caused by the same species as their first attack.

The decrease in reported cases was due principally to the decrease of malaria in military personnel (including recently discharged veterans). Military cases declined from 2,970 in 1971 to 442 in 1972 and comprised 75.2% of all cases diagnosed in this country (Table 1). All but 14 of these 1972 cases were acquired in Vietnam. Despite the increasing frequency of international travel, reports of malaria in civilians have remained quite constant over the past 9 years (Figure 1).

Table 1

Military and Civilian Malaria Cases
United States, 1959-1972*

Year	Military	Civilian	Total
1959	12	38	50
1960	21	41	62
1961	45	37	82
1962	75	40	115
1963	58	90	148
1964	52	119	171
1965	51	105	156
1966**	621	143	764
1967**	2699	158	2857
1968**	2567	131	2698
1969**	3914	145	4059
1970**	4094	151	4245
1971**	2970	202	3172
1972	442	146	588

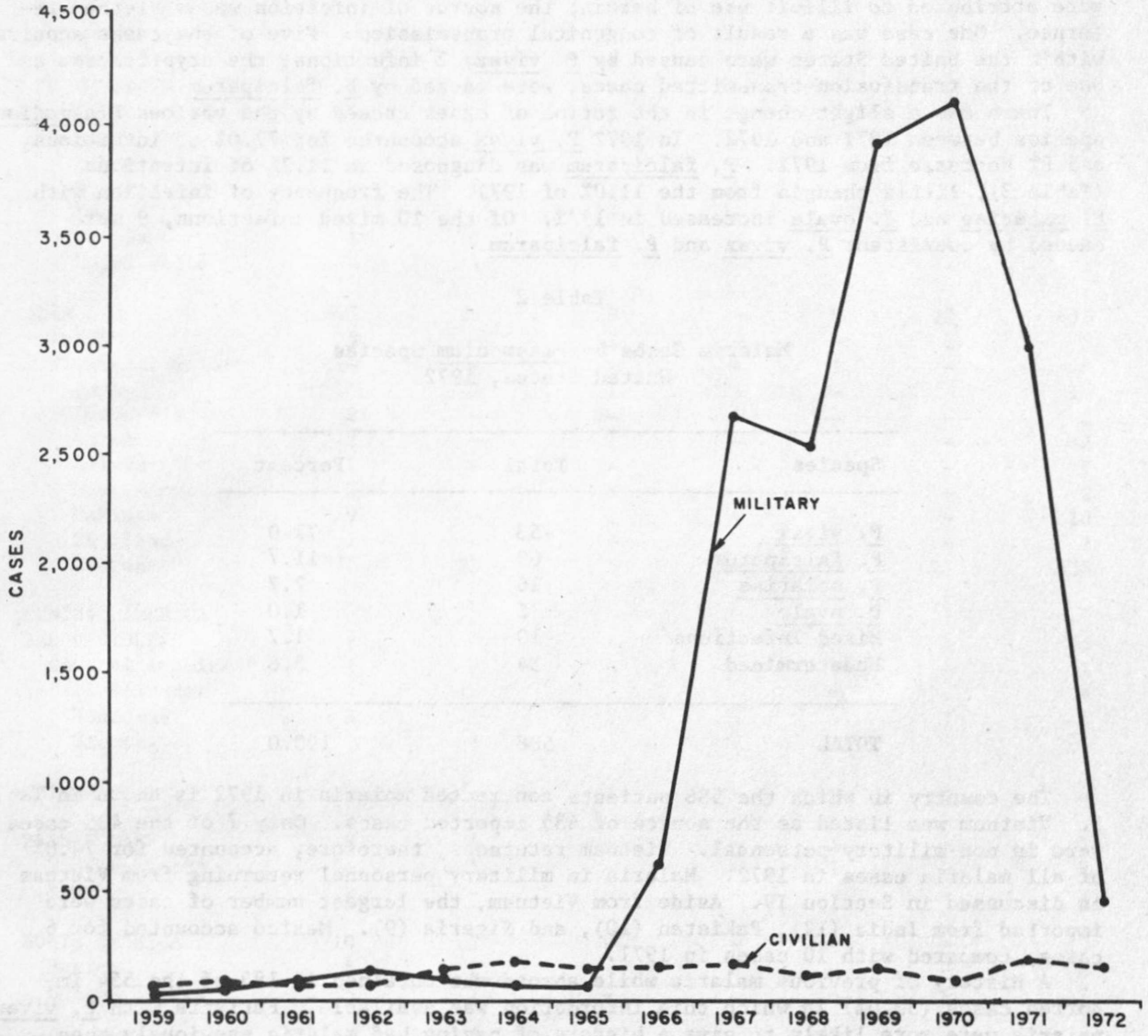
*Onset of illness in the United States and Puerto Rico

**Figures for these years have been updated to include cases reported after the publication of previous annual summaries.

*A "case" is defined as an individual's first attack of malaria in the United States, regardless of whether or not he had experienced previous attacks of malaria while outside the country. A subsequent attack in the same individual caused by a different Plasmodium species is counted as an additional case. Repeat attacks in this country caused by the same species are considered relapses, not additional cases. All cases included in this report were diagnosed as malaria on the basis of a positive peripheral blood smear examined in a local or state laboratory. Doubtful cases were referred to the National Malaria Repository, CDC.

Figure 1

MILITARY AND CIVILIAN CASES OF MALARIA, UNITED STATES 1959 – 1972



The apparent decrease in civilian cases from 191 in 1971 to 146 in 1972 is explained by the fact that 57 of the 1971 civilian cases constituted one unique outbreak among a group of narcotics addicts. In 1972, in 7 of the 146 civilian cases and in none of the military cases, the patients acquired their infections in the United States; the probable sources of transmission in at least 4 of these indigenous cases were Vietnam veterans. One indigenous case was classified as cryptic, although it was probably due to mosquito transmission. Three cases were transmitted by infected blood transfusions; at least 2 of the donors had acquired their infection in Vietnam. Two cases were attributed to illicit use of heroin; the source of infection was a Vietnam returnee. One case was a result of congenital transmission. Five of the cases acquired within the United States were caused by P. vivax; 2 infections, the cryptic case and one of the transfusion-transmitted cases, were caused by P. falciparum.

There was a slight change in the ratios of cases caused by the various Plasmodium species between 1971 and 1972. In 1972 P. vivax accounted for 77.0% of infections, a 5.8% decrease from 1971. P. falciparum was diagnosed in 11.7% of infections (Table 2), little changed from the 11.0% of 1971. The frequency of infection with P. malariae and P. ovale increased in 1972. Of the 10 mixed infections, 9 were caused by coexistent P. vivax and P. falciparum.

Table 2

Malaria Cases by Plasmodium Species
United States, 1972

Species	Total	Percent
P. vivax	453	77.0
P. falciparum	69	11.7
P. malariae	16	2.7
P. ovale	6	1.0
Mixed Infections	10	1.7
Undetermined	34	5.8
TOTAL	588	100.0

The country in which the 588 patients contracted malaria in 1972 is shown in Table 3. Vietnam was listed as the source of 435 imported cases. Only 7 of the 435 cases were in non-military personnel. Vietnam returnees, therefore, accounted for 74.0% of all malaria cases in 1972. Malaria in military personnel returning from Vietnam is discussed in Section IV. Aside from Vietnam, the largest number of cases were imported from India (12), Pakistan (10), and Nigeria (9). Mexico accounted for 6 cases, compared with 10 cases in 1971.

A history of previous malaria while abroad was obtained in 183 of the 554 imported cases (33.0%) in which this information was available. Patients with P. vivax malaria were more likely to give a history of having had malaria previously than patients with P. falciparum malaria (35.3% vs. 23.1%).

The geographic distribution of the 1972 malaria cases in the United States is shown by the state in which the patient first developed clinical symptoms of the disease (Figure 2). The disproportionate number of cases in California, Colorado, Georgia, Kansas, Kentucky, North Carolina, and Texas is due to the location of major military centers, particularly Army bases, in these states.

The seasonal distribution of malaria cases (Figure 3) has shown no distinct pattern in recent years and in 1972 was determined primarily by the number of troops that returned from Vietnam each month.

Table 3

Malaria Cases by Distribution of *Plasmodium* Species and Area of Acquisition
United States, 1972*

	vivax	falciparum	malariae	ovale	Mixed	Unknown	Total
AFRICA	15	30	3	5	-	7	60
Africa**	5	9	-	1	-	1	16
West Africa**	2	2	1	2	-	-	7
East Africa**	-	2	-	-	-	-	2
Congo	-	-	1	-	-	-	1
Ethiopia	1	-	-	-	-	-	1
Ghana	1	1	1	1	-	1	5
Kenya	2	3	-	-	-	1	6
Liberia	3	4	-	-	-	1	8
Nigeria	-	6	-	1	-	2	9
Togo	-	1	-	-	-	-	1
Uganda	1	1	-	-	-	1	3
Upper Volta	-	1	-	-	-	-	1
ASIA	407	26	9	-	9	22	473
Asia**	3	-	1	-	-	1	5
Southeast Asia**	-	-	-	-	1	-	1
India	10	1	1	-	-	-	12
Indonesia	2	-	-	-	-	-	2
Korea	2	-	1	-	-	-	3
Malaya	1	-	-	-	-	-	1
New Guinea	2	-	-	-	-	-	2
Pakistan	9	-	1	-	-	-	10
Thailand	2	-	-	-	-	-	2
Vietnam	375	25	5	-	8	21	435
CENTRAL AMERICA AND CARIBBEAN	9	3	2	-	-	1	15
Central America**	1	-	-	-	-	-	1
El Salvador	4	-	-	-	-	-	4
Honduras	1	2	2	-	-	1	6
Nicaragua	3	1	-	-	-	-	4
EUROPE	1	-	1	-	-	1	3
MIDDLE EAST	2	1	-	-	1	-	4
Middle East**	-	1	-	-	1	-	2
Iran	2	-	-	-	-	-	2
NORTH AMERICA	10	3	-	-	-	-	13
Mexico	5	1	-	-	-	-	6
United States	5	2	-	-	-	-	7
SOUTH AMERICA	2	1	-	-	-	1	4
South America**	-	-	-	-	-	1	1
Brazil	-	1	-	-	-	-	1
Colombia	1	-	-	-	-	-	1
Ecuador	1	-	-	-	-	-	1
UNKNOWN	7	5	1	1	-	2	16
TOTAL	453	69	16	6	10	34	588

*Onset of illness in the United States and Puerto Rico

**Country not specified

Figure 2 GEOGRAPHIC DISTRIBUTION OF MALARIA CASES WITH ONSET IN UNITED STATES, 1972

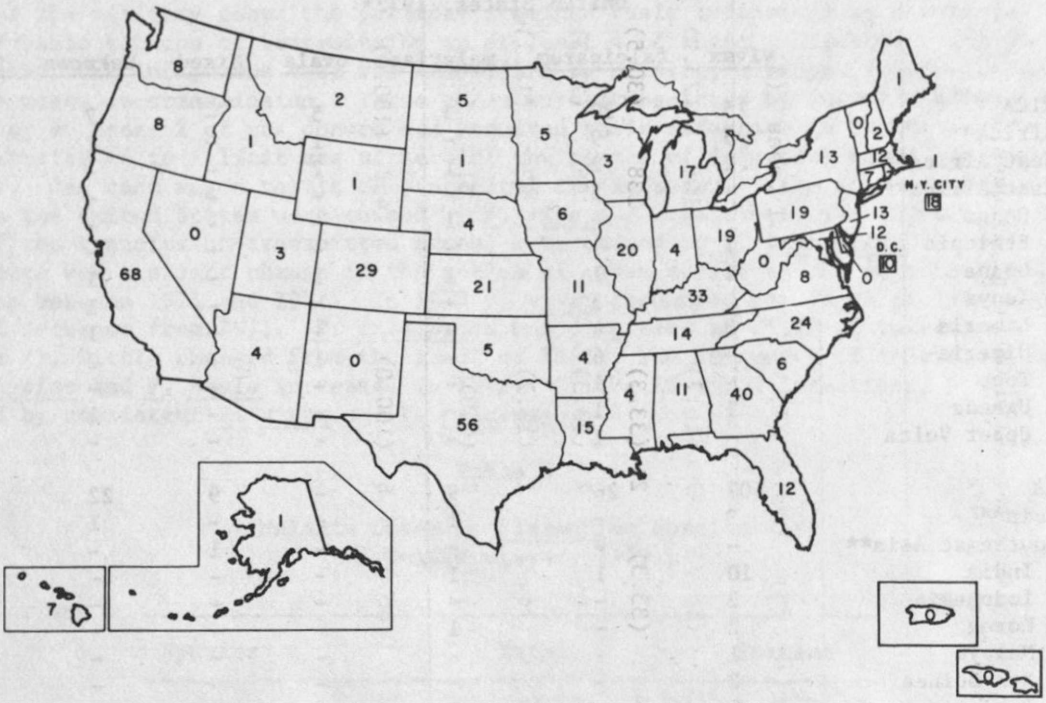


Fig. 3 MALARIA CASES BY MONTH OF ONSET, UNITED STATES, 1972

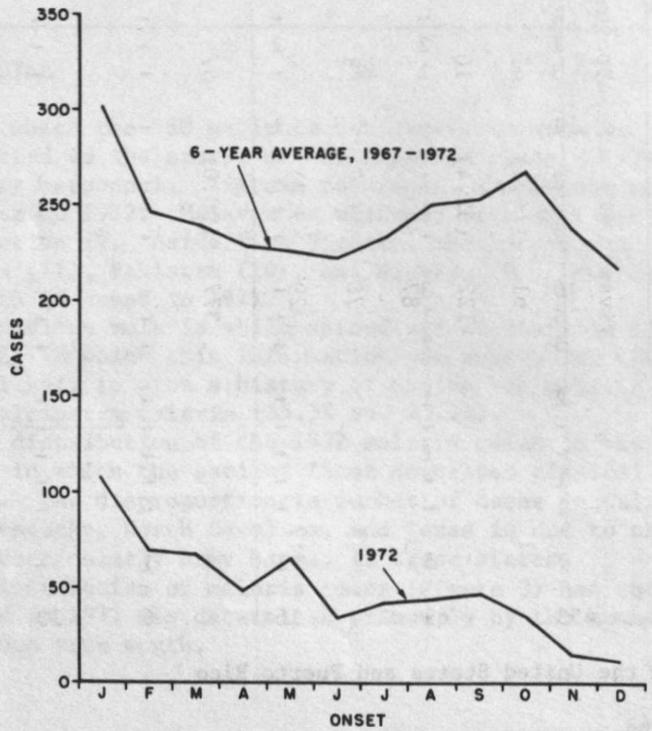


Table 4

Malaria Cases by Interval Between Date of Entry Into the United States and Onset of Illness, and by *Plasmodium* species, United States, 1972

Interval (in months)	*Plasmodium* species								All Cases	
	Vivax	(%)	Falciparum	(%)	Malariae	(%)	Ovale	(%)		
<1	61	(16.2)	41	(71.9)	2	(16.7)	1	(16.7)	105	(23.2)
1-2	122	(32.4)	10	(17.5)	4	(33.3)	2	(33.3)	138	(30.5)
3-5	87	(23.3)	5	(8.8)	2	(16.7)	2	(33.3)	96	(21.2)
6-11	78	(20.7)	1	(1.8)	2	(16.7)	1	(16.7)	82	(18.1)
≥12	29	(7.7)	0	(0.0)	2	(16.7)	0	(0.0)	31	(6.9)
TOTAL	377	(100.0)	57	(100.0)	12	(100.0)	6	(100.0)	452	(100.0)

As in previous years, clinical malaria developed within 30 days of arrival in the United States in 71.9% of P. falciparum and 16.2% of P. vivax infections for which both the exact date of arrival and the date of onset are known (Table 4). This fact is of particular importance because Vietnam veterans are commonly given 1 month's leave or are discharged from military service as soon as they return home. As a result, they are more likely to be seen by a civilian physician who is seldom as familiar with malaria as a military or Veterans Administration physician.

Within 6 months after returning to this country, 98.2% of patients with P. falciparum malaria and 71.6% of those with P. vivax malaria developed clinical symptoms. Only 29 patients with P. vivax malaria (7.7%) became ill more than 1 year after their last possible exposure to malaria abroad. The longest interval between entry into the United States and clinical illness in 1972 was 8 months for P. falciparum malaria and 32 months for P. vivax malaria.

Of the 588 cases reported in 1972, 48.6% of patients were initially treated in military hospitals,and 21.4% received care in a Veterans Administration hospital (Table 5). The Armed Forces and the Veterans Administration have made complete malaria reporting a major responsibility of their hospital staffs. Reporting by civilian physicians, on the other hand, is largely a matter of individual initiative, even though malaria is a reportable disease in every state. The above figures probably substantially underestimate the extent to which civilian physicians encounter cases of malaria.

Table 5

Malaria Cases by Type of Initial Hospital Admission
United States, 1972

Type of Hospital	Number of Patients	Percent
Military	286	48.6
Veterans Administration	126	21.4
Civilian	136	23.1
Public Health Service	12	2.0
Other	8	1.4
Not Specified	1	0.2
Not Hospitalized	19	3.2
TOTAL	588	100.0

One death occurred in the 69 cases of P. falciparum malaria reported in 1972, for a case fatality ratio of 1.4%. The mean fatality rate for P. falciparum malaria for the 10-year period 1963 to 1972 was also 1.4%. This case is discussed in detail in Section VII.

Intravascular hemolysis was the most frequent complication of P. falciparum malaria (9 cases) reported in patients for whom information on complications was recorded. Cerebral malaria occurred in 4 cases and renal failure in 2 cases. However, the true incidence of these complications is not known because the reporting of the clinical course of non-fatal cases is far less complete than for the fatalities.

IV. MILITARY MALARIA IMPORTED FROM VIETNAM

Four hundred and forty-two military cases of malaria were reported for 1972, and 428 of these (96.8%) were imported from Vietnam (Table 6). This represents a 85.4% decrease from the 2,932 military cases imported from Vietnam in 1971. P. vivax was the etiological agent in 372 of the Vietnam military cases (86.9%), P. falciparum in

23 cases (5.4%), and P. malariae in 5 cases (1.2%). Mixed plasmodium infections occurred in 9 cases (2.1%), and the plasmodium species could not be identified in 19 cases (4.4%). This decreased frequency of P. falciparum infections compared with 1971 (10.5%) may be related to decreased combat exposure of U.S. troops in the later months of 1972.

Army personnel acconted for 87.4% of the military malaria cases from Vietnam, and Marines accounted for 3.5%. Navy and Air Force personnel rarely contracted the disease (Table 6). Only among Air Force returnees was there no decrease in imported malaria cases between 1971 and 1972. There were 374 Army cases among 113, 367 returnees (3) in 1972 for an attack rate of 33 per 10,000 returnees which is significantly lower than the rate of 108 per 10,000 for 1971. Terminal chemoprophylaxis for malaria was changed at the end of 1971 from the 8-week chloroquine-primaquine regimen to a single 600 mg. (base) dose of chloroquine and 14-day course of 15 mg. (base) primaquine; greater effectiveness of this regimen may explain part of the decrease in the relapse rate.

Table 6

Malaria Cases in Military Returnees from Vietnam, by Branch of Service, United States, 1972

Branch of Service	Number of Cases	Percent of Cases
Army	374	87.4
Marines	15	3.5
Navy	5	1.2
Air Force	4	0.9
Unknown	30	7.0
TOTAL	428	100.0

The relapse rates in patients with P. vivax malaria imported from Vietnam in the years 1966 to 1972 are given in Table 7. Since relapse of P. vivax infections is unusual after 3 years, 1966-1969 figures may now be presumed to be complete, whereas there may be additions to the figures for 1970-1972. The relapse rate declined from 1966 to 1969 (probably because of the more thorough use of primaquine in military hospitals) but increased slightly in 1970.

Table 7

Relapse Rates of Military Cases of Vivax Malaria Imported from Vietnam, United States, 1966-1972

Year	Number of Primary Attacks	Percent of Patients with Relapses				
		First	Second	Third	Fourth	Fifth
1966	350	29.4	8.6	1.4	0.0	0.0
1967	2198	18.5	3.4	0.8	0.1	0.0
1968	2062	7.9	0.9	0.2	0.1	0.0
1969	3091	7.1	0.6	0.1	0.0	0.0
1970	3310	8.5	1.0	0.2	0.0	0.0
1971	2460	5.4	0.8	0.2	0.0	0.0
1972	372	2.7	0.3	0.2	0.0	0.0

The recrudescence rate in P. falciparum cases imported from Vietnam was 0.0% in 1972 (0 of 23 infections) compared with 2.2% in 1971, 4.4% in 1970, and 1.8% in 1969.

V. CIVILIAN MALARIA IMPORTED FROM ABROAD

In contrast to the striking decrease in military cases of malaria, the number of imported civilian cases has remained relatively constant for the past 9 years. The age and sex distribution of the 146 civilian cases is presented in Table 8, and as in previous years shows a predominance in males and in the 20-29 year-old age group. United States citizens accounted for 92 of the 139 imported civilian cases of malaria (Table 9). College students and teachers constituted the largest occupational group among U.S. citizens and foreign visitors. Merchant seamen, who contributed the largest number of imported civilian cases in the early 1960's (41.0% in 1963), made up only 5.8% in 1972.

Table 8

Civilian Malaria Cases, by Age and Sex,
United States, 1972

Age Group	Male	Female	Total	Percent
0-9	7	3	10	6.8
10-19	17	5	22	15.1
20-29	40	15	55	37.7
30-39	21	9	30	20.5
40-49	10	4	14	9.6
50-59	2	1	3	2.0
60-69	7	1	8	5.5
70+	0	0	0	0.0
Unknown	3	1	4	2.7
TOTAL	107	39	146	100.0

Table 9

Imported Civilian Malaria Cases, by Occupation and Nationality,
United States, 1972

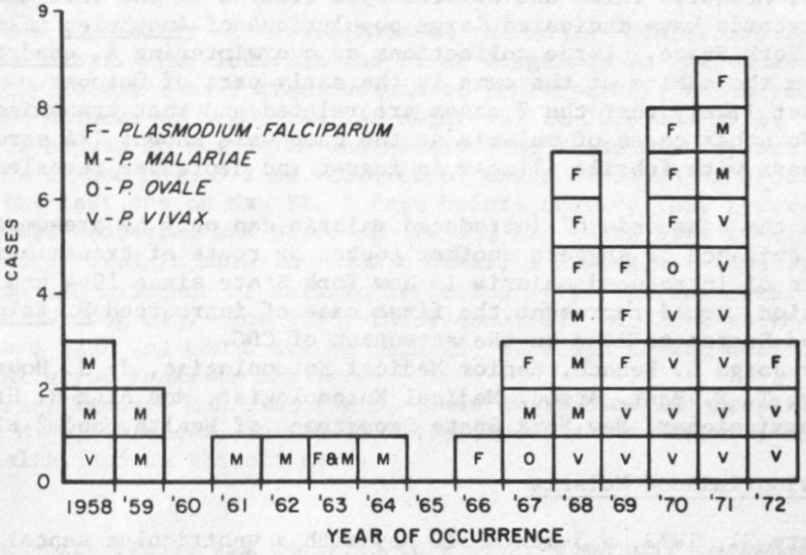
Occupation	U.S. Citizen	Foreign Visitor	Total	Percent
Tourist	17	2	19	13.4
Businessman	13	8	21	14.8
Government representative	5	1	6	4.2
Missionary	7	1	8	5.6
Peace Corps	5	0	5	3.5
Seaman	1	7	8	5.6
College Student or Teacher	26	11	37	26.1
Other	10	10	20	14.1
Unknown	8	7	15	10.8
TOTAL	92	47	139	100.0

VI. MALARIA ACQUIRED IN THE UNITED STATES

Seven persons acquired malaria infections within the United States, the smallest number for any year since 1969. Much of the decrease was due to the great reduction in needle-induced malaria (2 in 1972 vs. 46 in 1971, and 6 in 1970), and to the decrease in transfusion-induced malaria (3 in 1972 vs. 9 in 1971 and 8 in 1970) (Figure 4). This is almost certainly related to the great decrease in 1972 in the number of Vietnam returnees, who have been the principal source of infection in blood transfusion and needle-induced malaria in recent years.

Two cases in 1972 were induced by sharing of syringes and needles among heroin users, 3 were induced by blood transfusion (at least 2 units originating from Vietnam returnee donors), 1 was congenital, and 1 was classified as cryptic although it probably was introduced. There were no laboratory-accident induced cases in 1972.

Figure 4 TRANSFUSION MALARIA CASES, UNITED STATES, 1958-1972



A. Cryptic Malaria

Case 1

On August 27, 1972, a 22-year-old Yugoslavian man noted acute onset of headache and fever 1 day after leaving his summer job as counselor at a summer camp for children in southeastern New York State. The next day he went to a hospital in New York City where a temperature of 104° F. was documented, and he was treated with oral penicillin. A blood smear for malaria was read as negative and his fever resolved. On August 30, fever recurred and tetracycline was added. He remained febrile and traveled to Connecticut and on September 1 his temperature spiked to 105° F. A monospot test was negative; WBC was 6,000. He was treated with aspirin and ampicillin and became afebrile. He next traveled to California where his headache continued. On approximately September 12 another febrile episode occurred, and he was treated with penicillin. He traveled through Arizona, and upon reaching Santa Fe, New Mexico, he went to a physician complaining of chills and confusion; he was admitted to a hospital. Physical examination on admission revealed a temperature of 103° F., BP 90/64, and pulse 110, but no hepatosplenomegaly or adenopathy. The hematocrit was 41% with WBC 6,900 (35% polys). On the second hospital day a blood smear showed

P. falciparum parasites, and therapy with quinine, pyrimethamine, and sulfadiazine was started. He was afebrile within 24 hours and asymptomatic within 1 week.

Numerous interviews with the patient and his friends failed to reveal any suggestion of illicit parenteral drug exposure. He came to the United States on June 24, from Yugoslavia. There is no history of travel to a malarious area. He remained on his job as counselor from June 26 to August 26 except for a brief vacation in New Hampshire in late July. The camp enrolled approximately 300 campers in 2 sessions and had 36 counselors, 12 of which were international visitors. Epidemiologic investigations at the camp revealed that another counselor, a 24-year-old man from the Ivory Coast, had reported to the infirmary on July 7, 1972, complaining of headache, chills, and abdominal pain. His liver was palpable and the diagnosis of malaria was suspected but not confirmed. He recovered the following day. Although a record of a physical examination in the Ivory Coast prior to entering the United States did not mention malaria, he must have been aware of his having had malaria as he mentioned it to the infirmary physician, and later he casually described his illness in a letter as a relapse of his known malaria.

Populations of mosquitoes at the camp were consistently high throughout the month of July. On the same day the possible source case had his relapse, numerous campers complained of mosquito bites and several were treated in the infirmary. Previous light trap records have indicated large populations of Anopheles mosquitoes in that area of New York State. Large collections of overwintering A. quadrimaculatus were gathered from the cabins at the camp in the early part of October.

It is most likely that the 2 cases are related and that transmission occurred via mosquito. No other cases of malaria at the camp were known; IFA serology done on several campers with febrile illness in August and September revealed no positive titers.

Although the diagnosis of introduced malaria can only be presumptive in this case, there is no evidence to suggest another source or route of transmission. There have been no cases of introduced malaria in New York State since 1944 and this, if it is an introduction, would represent the first case of introduced P. falciparum malaria in the United States to come to the attention of CDC.

(Reported by Jorge L. Benach, Senior Medical Entomologist, J. J. Howard, Medical Entomologist, T. F. Bast, Assoc. Medical Entomologist, and Alan R. Hinman, M.D., Assistant Commissioner, New York State Department of Health, and 2 EIS officers.)

B. Transfusion-Induced Malaria

Case 2

On January 31, 1972, a 5-month-old boy with a ventricular septal defect and severe pulmonic stenosis underwent corrective cardiac surgery. During and after surgery he received several transfusions from a single unit of 3-day old blood. The postoperative course was uneventful, and the patient was discharged afebrile. On the 16th postoperative day he began to have spiking fever, and was readmitted 2 days later.

At readmission he was in moderate respiratory distress without hepatosplenomegaly, and was not icteric. On the sixth hospital day (24th postoperative) a firm, smooth spleen was felt 5 cm. below the left costal margin. Hemoglobin had fallen to 8.1 gm%. Daily fevers to 41° C. continued, and on the sixth hospital day P. vivax parasites were seen in the peripheral blood. Treatment with chloroquine (10 mg/kg initially, then 5 mg/kg at 6, 24 and 48 hours) resulted in resolution of fever within 24 hours.

Investigation of the origin of the unit of blood used at surgery revealed that it came from a donor who had served in Vietnam in 1969, and who had had at least 1 relapse of malaria since returning to the United States. Since he had previously been rejected by a blood bank for that reason, he deliberately denied his malaria history because he wanted the money.

(Reported by Ruth Seeler, M.D., Robert A. Miller, M.D., Cheng-Horng Lin, M.D., and Sun-Kuang Lin, M.D., Department of Pediatrics, Abraham Lincoln School of Medicine, University of Illinois.)

Case 3

On June 1, 1972, a 24-year-old white man with acute myelogenous leukemia in remission noted the onset of chills and fever and presented himself to the New York City hospital where he was being followed. He had been discharged from the hospital 1 day before in remission. He had been afebrile for 4 days before discharge and had 5% blast forms in his peripheral smear. He was readmitted to the hospital and treated with oxacillin and gentamycin after appropriate cultures had been taken. No response to antibiotics was seen, and after several days it was noted that his fever curve had assumed a classic tertian pattern. A peripheral blood smear examined on June 12 revealed P. vivax.

The patient was treated with chloroquine (2.5 gm. p.o. over 3 days) and rapidly became afebrile. Primaquine phosphate (15 mg base daily for 14 days) was begun on June 16, but on June 18 the patient was noted to be febrile again, and continued to experience daily fevers as high as 103° F. Alkaline phosphatase, SGOT and 5' nucleotidase were all noted to have significantly increased. On June 21 primaquine was discontinued. He improved rapidly and remained afebrile after June 22. Indirect fluorescent antibody tests of serum drawn on March 1 and April 4 were negative for malaria, but sera drawn on June 5 and on June 20 were positive at a titer of 1:256 for P. vivax.

The patient had no history of travel outside the United States and was not known to use intravenous drugs. His leukemia was first diagnosed in the summer of 1970, and he had subsequently received many transfusions of erythrocytes, leukocytes, and platelets. He had attacks of hepatitis (AA negative) in 1970 and 1971. From March 1971 to March 1972 he was in remission and received no transfusions, but during a relapse between March and May 1972 he received 67 units of blood or blood components from 63 donors, the last one on May 28, 4 days before onset of his fever. Sixty-two of these donors were contacted and blood smears and IFA tests were done. Four had histories of recent travel in malaria-endemic areas, 3 having returned from Vietnam recently, but none had evidence of malaria infection by peripheral smear and serology, and none admitted IV drug use. The sixty-third donor did not live at the address he had given the blood bank and could not be located, although he was well known to several commercial blood banks in New York.

(Reported by Michael Tapper, M.D., Resident, James-Ewing Memorial Hospital, New York; Pascal Imperato, M.D., Director, Bureau of Infectious Disease Control, New York City Department of Health, and an EIS officer.)

Case 4

A 46-year-old white female was admitted to a small community hospital in rural Georgia on August 2, 1972, with a bleeding ulcer. Between August 2 and August 8 she received 9 units of blood, all donated by local residents. Recovery appeared normal and the patient was dismissed from the hospital on August 8.

The patient returned to her physician on August 18, 1972, with complaints of fever, chills, and nausea. She was readmitted to the hospital and a blood smear taken; a diagnosis of P. falciparum malaria infection was made. The patient had an extremely heavy parasitemia and was transferred to a general hospital in a nearby county for treatment.

The parasite was resistant to chloroquine and the physician in charge contacted the Veterans Administration Hospital, Atlanta, for their recommended therapy. The treatment advised was pyrimethamine, 25 mg BID for 3 days, quinine, 650 mg TID for 14 days, and sulfadiazine, 500 mg QID for 7 days. With this regimen recovery was uneventful.

The 9 donors in question were interviewed and blood smears from each were examined; all smears were negative. All were in good health with no history of any illness within the past year. Two of the donors were ex-servicemen. One had served in Vietnam and the other at a naval institution in Turkey. Specimens for malaria IFA tests were also taken at the time of interview. The serum of the ex-serviceman who had served in Turkey was negative while the serum of the Vietnam veteran was positive

for P. falciparum with a titer of 1:4096. This titer is consistent with a recent P. falciparum infection and indicates that the Vietnam veteran was the probable source of the infection.
(Reported by Thomas N. Lumsden, M.D., and James A. Butts, M.D., private physicians; Conrad Routh and Ellen Daugherty, Parasitology Laboratory, and John E. McCroan, Ph.D., T. W. McKinley, and J. D. Smith, Epidemiology Unit, Division of Physical Health, Georgia Department of Human Resources, Atlanta, Georgia.)

C. Needle-Induced Malaria
Cases 5 and 6

On January 1, 1972, a 19-year-old boy was admitted to a hospital in Los Angeles, California, with a 1-day history of fever and chills. A peripheral blood smear revealed infection with P. vivax. He was treated with 2.5 grams of chloroquine phosphate and discharged on January 6.

The patient admitted to using heroin and named 7 persons with whom he had shared injection equipment in the previous 30 days. One of these persons was a 21-year-old Vietnam veteran who had returned from Southeast Asia on October 27, 1971. He had been well in Vietnam but did not take his antimalarial medication after returning home. This man became ill with P. vivax malaria in December 1971. He was admitted to a hospital in Los Angeles, treated with chloroquine and primaquine, and released. He named 8 persons with whom he had shared injection equipment.

On January 5, 1972, a 21-year-old woman was admitted to the same hospital as the first patient with a temperature of 106° F. and a 2-day history of shaking chills, headache, and fever. She was found to have P. vivax malaria on peripheral smear. She admitted using intravenous drugs and was a contact of the above 2 cases.

The 3 patients and 9 of their contacts were interviewed. Eleven of them were between 18 and 22 years of age; 1 was 31 years old. Only the veteran had been in Southeast Asia. Four of the contacts had been in Mexico in the past year, and the female patient had been in Panama at the age of 9. She and the veteran said they injected heroin approximately 4 times a week. The other patient stated that he took heroin approximately once a week. The contacts admitted to between 1 and 5 injections per week. Most of them had last shared equipment with each other on New Year's Eve.

Thick and thin blood smears were obtained from all contacts; serologic specimens were obtained from the contacts and 2 of the patients. Both patients had positive indirect fluorescent antibody (IFA) titers of 1:256 to P. vivax; of the 9 contacts, 1 had a positive IFA titer of 1:16. All of the contacts and the veteran were treated with 2.5 grams of chloroquine phosphate. The contacts were cautioned not to share injection equipment.
(Reported by Allen W. Mathies, M.D., head physician, Pediatrics-Communicable Disease, Joshua H. Ritchie, M.D., Chief Resident, Communicable Disease Service, Los Angeles County-University of Southern California Medical Center; Robert A. Murray, Epidemiology Analyst, Ichiro Kamei, M.D., Chief, Acute Communicable Diseases Control Division, G. A. Heidbreder, M.D., Health Officer, County of Los Angeles Health Department; and an EIS officer.)

D. Probable Congenital Malaria
Case 7

On May 22, 1972, a 3-week-old white boy became ill with slide-proven P. vivax malaria, and was treated with chloroquine (25 mg. stat and at 6, 24 and 48 hours); he made a rapid recovery. He was born in Puerto Rico and was brought soon thereafter to the United States, without travel through a malaria-endemic area. His mother had been ill with malaria before delivery. She had traveled recently to Africa and South America. No other epidemiologic details of the case were available.
(Reported by Leonard Newman, M.D., James Ewing-Metropolitan Hospital, New York, N.Y., and Pascal Imperato, M.D., Director, Bureau of Infectious Disease Control, New York City Department of Health.)

VII. MALARIA DEATHS IN THE UNITED STATES

Case 1

On July 12, 1972, an Irish seaman on board a British-flag merchant ship first experienced symptoms of headache, nausea, vomiting, and diarrhea. His symptoms progressed over the next 3 days, and the patient began having attacks of chills and fever while the headache grew worse. He was given symptomatic treatment by the chief steward. The ship docked on Saturday, July 15, and on Monday, the 17th, the patient entered a physician's office with a temperature of 104° F. Chest X-ray showed slight infiltrates at the lung bases, and the physician's initial diagnosis was "pneumonia." He was hospitalized in a private hospital where he rapidly developed oliguria, tachycardia, and tachypnea; he became stuporous and then comatose. He had moderately elevated BUN and bilirubin by his second day of hospitalization. He had no focal neurologic signs or seizures. The patient showed a few petechiae but no other signs and no other signs of bleeding disorder. Peripheral smear on July 18 revealed P. falciparum, and the patient received 1 dose of oral chloroquine phosphate, 500 mg. p.o. On Wednesday, July 19, the patient was cyanotic, semi-comatose, and had fever to 105° F. He died at 9:00 p.m. on July 19. Review of the peripheral blood smears by the hospital pathologist revealed ring trophozoite parasitization of 5 to 10% of all erythrocytes.

Between May 22, 1972, and July 4, 1972, the ship had touched at 17 ports on the West African coast and then proceeded to the East Coast of the United States. The seaman had gone ashore at several of these ports, but had last gone into the "bush" during the stopover at Abidjan, Ivory Coast, on June 28. Proguanil prophylaxis was available on the crew's mess tables, but it is not known if the seaman took it regularly or not.

Peripheral smears from all other crewmen on the ship were examined for malaria, and no parasites were found. The presenting symptoms of falciparum malaria were discussed with the ship's master, and a supply of chloroquine was left on board. (Reported by John Stafford, M.D., State Epidemiologist, Maryland State Department of Health, Sheldon Glusman, M.D., Chief of Pathology, Baltimore PHS Hospital, Baltimore, Md., and an EIS officer.)

VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY - 1972

The presence of plasmodium species or agreement that there were no parasites present was confirmed in blood films from 251 of the 295 cases submitted in 1972 to the National Malaria Repository. Malaria organisms were not found in blood films from 42 persons submitted as having parasites present (14.2%). Two specimens were submitted as negative, but parasites were found at CDC (0.7%). It should be noted that in 14 cases (4.7%) the National Malaria Repository determined that a different species was present than that identified by the laboratory that made the first diagnosis.

Tables illustrating the origin (Table 10) and species diagnosis (Table 11) of malaria smears examined by the Repository are shown below. Totals for the calendar year 1971 are included for comparison.

Table 10

Institutions Submitting Positive Slides for Malaria to the National Malaria Repository, 1971-1972

	ORIGIN							
	Army	Navy	VA Hosp.	Air Force	Health Dept. (State, County, City)	PHS Hosp.	Other Hospitals, Clinics, Physicians etc.	Cumulative
Cumulative total positive 1972	25	2	51	14	35	5	67	199
Cumulative total positive 1971	131	28	422	58	91	46	96	872

Table 11

Species of Malaria Identified by National Malaria Repository, 1971 and 1972

Species	Cumulative Total 1972	Cumulative Total 1971
P. vivax	149	737
P. falciparum	39	109
P. malariae	-	8
P. ovale	7	7
Plasmodium sp.	4	10
Negative	96	395
Unsatisfactory	-	1
Total examined	295	1,267
Cumulative positive	199	872

IX. MALARIA IN MERCHANT SEAMEN - 1963-1972

Shipboard malaria diagnosed in the United States has not been specifically reviewed since 1963, when an epidemic of *P. falciparum* malaria on a merchant vessel returning from West Africa to the United States was reported. However, it has been suspected that merchant seamen are at higher risk of contracting malaria and of dying from it than are most other occupational groups. It has been the policy at CDC to investigate promptly suspected malaria on any merchant ship returning to the United States with a view to identifying cases in crewmen of the vessel before their infections become life-threatening. The 1 known malaria death in 1972 (Case #1) was in a European crewman of a ship returning from Freetown, Sierra Leone. An investigation revealed no additional cases on this ship; however, a simultaneous investigation of another case on a Greek tanker returning from Liberia revealed an additional case

in a second crewman. The etiologies of these 3 illnesses had not been suspected at sea. No antimalarials were available on board the tanker, and the captain was not aware that Liberia had holoendemic malaria.

Eight cases of malaria in seamen were reported to CDC for 1972. We know malaria is under-reported in civilians and suspect that this is also true in merchant seamen. An unofficial but accurate count showed that at least 12 cases of malaria occurred (9 P. falciparum) on 8 merchant ships during the last 6 months of 1972 alone. Consequently, we measured the sensitivity of the reporting system for malaria in merchant seamen.

A search of inpatient records in the 8 U.S. Public Health Service hospitals was undertaken. One of the responsibilities of the USPHS hospitals is to treat merchant seamen, and for many years they were the only available source of medical care for this group. In recent years contract private physicians have been made available by some shipping companies, but a substantial part of American and foreign seamen still go to the USPHS hospitals.

For the period July 1964 through June 1971, 100 cases were retrieved from USPHS Central Records in Washington, D.C. Sixty-seven of these, from 1966 to 1972, could be checked against CDC's reported cases, and 28 of the 67 (42%) PHS hospital cases had not been reported through the CDC surveillance system. By making the assumption that this reporting discrepancy prevailed in 1964 and 1965, an additional 8 seaman cases were extrapolated for those years and included in this analysis.

In Table 12, the 194 CDC cases for the period 1963-1972 and 36 additional cases from the hospital record-search are tabulated. Because outpatient records were not coded and consequently could not be reviewed, and because some seamen go to private contract physicians for care, this is still not a complete case-count for the 10-year period.

Table 12

Malaria Cases in Merchant Seamen
1963-1972

Year	CDC Surveillance	Additional Cases PHS Hospitals	Total
1963	35	-	35
1964	35	4*	39
1965	15	4*	19
1966	28	7	35
1967	21	4	25
1968	16	5	21
1969	14	2	16
1970	13	4	17
1971	9	6	15
1972	8	-	8
TOTAL	194	36	230

*Extrapolated cases

The annual incidence of malaria in seamen, as a percentage of all seamen returning annually from areas of the world from which the United States requires quarantine inspections, has been decreasing steadily since 1963 (Figure 5). Although the denominator used does not measure exactly the number at risk of contracting malaria, this appears nonetheless to be a true decrease and is not easily explained. However, it was possible to gather specific denominator data on the number of seamen annually

re-entering the United States from North, West, and South Africa. Africa is a high-risk area for merchant seamen (Table 13). For the 18 months from January 1971 to June 1972 the risk of developing malaria (all species) for seamen visiting ports in these areas was 0.75 per 1,000 for Americans, and 0.74 per 1,000 for foreign seamen.

An analysis of malaria cases in seaman by area of acquisition and species from 1966 to 1972 (Table 13) shows that the majority of malaria infections acquired in Africa were caused by P. falciparum, and in Asia, Central and South America the most common species was P. vivax.

Fig. 5 MALARIA MORBIDITY IN MERCHANT SEAMEN, 1963 - 1972

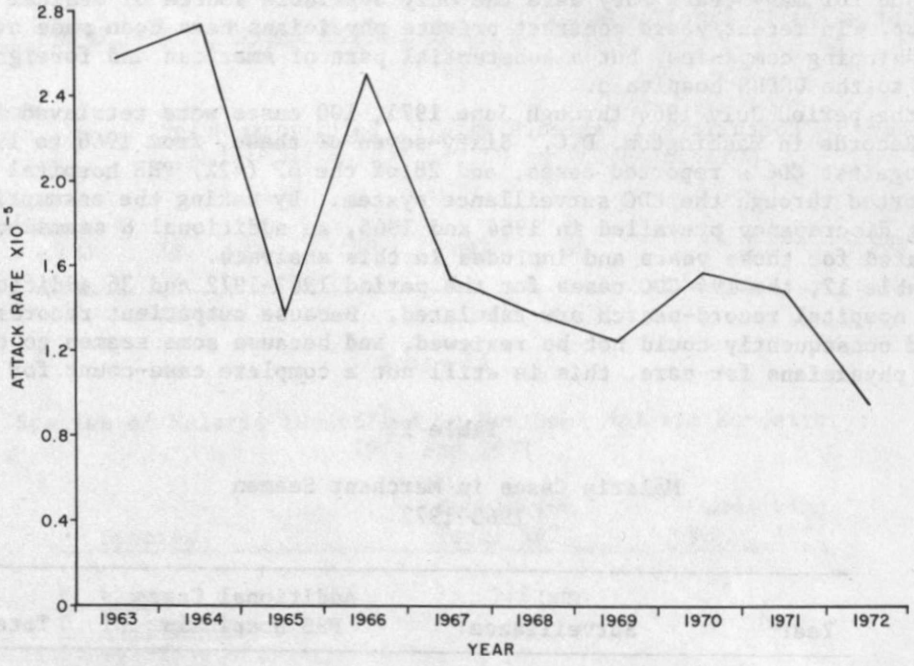


Table 13

Malaria in Seamen by Area of Acquisition and
P. falciparum Species
1966-1972

	P. falciparum	Other Species	Total
Africa			
West Africa	44	6	50
Other	15	4	19
Asia	10	28	38
Central and South America	2	10	12
Unknown	-	-	16
TOTAL	(71)	(48)	135

These data suggest that the relative risk of life-threatening malaria infection might be greatest in seamen returning from Africa. Confirmation of this hypothesis was made by examination of malaria deaths. For the 10-year period from 1963-1972, 9 of the 10 deaths reported were in seamen of foreign nationality, all 10 were caused by P. falciparum infection, and all 10 had acquired their infection in West or North Africa. A comparison of malaria mortality for that period (all species) for military personnel diagnosed in the United States, for all civilians and for merchant seamen, revealed that the seamen had the highest death rate, 43.5 per 1,000 cases. The rate for all other civilians was 16.4 per 1,000, significantly different ($p < 0.05$), and the rate in military personnel smaller still (0.8 per 1,000). When mortality rate for P. falciparum cases alone was analyzed, (Table 14) seamen still had an apparently higher mortality than other civilians although the difference was not statistically significant.

Table 14

Mortality in Patients with P. falciparum Malaria Diagnosed in the United States by Status, 1966-1972

	Military	Civilians Exclusive of Merchant Seamen	Merchant Seamen
P. falciparum malaria	2,298	168	71
Deaths	12	12	6
Case-fatality rate per thousand	5.2	71.4	84.5

The explanation for the significantly higher malaria mortality among civilians than among military personnel is probably related to greater delay between presentation and diagnosis in civilian facilities than in military, and to inappropriateness of specific chemotherapy after diagnosis. These conditions are seen more frequently in seamen than in most other civilians; seamen often are seen by a physician only late in their illness or not at all. Seamen may be comparable to civilians who refuse medical care of any kind for their malaria, for whom the mortality in 1963-72 was 240 per 1,000.

While the reason for the gradually decreasing attack rate for malaria in seamen arriving in the United States is not clear, the risk of death, especially from P. falciparum infection, is still higher for them than for other civilians and higher for foreign seamen than for American seamen. Malaria chemoprophylaxis is frequently not used on ships entering endemic areas.

X. ACKNOWLEDGMENT

The Malaria Surveillance Report, prepared annually at the Center for Disease Control, is based on information provided in individual reports. The excellent support given to malaria surveillance by State and local health departments and personnel of the Preventive Medicine Services of the U.S. Army, Navy, and Air Force is greatly appreciated.

Thorough and comprehensive evaluation of all cases of malaria reported in the United States constitutes the most effective approach to preventing reestablishment of malaria transmission subsequent to importation.

All cases of malaria, whether first attacks or relapses, regardless of where they are acquired, should be promptly reported tó the appropriate health department. Clinical and epidemiological information on each case should be provided on the Malaria Case Surveillance Report Form 4.80 (CDC). Extra copies of this form are available on request. Every effort should be made to obtain pretreatment thick and thin blood films for each case. These films may be submitted with the Surveillance Form.

REFERENCES

1. World Health Organization: Terminology of Malaria and of Malaria Eradication. 1963, p 32

2. World Health Organization: Expert Committee on Malaria, 10th Report, Tech Rep Ser No. 272, p 34

3. Unpublished data. Office of the Surgeon General, Department of the Army, 1972

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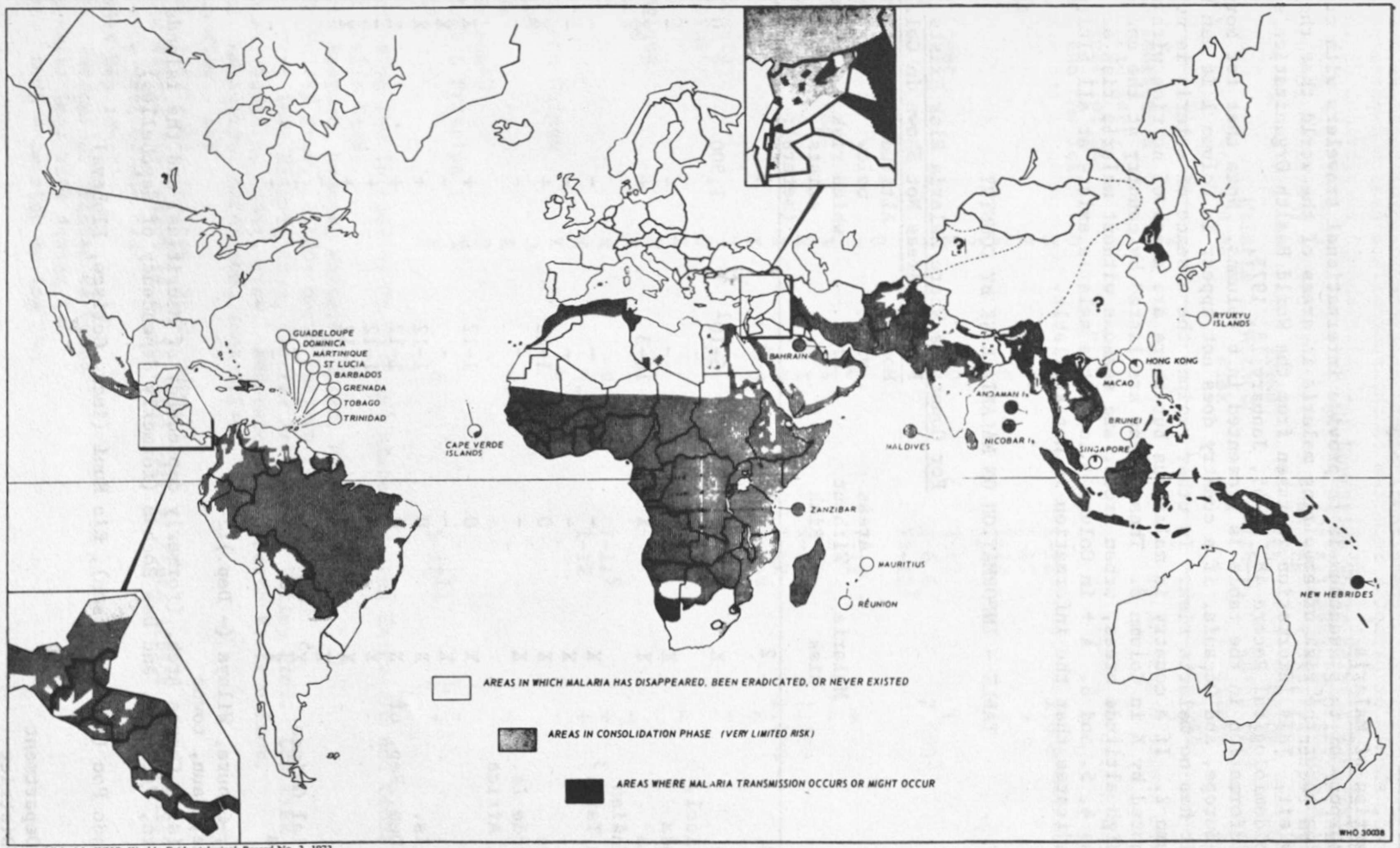


Map published in WHO *Weekly Epidemiological Record* No. 3, 1973

XI. ADDENDUM I

The Prevention of Malaria

The purpose of this addendum is to provide international travelers with current information about the risk of acquiring malaria in areas of the world that they intend to visit. This information is taken from the World Health Organization's Weekly Epidemiological Record 48, 25-45, January 19, 1973.

The information in the table is presented in 6 columns. Note that for North America, Europe, and Oceania, if a country does not appear in Column 1 it can be assumed it has no malaria risk. In other regions the absence of malaria is noted by 0 in Column 2. If a country is malarious but there are areas of no risk within it this is noted by X in Column 3. These areas are listed by country at the end of the table. High altitude areas, urban areas, and seasons without malaria risk are shown in Columns 4, 5, and 6. A + in Column 5 indicates malaria exists at all altitudes. A dash indicates that the information is not available.

TABLE - INFORMATION ON MALARIA RISK BY COUNTRY

			For Countries Where Malaria Risk Exists		
			For All Areas Not Shown in Col. 3		
Country	Malaria Risk	Areas Without Risk	Months with Risk	Altitude below which risk exists (meters):	Risk in Urban Areas
Col. 1	2	3	4	5	6
AFRICA					
Algeria	X	X	6-10[1]	1,500	0
Angola incl. Cabinda	X	-	-	-	-
Botswana	X	X	10-3	+	X[2]
Brit. Indian Ocean Terr.[3]	X	-	-	-	-
Burundi	X	-	-	-	-
Cameroon	X	0	1-12	+	X
Cape Verde Is.	X	-	-	-	-
Central Africa Rep.	X	0	1-12	+	X
Chad	X	-	-	-	X
Comoro Is.	X	0	1-12	+	X
Congo, Dem. Rep. of[4]	X	0	1-12	+	X
Congo	X	0	1-12	+	X
Dahomey	X	0	1-12	+	X
Egypt	X	-	-	-	-
Equatorial Guinea	X[5]	-	-	-	-
Ethiopia	X	-	-	-	-

1 Oasis, Saoura, Wilaya (= Dep.):2-8
2 Kasane, Maun, towns
3 Comprising Chagos Arch. (formerly dependency of Mauritius) and the islands of Aldabra, Farquhar, and Des Roches (formerly dependency of Seychelles)
4 Zaire
5 Fernando Poo (incl. Annobon), Rio Muni (incl. Corisco, Elobeys).

Dep. - Department
D. - District
S. - State

(Table continued next page)

TABLE (continued)

Country	For Countries Where Malaria Risk Exists	For All Areas Not Shown in Col. 3			
	Malaria Risk	Areas Without Risk	Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
French Southern & Antarctic Terr.[1]	0				
French Terr. of the Afars and the Issas	0				
Gabon	X	0	1-12	1,000	X
Gambia	X	0	1-12	+	X
Ghana	X	0	1-12	+	X
Guina	X	-	-		-
Ivory Coast	X	0	1-12	+	X
Kenya	X	0	4-6 & 11-12[2]	2,000[3]	X[4]
Lesotho	0				
Liberia	X	0	1-12	+	X
Lybian Arab. Rep.	X	X	-	-	-
Madagascar	X	X	9-3	1,100	X[5]
Malawi	X	0	1-12	1,700	X
Mali	X	0	1-12[6]	+	X
Mauritania	X	-	-	-	-
Mauritius[7]	0				
Morocco	X	-	-	-	-
Mozambique	X	-	-	-	-
Namibia[8]	X	-	-	-	-
Niger	X	0	7-11[9]	+	X
Nigeria	X	0	1-12	+	X
Portuguese Guinea	X	-	-	-	-
Reunion	0				
Rwanda	X	-	-	-	-
St. Helena[10]	0				
Sao Tome & Principe	X	-	-	-	-
Senegal	X	0	1-12[11]	+	X[12]

1 Comprising the islands of St Paul and Amsterdam, the Kerguelen and Crozet Arch. and Adelie Coast
2 North Eastern, Nyanza, Western, Coast, Prov.:1-12
3 Rift Valley Prov.: 2,500; North Eastern Prov.: 1,500
4 Risk very low: Nairobi Area, Central Prov., Rift Valley Prov. Low risk - Eastern, Nyanza, Western, Coast, Prov. Moderate risk - North Eastern Prov.
5 Excl. Ambositra, Antsirabe, Tananarive
6 Less risk - 4-6
7 Incl. Rodrigues, Agalega, St Brandon, Is.
8 Incl. Walvis Bay, which is an integral part of South Africa but administered as if it were part of Namibia
9 Agades Dep.:8-10
10 Incl. Ascension, Tristan da Cunha
11 Cap-Vert: less risk during 1-6
12 Dakar, town - no risk during 1-6

(Table continued next page)

TABLE (continued)

Country	Malaria Risk	Areas Without Risk	For Countries Where Malaria Risk Exists For All Areas Now Shown In Col. 3: Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Seychelles	0				
Sierra Leone	X	0	1-12	+	X
Somalia	X	0	1-12	+	X[1]
South Africa[2]	X	-	-	-	-
Southern Rhodesia	X	-	-	-	-
South West Africa[3]					
Spanish North Africa[4]					
Spanish Sahara[5]	0				
Sudan	X	X	-	-	-
Swaziland	X	X	-	-	-
Togo	X	0	1-12	+[6]	X
Tunisia	X	X	5-11[7]	+	0[8]
Uganda	X	X	1-12	1,800	X[9]
United Arab Rep[10]					
United Rep. of Tanzania					
Tanganyika	X	0	1-12	+	X
Zanzibar	X	-	-	-	-
Upper Volta	X	0	1-12[11]	+	X
Zaire	X	0	1-12	+	X
Zambia	X	0	11-5	+	X
AMERICA, NORTH -					
Malaria Risk Only in Countries Noted Below					
Brit. Honduras	X	0	1-12	500	X
Costa Rica	X	X	-	500	0
Dominican Rep.	X	X	1-12	500	0
El Salvador	X	0	1-12	800	0[12]
Guatemala	X	X	6-11[13]	1,000	0
Haiti	X	X	7-3	500	0

1 Mogadishu: very low risk
2 Walvis Bay, See Note 8 on previous page
3 Namibia
4 See Spain
5 Comprising the Northern Region (former Seguia el Hamra) and the Southern Region (former Rio de Oro)
6 Above 600 m. marked reduction of risk
7 Sfax Governorate
8 Gabes Governorate
9 Entebbe, Fort Portal, Jinja, Kampala, Mbale: 0
10 Egypt
11 Djibo, Oudalan, cercles: 6-12
12 Acajutla, la Libertad, la Union, Usulatan, Dep.: X
13 Alta Verapaz, Izabal, Dep.: 1-12

(Table continued on next page)

TABLE (continued

Country	Malaria Risk	Areas Without Risk	For Countries Where Malaria Risk Exists: For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters):	Risk in Urban Areas
Col. 1	2	3	4	5	6
Honduras	X	X	1-12[1]	1,000	0
Mexico	X	X	1-12[2]	1,500	0
Nicaragua	X	0	1-12	1,000	0
Panama[3]	X	X	1-12	1,000[4]	0[5]
Canal Zone -	0				
AMERICA, SOUTH					
Argentina	X	X	9-5	2,000	0
Bolivia	X	X	1-12	2,000	0
Brazil	X	X	1-12	900	0[6]
Brit. Antarctic Terr.[7]	0				
Chile	0				
Colombia	X	X	-	1,500[8]	0
Ecuador	X	X	1-12[9]	1,500[10]	0[11]
Falkland Is. (Malvinas)	0				
French Guiana	X	X	1-3[12]	-	X
Guyana	X	X	1-12	+	0
Paraguay	X	X	9-5[13]	+	X
Peru	X	X	1-12[14]	1,500	0
Surinam	X	X	1-12	+	X[15]

1 Copan, Intibuca, la Paz, Lempira, Olancho, Dep.:5-12
2 Higher risk during 6-11 in -: Campeche, Chiapas, Colima, Guerrero, Jalisco, Michoacan, Morelos, Nayarit, Oaxaca, Puebla, Quintana Roo, Sinaloa, Sonora, Tabasco, Veracruz, Yucatan
3 Excl. Canal Zone, shown separately hereunder
4 Colon, Darien, Panama, Prov.: +
5 Occasionally possible
6 Amazonas, Maranhao, Para, S. - ; Terr. Federales: X
7 Comprising the South Orkney Is., South Shetland Is. and Graham Land (former dependencies of Falkland Is. (Malvinas) south of 60° latitude) and the sector of Antarctic Continent between longitudes 20° W and 80° W
8 Boyaca, Norte de Santander, Santander, Dep.; Caqueta, Meta, Intendencias; Putumayo, Comisaria: 1,000 m
9 Canar, Loja, Prov.:12-7
10 Concerning Pichincha Prov. only
11 Concerning only the urban centres of - : Guayaquil (Guayas Prov.); Manta, Portoviejao (Manabi Prov.); Macas (Morona Prov.)
12 Main season with risk
13 Amambay, Cordillera, Itapua, Dep.: risk very low, and in small parts only
14 Piura Dep.:12-7
15 Albina, Moengo (Marowijne D.), Nickerie, Wageningen (Nickerie D.): O

(Table continued next page)

TABLE (continued)

Country	Malaria Risk	Areas Without Risk	For Countries Where Malaria Risk Exists: For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Uruguay	0				
Venezuela	X	X	1-12	600	0[1]
ASIA					
Afghanistan	X	-	-	-	-
Bahrain	X	-	-	-	-
Bangladesh	X	-	-	-	-
Bhutan	X	-	-	-	-
Brunei	0				
Burma	X	X	4-11	900	0[2]
Ceylon[3]					
China	-	-	-	-	-
Cyprus	0				
Hong Kong[4]	X	X	-	-	-
India[5]	X	X	3-10	1,600	X
Indonesia[6]	X	X	1-12	1,200	X[7]
West Irian[8]	X	0	1-12	1,200	X
Iran	X	-	-	-	-
Iraq	X	-	-	-	-
Israel	0				
Japan[9]	0				
Jordon	X	X	-	-	0
Khmer Rep.	X	X	1-12[10]	+	X[11]
Korea -					
Dem. People's Rep. of Korea	X	-	-	-	-
Rep. of Korea	X	X	5-10	+	0
Kuwait	0				
Laos	X	X	-	-	-
Lebanon	0				

1 Practically no risk
2 Generally no risk in most urban areas
3 Sri Lanka
4 Hong Kong I., Kowloon and the New (leased) Territories
5 Incl. Andaman, Nicobar, Laccadive, Minicoy and Amindivi Is.; excl. Sikkim shown separately; also incl. Jammu and Kashmir, the final status of which has not yet been determined
6 Excl. West Irian, shown separately hereunder
7 Outskirts only
8 Western part of island of New Guinea
9 Comprising Hokkaido, Honshu, Kyushu, Shikoku, the Amami Is., and the Tokara Arch.
10 Kg. Som, Kep-Bokor, Municipality:11-5
11 Kirivong Town (Takeo Prov.):0

(Table continued next page)

TABLE (continued)

Country	For Countries Where Malaria Risk Exists: Malaria Risk	Areas Without Risk	For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Macao[1]	0				
Malaysia					
East Malaysia					
Sabah	X	X	1-12	1,700	0
Sarawak	X	0	1-12	+	0
West Malaysia	X	X	1-12	1,700	0[2]
Maldives	X	X	1-12	+	0[3]
Mongolia	0				
Muscat and Oman[4]					
Nepal	X	X	6-11[5] 1-12[6]	1,200	X
Oman[7]	X	-	-	-	-
Pakistan[8]	X	0	3-10[9]	2,000	X
Palestine[10]					
Gaza Strip[11]	X	-	-	-	-
Philippines	X	X	1-12	600	0[12]
Portuguese Timor	X	0	1-12	+	X
Qatar	X	-	-	-	-
Ryukyu Is.[13]	0				
Saudi Arabia	X	X	1-12	-	X[14]
Sikkim	X	-	-	-	-
Singapore	X	X	1-12	+	0
Sri Lanka[15]	X	X	1-12	800	X
Syrian Arab Rep.	X	X	5-10	600	0

1 Comprising Macao City and islands of Taipa and Coloane
2 Small towns near foothills
3 There are no urban agglomerations in the malarious areas except the capital city.
4 Oman
5 In cultivated areas (below 250 m.) and in hill valleys (750-1,200 m.)
6 250-750 m.
7 Formerly Muscat and Oman
8 Excl. Jammu and Kashmir, the final status of which has not yet been determined
9 North-West-Frontier Prov., hilly areas of Baluchistan and Punjab Prov. - North-West-Frontier Prov.,:6-9
10 Former mandated territory administered by the United Kingdom until Armistice of 1949
11 Comprising that part of Palestine under Egyptian administration from the Armistice of 1949 until June 1967, when it was occupied by Israeli military forces
12 Practically no risk
13 Comprising those islands of the Ryukyu group south of 28° N, except the Amami Is.
14 Jeddah, Mecca, Medina, Qatif:0
15 Formerly Ceylon

(Table continued next page)

TABLE (continued)

Country	Malaria Risk	Areas Without Risk	For Countries Where Malaria Risk Exists: For All Areas Not Shown in Col. 3: Months with Risk	Altitude below which risk exists (meters)	Risk in Urban Areas
Col. 1	2	3	4	5	6
Thailand	X	X	1-12	+	0[1]
Trucial Oman[2]					
Turkey	X	X	7-10[3]	1,000	0
United Arab Emirates[4]	X	-	-	-	-
Vietnam					
Dem. Rep. of Vietnam	X	-	-	-	-
Rep. of Vietnam	X	X	5-12[5]	-	0[6]
Yemen	X	X	9-2	1,400	X
Yemen, Democratic	X	-	-	-	-
EUROPE					
Risk Only in Countries Noted Below					
Greece	X	X	6-11	+	0
OCEANIA					
Risk Only in Countries Noted Below					
British Solomon Is.[7]	X	0	1-12	400	X
New Guinea[8]					
New Hebrides	X	0	1-12	+	X[9]
Papua New Guinea[10]	X	0	1-12	-	X
UNION OF SOVIET SOCIALIST REPUBLICS					
Union of Soviet Socialist Rep.	X	-	-	-	-
Byelorussian Soviet Socialist Rep.	0				
Ukrainian Soviet Socialist Rep.	0				

1 In Bangkok and in most urban areas
2 United Arab Emirates
3 Edirne, Siirt, Prov.:7-9; Hakkari Prov.:8-10
4 Comprising 6 sheikhdoms of Abu Dhabi, Dubai, Sharjah, Ajman, Umal Qaiwayn and Fujairah
5 Binh-Long, Darlac, Kon-Tum, Lam-Dong, Phu-Bon, Phuoc-Long, Pleiku, Quang-Duc, Tuyen-Duc:1-12
6 Practically no risk
7 Comprising the Solomon Is. group (except Bougainville and Buka which are included with New Guinea below), Ontong Java, Rennell and Santa Cruz Is.
8 Papua New Guinea
9 Southern Division
10 New name for the Territory of Papua under Australian administration and for New Guinea, UN Trust Territory administered by Australia, adopted by UN General Assembly Resolution A/Res/286 (XXVI) on 20 December 1971

Areas of Countries Free of Malaria

Algeria - Oran Wilaya (= Dep.), Saida Wilaya; Frenda Daira (= Arrond.), Aflou Daira, (Tairet Wilaya); Ain Oussera Daira, Bou-Saada Daira, Djelfa Daira, (Titteri Wilaya); Mascara Daira, Mostaganem Daira, Tighennif Daira, (Mostaganem Wilaya).

Botswana - Ghanzi, Kgalagadi, Kweneng, Ngamiland,[1] Ngwaketse, Ngwato,[2] Tuli Block,[2] D.

Lybian Arab Rep. - Whole country, except 2 small foci in the southwest of the country

Madagascar - Andramasina, Antanifotsy, Arivonimamo, Imeririna-Fovoany, Manjakandriana, Pref.: Nossi-Be, Is.

Sudan - Northern Prov. (northern part)

Swaziland - Most of the country [3]

Tunisia - Beja, Bizerte, Jendouba, Kairouan, Kasserine, Le Kef, Nabeul, Sousse, Tunis, Governorates

Uganda - Kigezi D. (southern part)

Costa Rica - Ciudad San Jose (San Jose Prov.); Penas Blancas, Pasos Canoas (Carretera Interamericana)

Dominican Rep. - Most of the country, malaria risk exists only in - : Dajabon, Loma de Cabrera, Municipios (Dajabon Prov.); Pepillo Salcedo Mun. (Monte Cristi Prov.); Pedernales Mun. (Pedernales Prov.); Elias Pina, Hondo Valle, Banica, Pedro Santana, Mun. (Estrelleta Prov.)

Guatemala - Chimaltenango, el Progreso, Guatemala, Jalapa, Sacatepequez, Solola, Totonicapan, Dep.

Haiti - Sud-Ouest Dep.; part of -: Artibonite, Centre, Nord, Sud, Dep.

Honduras - Ocotopeque Dep.

Mexico - Aguascalientes, Baja California Norte, Baja California Sur, Chihuahua, Distrito Federal, Durango, Guanajuato, Hidalgo, Mexico, Nuevo Leon, Queretaro, San Luis Potosi, Tamaulipas, Tlaxcala, Zacatecas, States

Panama - Ciudad Panama, Ciudad Colon

Argentina - Most of the country, malaria risk exists only in - Oran, San Martin Dep. (Salta Prov.); Ledesma, San Pedro, Santa Barbara, Dep. (Jujuy Prov.).

Bolivia - la Paz, Cochabamba, Santa Crux, Oruro, Potosi, Sucre, Tarija, Trinidad, Dep.

Brazil - Alagoas, Distrito Federal, Guanabara, Paraiba, Pernambuco, Rio Grande do Norte, Rio Grande do Sul, Rio de Janeiro, Sergipe, States - Partially - Bahia, Ceara, Espirito Santo, Minas Gerais, Parana, Santa Catarina, Sao Paulo, States

Colombia - Bogota, Cundinamarca, Huila, Tolima, Dep., San Andres Is.

Ecuador - Azuay, Bolivar, Carchi, Chimborazo, Cotopaxi, Imbabura, Tungurahua, Arch. de Colon (Galapagos Is.), Zamora-Chinchipe, Prov.

French Guiana - Cayenne City

Guyana - East Berbice, West Berbice, East Demerara, West Demerara, Essequebo Is., Essequebo, Circles

Paraguay - Boqueron, Central, Concepcion, Misiones, Neembucu, Olimpo, Paraguari, Presidente Hayes, Dep.

Peru - Amazonas (excl. Bagua Prov.), Ancash, Apurimac, Arequipa, Ayacucho, Cajamarca (excl. Cutervo, Jaen. S. Ignacio, Prov.), Callao, Cuzco, Huancavelica, Huanuco, Ica, Junin (excl. Satipo Prov.), la Libertad, Lambayeque, Lima, Madre de Dios, Moquegua, Pasco, Piura (excl. Ayabaca, Huancabamba, Morropon, Prov.), Puno, Tacna, Tumbes, Dep.

Surinam - Commewijne, Coronie, Para, Paramaribo, D.

Venezuela - Anzoategui, Aragua, Carabobo, Cojedes, Falcon, Guarico, Lara, Miranda Monagas, Nueva Esparta, Portuguesa, Sucre, Trujillo, Yaracuy, States - ; Distrito Federal, Territorio Federal Delta-Amacuro

1 West of 22° E and south of 19° S

2 South of 23° S

3 Excl. some small areas near the border. Most of the notified cases are of non-local origin

Areas of Countries Free of Malaria

Burma - Rangoon Division

Hong Kong - Hong Kong I., Kowloon, New Kowloon

India - Andhra Pradesh S.: Anantapur, Chittoor, Cuddappah, E. Godavari, W. Godavari, Hyderabad, Karimganj, Khammam, Krishna, Kurnool, Mahbubnaga, Medak, Nalgonda, Nellore, Nizamabad, Warangal, D.
Bihar S.: Bhagalpur, Champaran, Darbhanga, Gaya, Monghyr, Muzaffarpur, Palamau, Patna, Purnea, Saharsa, Santal Parganas, Saran, Shahdol, D.
Chandigarh Union Terr.: Chandigarh D.
Coalfields: Dhanbad D.
Delhi, Terr.: Part of - : Delhi, Terr.
Goa Daman & Div., Terr.: Panaji D.
Haryana S.: Ambala, Jind, Karnal, D. Part of - : Gurgaon, Hissar, Rohtak, D.
Himachal Pradesh S.: Part of - : Dharamshala, Simla, D.
Jammu & Kashmir S.: Part of - : Doda, Jammu, Kathua, Punch, Udhampur, D.
Kerala S.: Alleppey, Cannanore, Ernakulam, Kottayam, Kozhikode, Palghat, Quilon, Trichur, Trivandrum, D.
Maharashtra S.: Akola, Amravati, Kilhapur, Ratnagiri, Wardha, D.
Part of - : Ahmednagar, Aurangabad, Bhandara, Bhir, Buldhana, Nagpur, Nasik, Osmanabad, Parbhani, Poona, Sangli, Satara, Sholapur, Yeotmal, D.
Mysore S.: Bangalore, Chikmagalur, Chitradurga, Coorg, Hassan, N. Kanara, S. Kanara, Kolar, Mandya, Tumkur, D.
Part of - : Belgaum, Bellary, Bijapur, Dharwar, Gulbarga, Mysore, Shimoga, D.
Orissa S.: Part of - : Balasore, Cuttack, Puri, D.
Punjab S.: Amritsar, Bhatinda, Gurdaspur, Hoshiarpur, Jullundur, Kapurthala, Ludhiana, Patiala, D.
Part of - : Ferozepur, Ropar, Sangrur, D.
Rajasthan S.: Jhundjhunu, Sikar D.
Part of - : Churu, Jaipur, Nagaur, Sawai Madhopur, D.
Tamil Nadu: N. Arcot, Chingleput, Coimbatore, Kanyakumari, Nilgiris, Thanjavur, Tiruchirapalli, Tirunelveli, D.
Part of - : South Arcot, Dharmapuri, Madras Corp., Madurai, Ramanathapuram, Salem D.
Uttar Pradesh S.: Agra, Aligarh, Azamgarh, Ballia, Bara-Banki, Budaun, Bulandshahr, Chamoli, Deoria, Etah, Etawah, Faizabad, Farrukhabad, Fatehpur, Ghazipur, Hardoi, Jalaun, Jaunpur, Kanpur, Lucknow, Mainpuri, Mathura, Pratapgarh, Rae Bareli, Sitapur, Sultanpur, Unnao, Varanasi, D.
Part of : Allahabad, Almora, Bahraich, Bareilly, Basti, Bijnor, Gonda, Gorakhpur, Meerut, Moradabad, Muzaffarnagar, Pauri, Rampur, Saharanpur, Shahjahanpur, D.

Indonesia - Djakarta-Raya, Surabaja, Regencies

Jordon - Whole country, with exception of Jordon Valley and Karak Lowlands where there is some risk, but, normally not visited by tourists

Khmer Rep. - Kandal, Preyveng, Svay-Rieng, Takeo (excl. Kirivong D.), Prov.: Phnom-Penh Municip.

Rep. of Korea - Cheju-Do, Cholla-Namdo, Cholla-Pukto, Chungchong-Namdo, Chungchong-Pukto, Kangwon-Do, Kyongsang-Namdo, Prov.; Seoul Special City

Laos - Vientiane

Sabah - Kota Kinabalu, Sandakan, Towns

West Malaysia - Kuala Lumpur, Cap.; Georgetown (Penang State); Malacca Municipality

Maldives - Male I. (Cap.), Male Atoll (Kaaf)

Nepal - Dhaulagiri Anchal (=Prov.), Karnali Anchal

Philippines - Greater Manila, Baguio City, Davao City, Zamboanga City; Bohol, Catanduanes, Cebu, Leyte, Masbate Negros (northern part), Panay Is. Albay, Sorsogon, Prov.; plain areas of - : Bulacan, Nueva Ecija, Pampanga, Pangasinan, Tarlac, Prov.; Luzon (west coast of northern part)

Areas of Countries Free of Malaria

Saudi Arabia - Alhasa, Arar, Jauf, Quraiya (Qurayyat), Riyad, Tabuk, Taif, and rural parts of Jeddah, Mecca, Medina, as well as areas on the pilgrimage road and pilgrimage areas

Singapore - City District (southern part of the island)

Sri Lanka - Galle, Kalutara; partially - : Colombo

Syrian Arab Rep. - Damascus, Deir-ez-Zor, Hama, al Hasakeh, Latakia, Sweida, Tartus, sub. D. (Latakia D.).

Thailand - An Thong, Maha Sarakham, Nakhon Pathom, Nonthaburi, Pathum Thani, Phichit, Phra Nakhon, Phra Nakhon Si Ayutthaya, Samut Prakan, Samut Sakhon, Samut Songkhram, Sing Buri, Thon Buri, Prov.
Part of - : Buri Ram, Chachoengao, Chai Nat, Chiang Mai, Chon Buri, Kalasin, Kanchanabur, Khon Kaen, Lamphun, Lop Buri, Nakhon Nayok, Nakhon Ratchasima, Nakhon Sawan, Nakhon Si Thammarat, Narathiwat, Nong Khai, Pattani, Phetchaburi, Phitanulok, Prachin Buri, Ratchaburi, Roi Et, Saraburi, Si Sa Ket, Songkhla, Sukothai, Suphan Buri, Surat Thani, Surin, Udon Thani, Ubon Ratchathani, Uthai Thani, Uttaradit, Prov.

Turkey - Whole country - (excl. Adiyaman, Edirne, Hakkari, Mardin, Siirt, Prov.)

Rep. of Vietnam - An-Giang, An-Xuyen, Ba-Xuyen, Chuong-Thien, Kien-Giang, Kien-Phong, Kien-Tuong, Phong-Dinh, Vinh-Long, Sa-Dec, Vinh-Long, Vung-Tau, Prov.

Yemen - Hajja, Sada, Prov.

Greece - Practically the whole country; extremely limited risk exists only in - : Alexandria (Hematheia - Imathia, Dep.); Propouliou (Lesbos Dep.)

All tourists who travel in a malarious area should use a prophylactic drug no matter how brief their visit. The drug of choice is chloroquine phosphate 500 mg (300 mg. base) once a week beginning 1 week before entering the malarious area and continuing until 6 weeks after departure. The pediatric dose of chloroquine phosphate is 5 mg/kg weekly. Alternatives to chloroquine phosphate, which are given at the same intervals as chloroquine, are hydroxychloroquine sulfate 400 mg (310 mg. base) and amodiaquine hydrochloride 520 mg (400 mg. base). These drugs will suppress a clinical attack of malaria. Primaquine phosphate can be used for terminal chemoprophylaxis but it should not be given routinely. Its use depends on the intensity of exposure to tertian malaria and the patient's predisposition to G-6-P-D deficiency. The dose is 26.3 mg (15 mg base) daily for 14 days after the patient's last exposure. Subsidiary measures to reduce contact with night-biting mosquitoes include the use of insecticides, mosquito nets and screens, and long sleeves and trousers.

XII. ADDENDUM II

The Microscopic Diagnosis of Malaria

Early diagnosis of malaria requires a high level of clinical suspicion and, in particular the careful taking of a travel history from every patient with a fever of unknown origin. Once the diagnosis is suspected a Giemsa-stained smear of peripheral blood should be examined for the presence of parasites. Since the accuracy of diagnosis is dependent on the quality of the blood film the following guide is offered for the proper preparation of thick and thin blood smears.

1. Manufacturers' "pre-cleaned" slides are not considered clean enough for use in malaria diagnosis. Prior to use, such slides should be washed in mild detergent, rinsed thoroughly in warm running water, then in distilled water, and dipped in ethyl alcohol (90-95%). Slides may then be wiped dry with a lintless cloth or tissue for immediate use or stored in 95% alcohol until needed.

2. The patient's finger should be cleaned with alcohol and wiped dry with a clean cloth or gauze.

3. After puncturing the finger with the blood lancet, allow a large globule of blood to form.

4. Place cleaned surface of slide against drop of blood and with a quick circular motion, make a film the size of a dime in the middle third of one end of the slide. Ordinary newsprint should be barely legible through such a wet drop (Figure 6). (Excessive mixing or stirring with a second slide leads to distortion of blood cells and parasites.)

5. The finger should then be wiped dry and a small drop of blood gently squeezed from the puncture and placed at the edge of the middle third of the same slide (Figure 7).

6. Apply a clean "spreader" slide to the edge of the small drop at a 45° angle and allow the blood to extend about two-thirds of the slide width; then keeping even contact, push the spreader forward along the slide. This will produce an even layer of red blood cells with a "feathering" at the lower edge (Figure 8).

7. The blood film should be kept horizontal and protected from dust and insects while the thick film dries (minimum of 6 hrs. at room temperature).*

8. Label the slide in the upper part of the thin film with the date and the name or initials of the patient as illustrated (Figure 8).

* If a rapid diagnosis is desired, the thin and thick films may be made on separate slides. The thin film can be air dried, fixed with methyl alcohol, and stained immediately. If no parasites are found on the thin film, the thick film should be examined subsequently for rare organisms not detected on the thin preparation.

FIGURE 6

in all their phases. The importance of the examination of blood films for the presence of malaria parasites will be fully understood

FIGURE 7

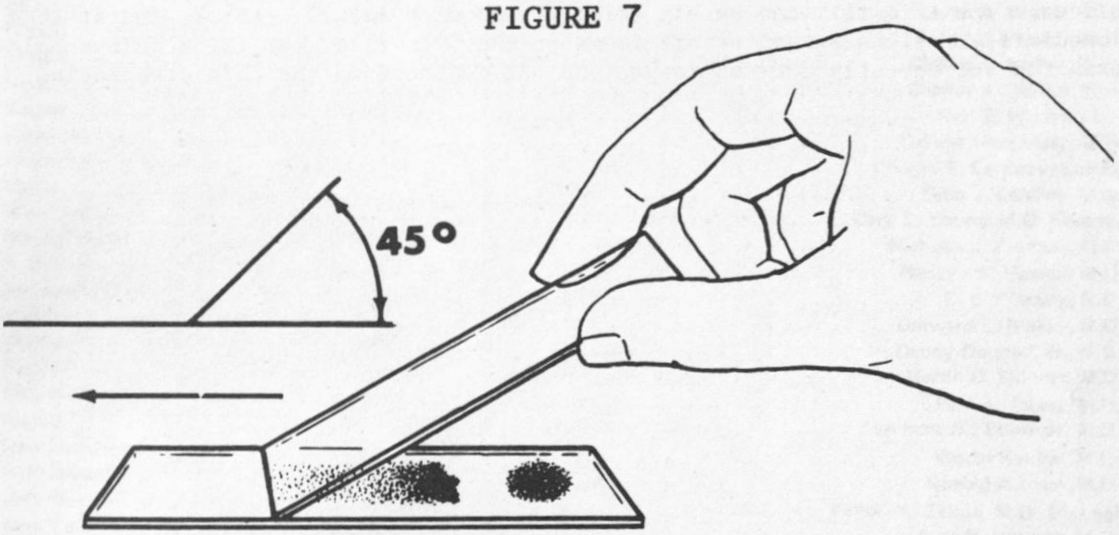
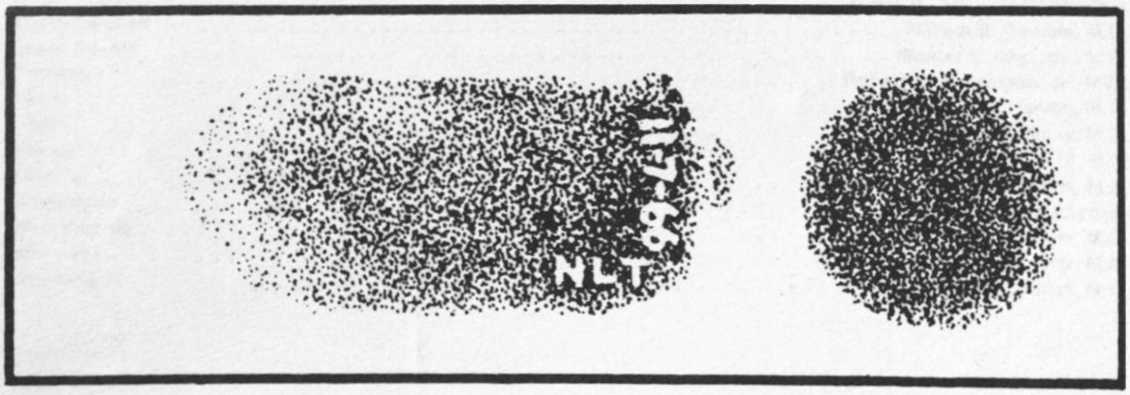


FIGURE 8



STATE EPIDEMIOLOGISTS

Key to all disease surveillance activities are those in each State who serve the function as State epidemiologists. Responsible for the collection, interpretation and transmission of data and epidemiologic information from their individual States, the State epidemiologists perform a most vital role. Their major contributions to the evolution of this report are gratefully acknowledged.

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