

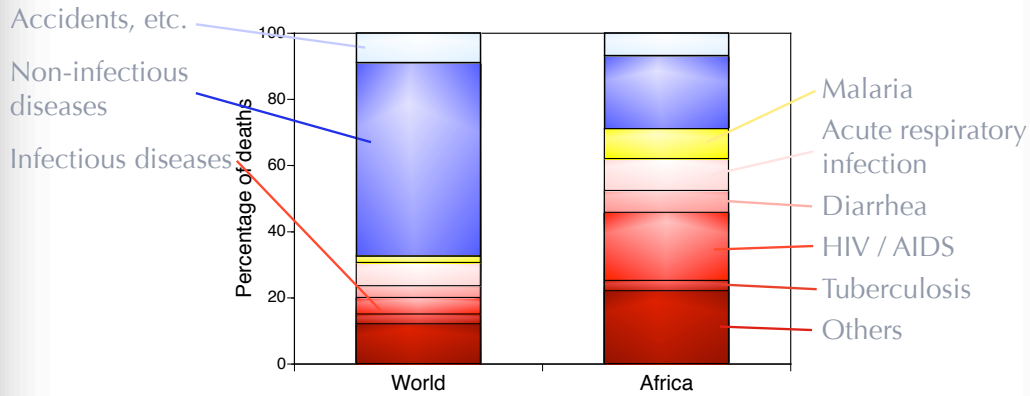
Epidemiology and control of malaria

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Outline

- An introduction to malaria
 - Global situation
 - Life-cycle and some biology
 - Local epidemiology
- Basic equations of malaria control
- Strategies for the management of drug resistance
- Malaria vaccines
- Genetic manipulation of mosquitoes for malaria control

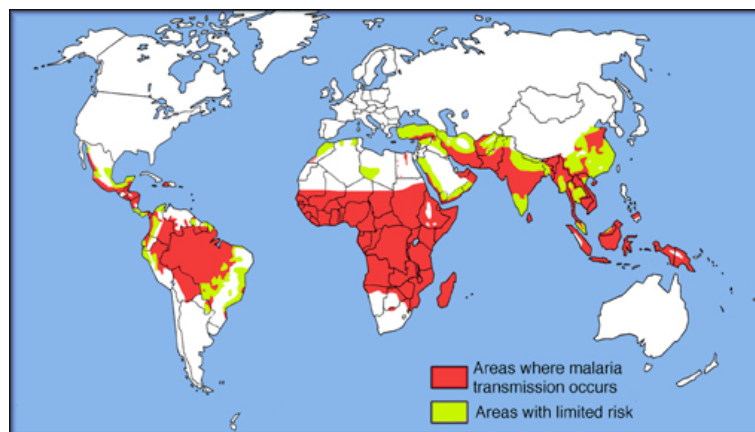
Causes of death, 2001



1-2 million out of 60 million deaths due to malaria

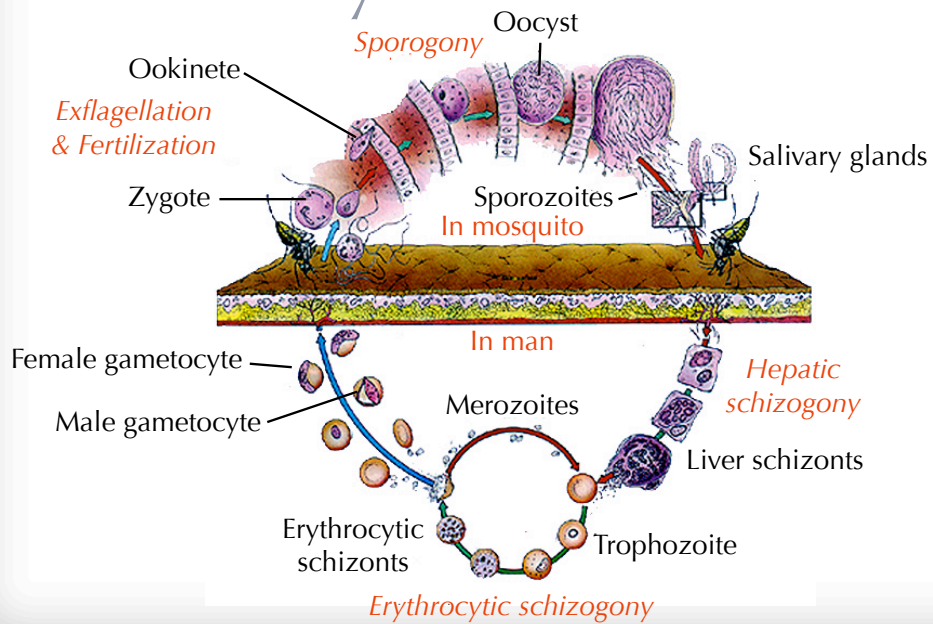
WHO. 2002. World Health Report.

Distribution of malaria



- 40% of the world's population at risk
- 500 million of malaria cases each year
- 1-2 millions deaths, mostly in sub-Saharan Africa

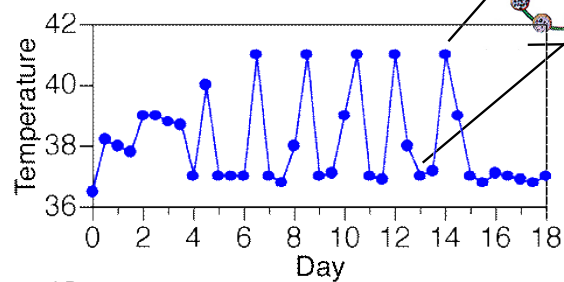
Life-cycle of malaria



Clinical malaria

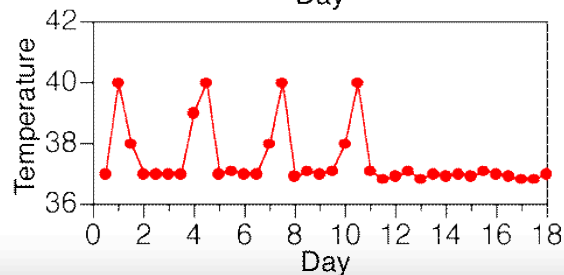
2-day cycle:

P. vivax
P. ovale



3-day cycle:

P. falciparum
P. malariae



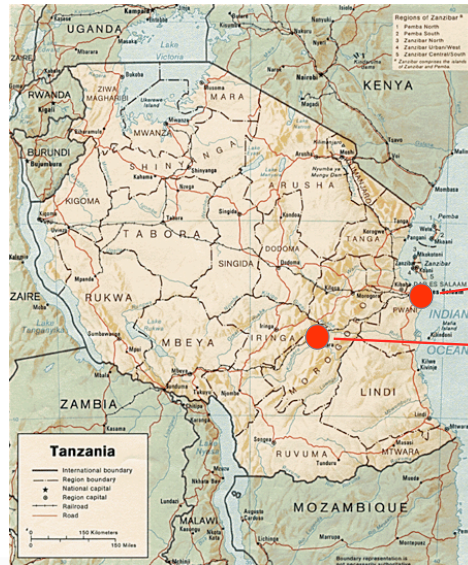
Clinical malaria

- Asymptomatic infection
- Periodic temperature with
 - headache
 - shivering
 - muscle pains
 - diarrhea
 - ...

Clinical malaria

- Severe malaria
 - Severe anemia (30% of red blood cells can be infected. Can be lethal without transfusion)
 - Cerebral malaria (coma, 20% mortality even if treated)
 - Kidney failure (high mortality)

Malaria in Ifakara, Tanzania



Dar es Salaam

Ifakara

The Kilombero valley

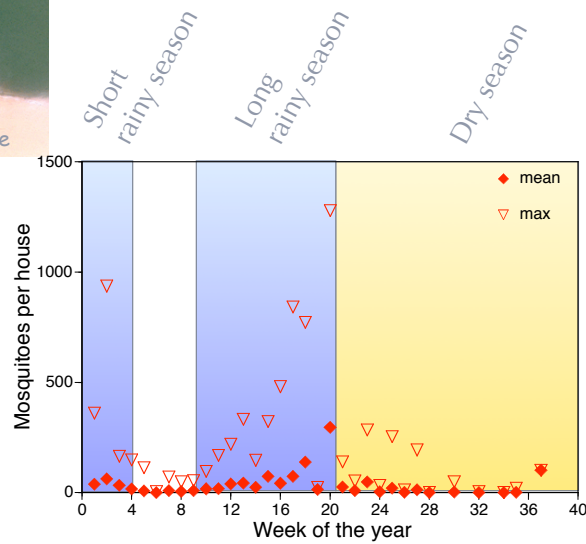


during the dry season

during the rainy season

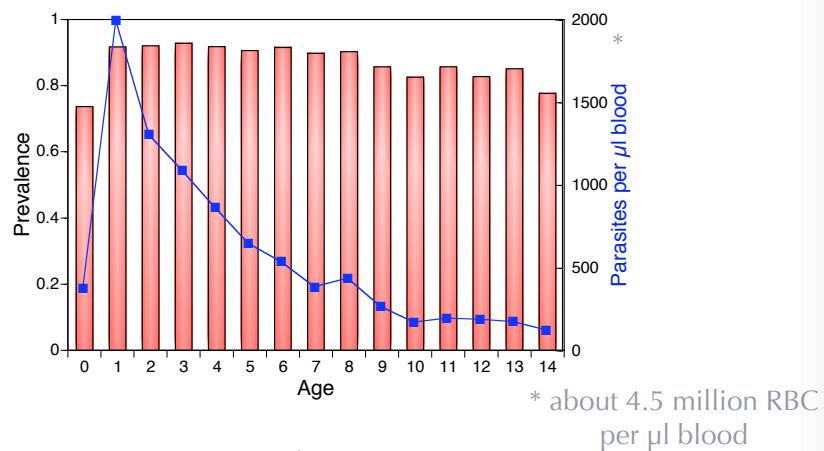


Mosquitoes per house



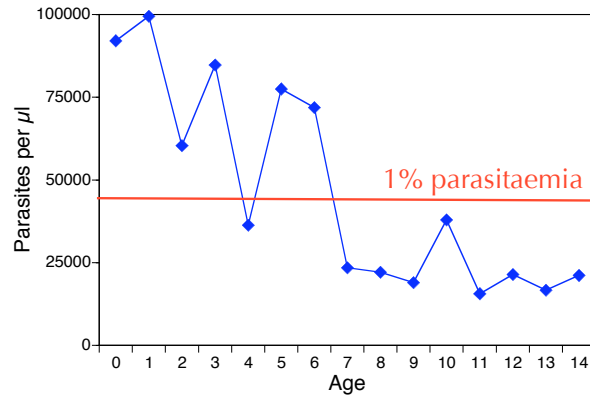
More than 600 infectious bites per person every year

Malaria in Ifakara

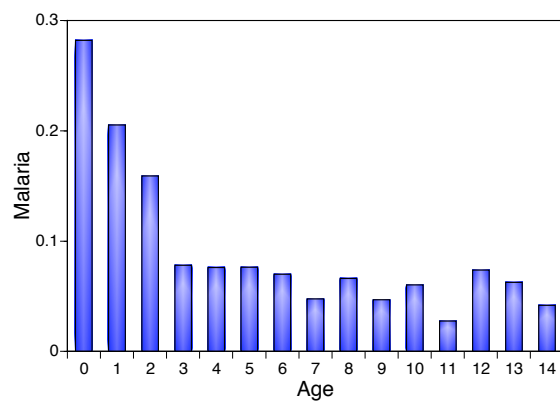


Decrease of parasitaemia reflects slow increase of immunity

Malaria in Ifakara



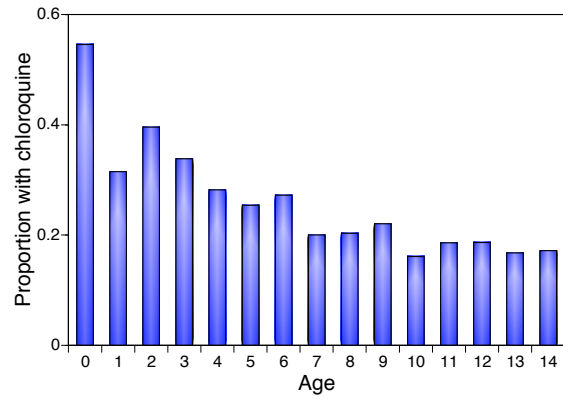
Malaria in Ifakara



'Malaria' is defined as

- Headache
- Temperature $> 38^{\circ}\text{C}$

Chloroquine-use in Ifakara



CQ-use defined as the presence of metabolites of chloroquine in the urine. These can be detected up to 2 to 3 weeks after CQ-use.