Mosquitoes and Disease

The most notorious of mosquitoes, the malaria vector *Anopheles gambiae* contributes to the death of about 1 million people a year. Most of the victims are children in Africa. On that continent, *An. gambiae* carries the deadliest parasite, *Plasmodium falciparum*, along with three other parasites, *P. vivax*, *P. malariae*, and *P. ovale*.

Worldwide, some 60 other anophelines transmit malaria, although transmission by these vectors is often much less efficient. *An. culicifacies*, *An. stephensi*, and others transmit malaria in India, where both *P. falciparum* and *P. vivax* pose a threat. In South America, malaria, caused by *P. falciparum* or *P. vivax*, is transmitted mainly by *An. darlingi*. *Culex* and *Aedes* mosquitoes, also widespread, transmit dengue, yellow fever, West Nile, and other diseases (see maps below).

Whatever the mosquito species, these disease vectors are exquisitely adapted to living around humans. All use human blood almost exclusively to nurture their eggs, and many exploit discarded containers and other urban debris as breeding sites. Some mosquitoes prey on their victims at night; others bite at dawn or throughout the day. Just one bite from an infected mosquito can cause disease.

Range

Mosquitoes inhabit almost every corner and climate zone on Earth, from the equator to the Arctic. *Anopheles* transmit malaria mostly in the tropics and mostly at relatively low elevations, although data suggest that their range is expanding.

PHIL LOUNIBOS/UF/FMEL

AN. DARLINGI

CDC

MAE MELVIN/CDC

AN. GAMBIAE AND P. FALCIPARUM

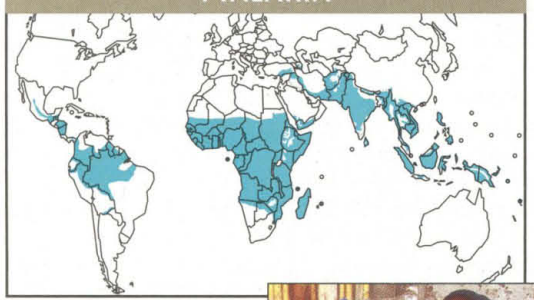
Major Malaria Vectors

This map shows the most important malaria vectors in areas where the disease is endemic. Predominant species are determined by the vector's abundance, survival rate, and efficiency in transmitting disease, among other factors. Where more than one vector is important in alternating seasons, both are included. Some important secondary vectors are not included.

SOURCE: JEFFREY SACHS, COLUMBIA EARTH INSTITUTE; ANDREW SPIELMAN, ANTHONY KISZEWSKI, AND SONIA EHRLICH, HARVARD SCHOOL OF PUBLIC HEALTH; ANDREW MELLINGER AND PIA MALANEY, HARVARD'S CENTER FOR INTERNATIONAL DEVELOPMENT.

Distribution of Major Mosquito-Borne Diseases

MALARIA



P. VIROT/WHO

Endemic in more than 100 countries, malaria can cause fever, chills, vomiting, exhaustion, anemia, and organ failure.

300 million cases; 1 million deaths a year*

DENGUE

DAVID LONGSTREATH/AP

Painful and sometimes fatal, "breakbone fever" is carried primarily by *Aedes aegypti* mosquitoes. Caused by four related viruses, dengue is sharply on the rise, especially in urban areas in poor countries.

50 million cases a year

LYMPHATIC

Parasitic worms, the causative agents of elephantiasis, are transmitted in urban areas by *Culex quinquefasciatus* and in rural areas by *An. gambiae* and other species.

120 million affected; 40 million incapacitated

* ALL ESTIMATES FROM WORLD HEALTH ORGANIZATION AND U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION.

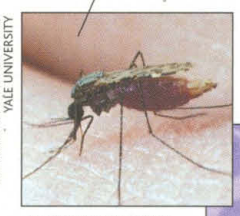
Transmission

To transmit malaria, a mosquito must bite an infected person and then live long enough—10 to 14 days—to bite an uninfected person. In that period the parasite multiplies and makes its way to the insect's salivary glands.

FRANK H. COLLINS

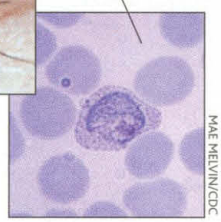
Breeding sites

Each mosquito species has its own preference, but almost any type of water can accommodate some of them: fresh or salt, still or moving, in ponds, lakes, streams, tree holes, irrigation ditches, cesspools, used tires, water jugs, sewers, or bird baths.



LEONARD E. MUNSTERMANN/ YALE UNIVERSITY

AN. STEPHENSI AND *P. VIVAX*

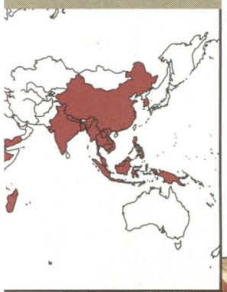


MAE MELVIN/CDC

Anopheles species

- *albimanus*
- *annularis*
- *anthropophagus*
- *aquasalis*
- *arabiensis*
- *arabiensis* and *funestus*
- *barbirostris*
- *culicifacies*
- *darlingi*
- *dirus*
- *farauti*
- *flavirostris*
- *fluviatilis*
- *funestus* and *arabiensis*
- *funestus*, *arabiensis*, and *gambiae* s.s.
- *funestus* and *gambiae* s.s.
- *gambiae* s.s.
- *gambiae* s.s. and *funestus*
- *maculatus*
- *marajoara*
- *melas*
- *minimus*
- *nuneztovari*
- *punctulatus* group
- *pseudopunctipennis*
- *sacharovi*
- *sergentii*
- *sinensis*
- *sundaicus*
- *superpictus*

Filariasis



RIEKY FARCIS/WHO

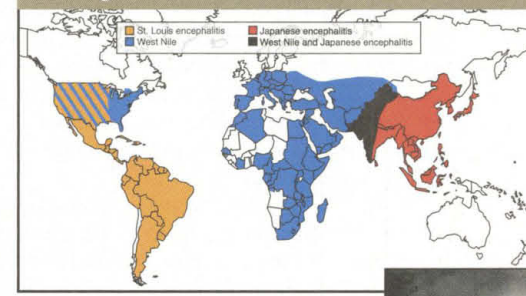
Yellow Fever

COURTESY OF PFIZER INC.

Dreaded for more than 400 years, yellow fever is on the rise again, mostly in rural areas in developing countries. Experts fear that with its vector, *Aedes aegypti*, omnipresent, devastating urban outbreaks could occur at any time.

200,000 cases; 30,000 deaths a year

Japanese Encephalitis



DARRIN PHEGLEY/*THE GLEANER*/AP

Japanese encephalitis (50,000 cases per year, transmitted by *Culex tritaeniorhynchus*), West Nile, and several other flaviviruses carried by different mosquitoes cause potentially fatal brain inflammation, although most cases are mild. West Nile, which made its U.S. debut in New York City in 1999, is exploding across the country.