

Malaria at a Glance

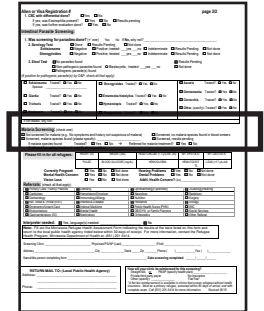
Minnesota Initial Refugee Health Assessment

Malaria Screening: (check one)

- Not screened for malaria (e.g., No symptoms and history not suspicious of malaria) Screened, no malaria species found in blood smears
 Screened, malaria species found (please specify): _____ Screened, results pending
If malaria species found: Treated? Yes No → Referred for malaria treatment? Yes No
If referred for malaria treatment, specify physician/clinic: _____

- Clinicians should have a high index of suspicion for malaria, particularly for refugees from tropical and subtropical areas who have fever of unknown origin or other characteristic symptoms.
- Sub-Saharan Africans frequently originate in highly endemic areas where subclinical infection is common and should undergo either presumptive treatment on arrival (preferred) if there is no documentation of pre-departure therapy, or have laboratory screening.
- For all other refugees, subclinical infection is rare and testing should be performed only in individuals with signs or symptoms suggestive of disease.
- If malaria is suspected due to symptoms (e.g., fever), laboratory evaluation should be performed. Malaria blood films (i.e., thick and thin smears) and rapid antigen testing are the most widely available diagnostic techniques.
- Polymerase chain reaction is more sensitive in asymptomatic individuals and is the test of choice when available.
- Diagnosis should be confirmed by experienced personnel.
- Because treatment varies by species of *Plasmodium* and may be complicated, if the practitioner is not comfortable, expert advice should be sought.
- When there is a diagnostic dilemma, or when appropriate treatment recommendations are sought, local infectious disease/tropical medicine experts or the CDC Malaria Hotline should be contacted.

Anopheles mosquitoes capable of transmitting malaria do exist in Minnesota. If the population of Anopheles mosquitoes were in sufficient numbers near a malaria-infected person(s), local transmission could occur.



In 2009, 43 cases of malaria were reported to MDH. Forty-one (95 percent) case-patients likely acquired malaria in Africa.

Key Resources

CDC, Malaria

www.cdc.gov/malaria

www.cdc.gov/immigrantrefugeehealth/guidelines/domestic/malaria-guidelines-domestic.html

Treatment information is available at:

www.cdc.gov/malaria/diagnosis_treatment/index.html

In addition, health care providers needing assistance with diagnosis or management of suspected cases of malaria may call the CDC Malaria Hotline:

770-488-7788 (M-F, 8 a.m. – 4:30 p.m., eastern time).

Emergency consultation after hours, call: 770-488-7100 and request to speak with a CDC Malaria Branch clinician.

MDH, Acute Disease Investigation and Control Section

651-201-5414

1-877-676-5414

American Academy of Pediatrics

847-228-5005

Malaria

Purpose

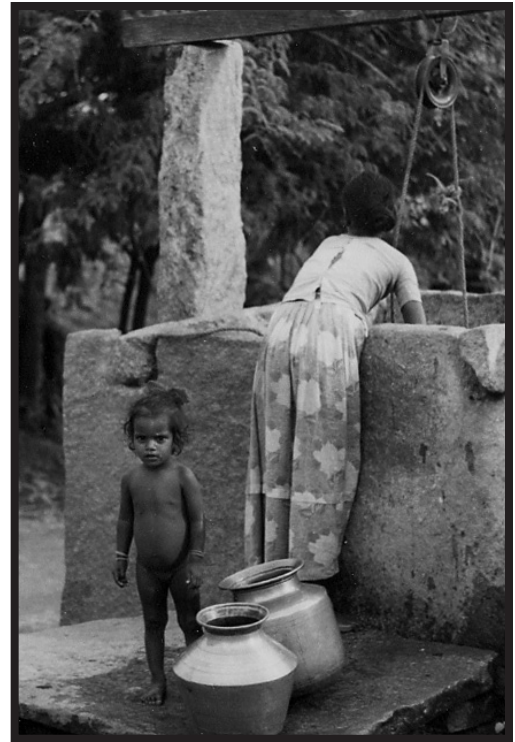
To screen and treat refugees from identified highly endemic areas, as well as those refugees who present with symptoms suspicious of malaria.

Background

Malaria, caused by *Plasmodium* parasites, is one of the most prevalent diseases in the world, with disastrous social consequences and a heavy burden on economic development. In 2008, an estimated 243 million clinical cases of malaria, including 863,000 deaths, occurred worldwide. Eighty-nine percent of malaria deaths occurred in Africa (especially sub-Saharan Africa). Malaria is the fifth leading cause of death due to infectious disease behind respiratory infections, HIV/AIDS, diarrheal disease, and tuberculosis. In the United States, the Centers for Disease Control and Prevention (CDC) reported 1,298 people diagnosed with malarial infection and two deaths in 2008. The absence of adequate health services, incomplete treatment, and inappropriate use of prophylaxis has increased drug resistance of *Plasmodium*.

Over three billion people (half of the world's population) live in malaria-endemic areas. Malaria is considered endemic in the Americas from as far north as Mexico to as far south as Argentina; in Africa from Egypt to South Africa; in Asia from Turkey in the west to Indonesia in the southeast; and in the islands of Oceania such as Papua New Guinea and the Solomon Islands. Refugees from non-endemic areas may also be at risk if they had to migrate through or into an endemic zone. See resources at the end of this section for maps of malaria distribution and endemic countries.

In endemic regions, where transmission is high, people are continuously infected so that they gradually develop immunity to the disease. Until they have acquired such immunity, children remain highly vulnerable. Pregnant women are also highly susceptible since the natural defense mechanisms are reduced during pregnancy.



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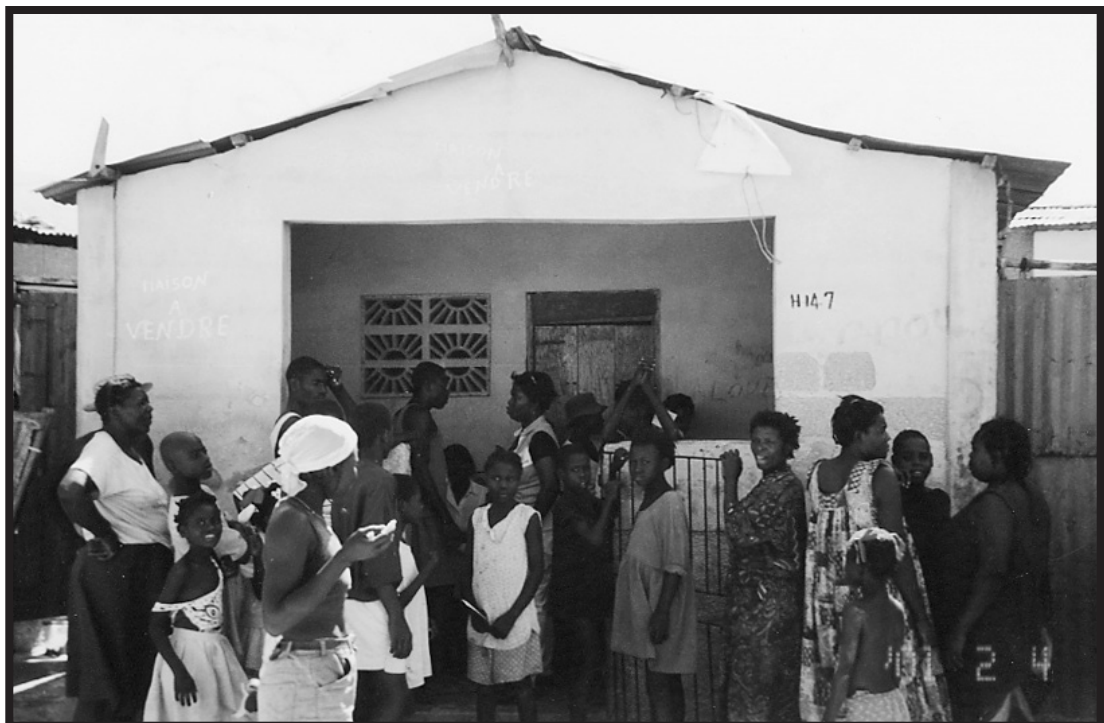
Problems with malaria control may be worse in areas burdened with armed conflicts and mass movements of refugees. Some recent epidemics have been linked to the opening up of previously non-endemic areas to development projects. Insecticide resistance and antimalarial drug resistance also constitute major problems. New antimalarial drugs become increasingly expensive, making them unaffordable for the people who need them.

Information Summary

The following summary is designed to assist the provider in screening for malaria on the *Minnesota Initial Refugee Health Assessment* and in diagnosing and treating malaria, in the event that the screening test is positive.

Screening

- At this point in time, other than in sub-Saharan Africans, asymptomatic infection is rare, and testing should be performed only in individuals with signs or symptoms suggestive of disease.
- If malaria is suspected due to symptoms (e.g., fever), laboratory evaluation should be performed. Clinicians should have a high index of suspicion for malaria, particularly for refugees from tropical and subtropical areas who have fever of unknown origin or other characteristic symptoms.



- Malaria blood films (i.e., thick and thin smears) and rapid antigen testing are the most widely available diagnostic techniques. These tests perform well in symptomatic individuals. However, the same tests do not have good sensitivity in persons who have subclinical infection (and are not symptomatic).
- Polymerase chain reaction is more sensitive in asymptomatic individuals and is the test of choice when available.
- Diagnosis should be confirmed by experienced personnel.
- Because treatment varies by species of *Plasmodium* and may be complicated, if the practitioner is not comfortable, expert advice should be sought. When there is a diagnostic dilemma, or when appropriate treatment recommendations are sought, local infectious disease/tropical medicine experts or the CDC Malaria Hotline should be contacted.
- Specific to ***asymptomatic sub-Saharan African*** refugees:
 - Those refugees who do not have documented pre-departure therapy with an ACT regimen (artemisinin-based combination therapy, completed no sooner than three days prior to departure) should undergo either presumptive treatment on arrival (preferred) or have laboratory screening to detect *Plasmodium* infection. When PCR is available it is the preferred method of diagnosis in asymptomatic refugees.
 - The medication of choice for presumptive post-arrival treatment of malaria should be considered atovaquone-proguanil (Malarone®, AP). This antimalarial is recommended because it is highly effective for treatment of *P. falciparum* malaria (as well as *P. malariae* and the blood stages of *P. vivax* and *ovale*), there is little documented drug resistance, the treatment regimen is short and simple, and it is well tolerated with few adverse effects. See *Treatment Guidelines and Dosing of Anti-Malarials* in appendix.
 - Pregnant women, lactating women, and persons with other contraindications such as allergy or hypersensitivity to medications are excluded from all presumptive regimens. These individuals should undergo diagnostic testing and receive directed treatment if they are found to have malaria and may need to be referred to a specialist for therapy.



- Children <5 kilograms should not receive AP at the domestic visit. In addition, children weighing < 5 kilograms on domestic evaluation do not need to be routinely screened but should have testing if they have signs or symptoms of clinical disease.
- Refugees who, on medical screening after arrival to the United States, have documented overseas treatment do not need further evaluation or treatment for malaria unless they have clinical symptoms of disease.

Transmission

Malaria is an infection caused by protozoa of the genus *Plasmodium* in which the asexual cycle (schizogony) takes place in the red blood cells of vertebrates and the sexual cycle (sporogony) takes place in mosquitoes. *Anopheles* mosquitoes are the arthropod vector for transmission. Four *Plasmodium* species are most common in infections of humans: *P. falciparum*, *P. vivax*, *P. ovale*, and *P.*

malariae.

Anopheles mosquitoes capable of transmitting malaria exist in

In 2008 Minnesota's malaria case total of 29 was fifteenth in the nation; local vector-borne transmission has occurred in some states with higher case numbers in past years.

Minnesota. If a location has a sufficient population of *Anopheles* mosquitoes in an area with *Plasmodium*-infected person(s), local transmission could occur. In 2008 Minnesota's malaria case total of 29 was fifteenth in the nation; local malaria transmission has occurred in some states with higher case numbers in past years but has not been reported in Minnesota.

Active Disease

Typical clinical manifestations of the disease include cyclical fevers, chills, and sweats. Some cases also report cough, headaches, backaches, muscle aches, nausea and vomiting, diarrhea, and altered consciousness. *P. falciparum* infection, and rarely infection with other species, may also cause clinical complications such as cerebral malaria, anemia and hemolysis, renal failure, hypoglycemia, pulmonary edema, and thrombocytopenia.

Susceptibility and Resistance

Susceptibility is universal except in humans with certain genetic traits. Tolerance or refractoriness to disease is present in adults in highly endemic communities where exposure to infective anopheline mosquitoes is continuous over many years. Most black Africans show a natural resistance to infection with *P. vivax*, which is associated with the absence of Duffy factor on their erythrocytes. Persons with sickle cell trait have relatively low parasitemia when infected with *P. falciparum* and therefore are relatively protected from severe disease.

Epidemiology in Minnesota

Although local transmission of malaria frequently occurred in Minnesota nearly 100 years ago, all of the cases reported in Minnesota residents since that time were likely imported infections acquired abroad. Between 1988 and 2009, 705 cases of malaria were reported to the Minnesota Department of Health. The number of cases per year ranged from a low of five cases in 1988 to a peak of 76 cases in 1998.

Despite elevated case numbers, the epidemiology of malaria in Minnesota in 2009 was typical of recent years. Forty-three malaria cases (0.8 per 100,00 population) were reported in Minnesota residents. This represented a 48% increase from the 29 cases reported in 2008 and 19% increase from the median number of cases reported annually from 2000 to 2007 (median 36 cases; range, 29 to 50). Of 35 cases in which *Plasmodium* species was specified, 31 (89%) were identified with *P. falciparum*, four (11%) with *P. ovale*, three (9%) with *P. vivax*, and two (6%) with *P. malariae*. This included four case-patients with mixed infections (two *P. falciparum*-*P. ovale*; one *P. falciparum*-*P. malariae*, and one *P. falciparum*-*P. vivax*-*P. malariae*). The median age of case-patients was 34 years (range, two to 70 years). Of 38 case-patients of known race, 36 (94%) were black, one (3%) was white, and one (3%) was Asian. The majority of case-patients (91%) resided within the seven-county metropolitan area. Of the 34 case-patients with known country of birth, four (12%) were born in the United States. Forty-one (95%) case-patients in 2009 likely acquired malaria in Africa.

