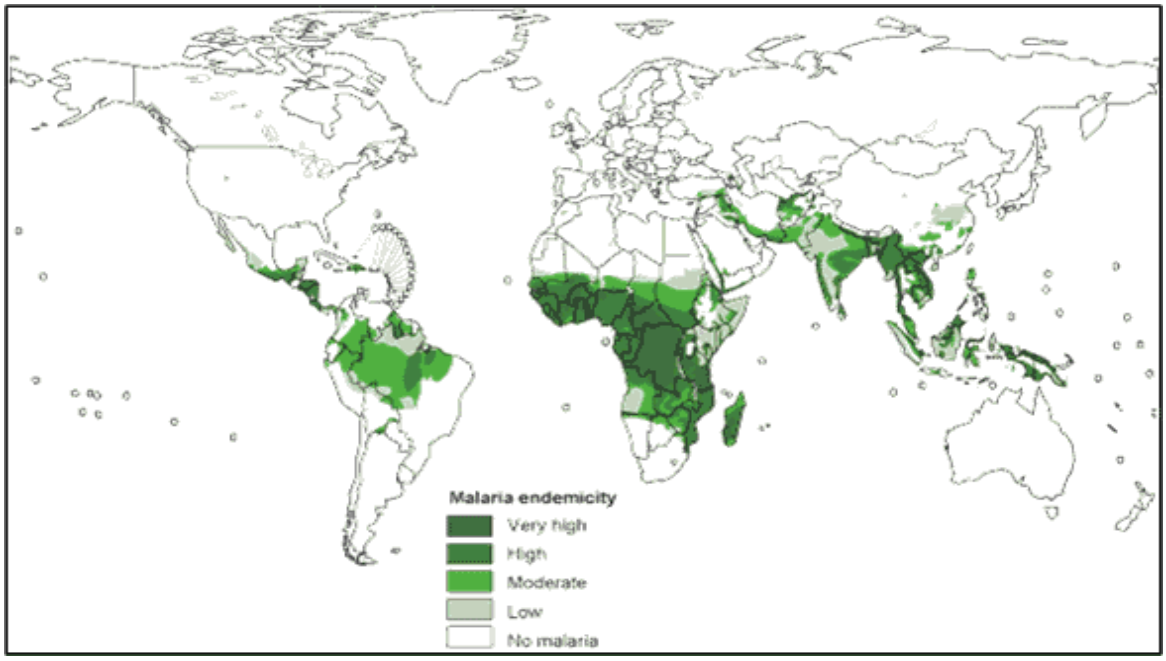
The level of malaria transmission varies in different regions, countries and also within countries. Endemic regions are characterised by warm temperatures and rainfall, both suitable for mosquito breeding, and where populations of human hosts and malaria parasites co-exist. Because of the climatic conditions required, seasonal maps can be drawn up that allow prediction of when transmission will be at its highest and where epidemics are likely to occur. Such seasonal information should help with the development of malaria control calendars and assist health services in appropriately focusing their control activities, such as drug procurement and anti-vector measures. The map shows areas of the world with different levels of endemicity or transmission intensity (source: WHO).



In areas of high and stable transmission people develop immunity following repeated infections, so that the populations at greatest risk of becoming sick with malaria are young children, who have not yet had multiple infections. Pregnant women are also at higher risk. In areas of lower or irregular transmission all age groups fall ill when infected and are vulnerable to severe disease.

In some areas malaria occurs throughout and from year to year, but often there are peaks around rainy seasons, when the mosquitoes increase. In other areas with less overall malaria, transmission is less stable, and epidemics (when the incidence of malaria peaks suddenly) occur in populations with little or no immunity, such that people of all age groups are at risk of death or severe disease, and they can be devastating. Epidemics are characterized by a sudden and dramatic increase in infections, greatly above usual seasonal variations. The populations most at risk of epidemics are those living in the highlands, arid and desert-fringe zones, as well as those living in areas

where successful control measures (spraying and treatment) have not been consolidated or maintained, such as areas of post emergency or conflict.

Factors which may precipitate a malaria epidemic fall into two categories: natural (climatic variations, natural disasters), and man-made (conflict and war, agricultural projects, dams, mining, logging). Most of these factors modify the physical environment, and increase the capacity of mosquitoes to transmit malaria. Some factors also result in massive population movements that expose non-immune populations to malaria infection.

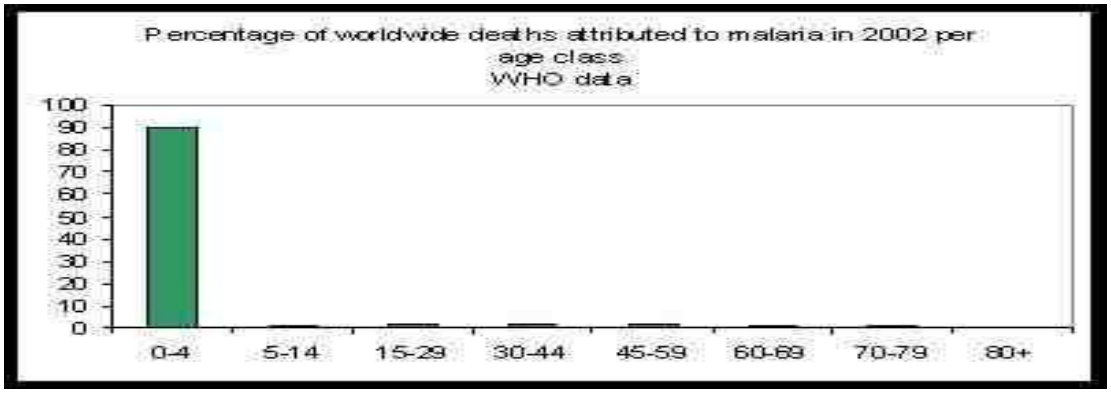
The epidemiology of malaria is very important in understanding which populations will be most at risk, so that control programmes can be designed accordingly.

Burden of Disease

Not only does malaria cause around 500 million cases every year, and between 1 and 3 million deaths, but it also carries a huge burden that impairs the economic and social development of large parts of the planet. The failed attempt to eradicate malaria globally in the 1950s and 1960s did, however, cause a major reduction in the burden in many countries outside Africa. It gave way to a control strategy that was followed by a resurgence of malaria during the late 1970s and 1980s. The emergence and spread of resistance to drugs and the weak health infrastructure in many of the endemic countries, particularly in Africa, contributed to a worsening malaria situation until the present day.

The cost of malaria to Africa is estimated at $12 billion every year in lost GDP. In some countries, malaria accounts for up to 40% of total health expenditure and 20-50% of hospital admissions. It is estimated that $3 billion per annum is all that is needed to control it. As well as economic burden, malaria causes immense suffering, especially to children and pregnant women.

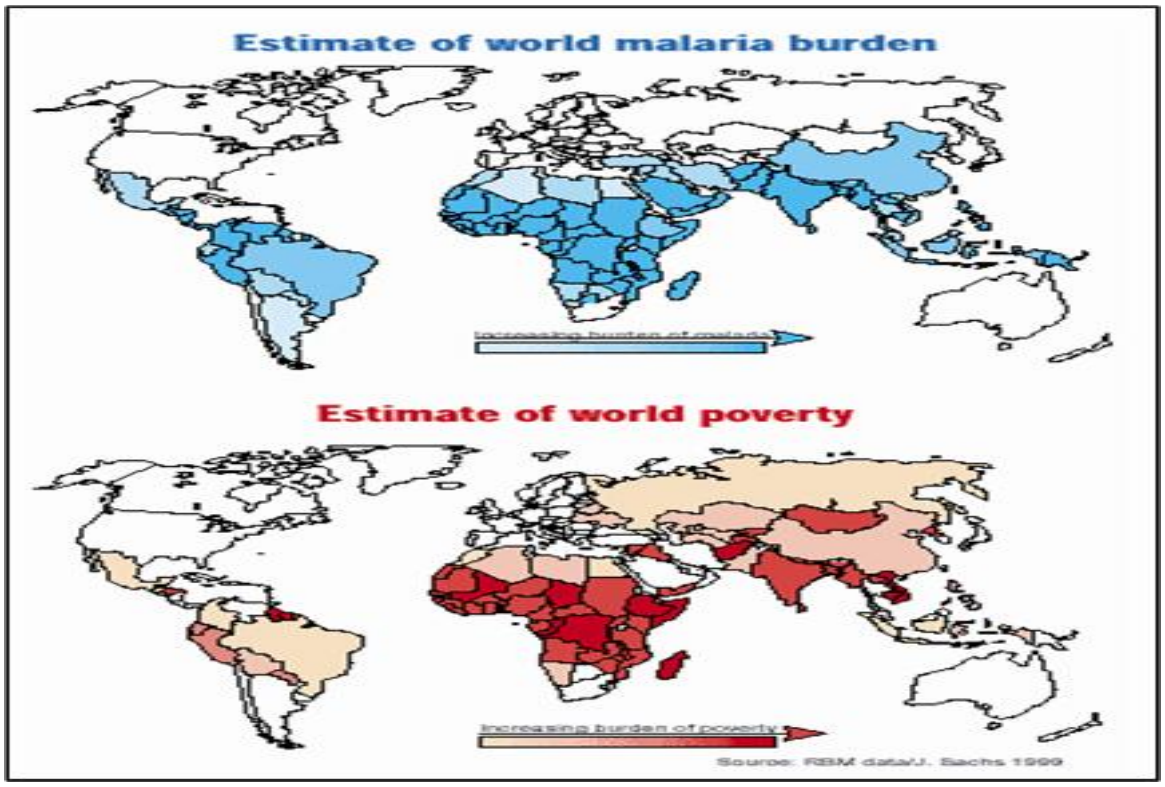
The greatest mortality due to malaria is in children, as seen in the following figure:



Disability Adjusted Life Years (DALYs) are a measurement of how many years are lost by premature death and ill health due to an illness. On a disease/illness scale, for the leading causes of DALY's lost worldwide, malaria is the eighth most important factor.

1	Lower Respiratory Infections	91.4
2	HIV/AIDS	84.5
3	Unipolar Depression	67.3
4	Diarrhoeal Diseases	62.0
5	Ischaemic Heart Diseases	58.6
6	Neglected Tropical Diseases	56.6
7	Cerebrovascular Diseases	49.2
8	Malaria	46.5
9	Road Traffic Accidents	38.7
10	Tuberculosis	34.7

The overlap between the estimated disease burden of malaria and the levels of world poverty suggests that one exacerbates the other and vice versa:



Key Points:

Epidemiology of Malaria

- Transmission is classified in terms of endemicity: low, medium, high or very high and stable (constant) or unstable transmission.
- This determines the level of malaria illness and therefore the disease burden.
- Epidemics occur in areas of unstable transmission, where ecological factors have allowed mosquitoes to breed, or where there has been population movement due to civil unrest, or where control methods have been discontinued.
- An understanding of the epidemiology of malaria is essential for designing and monitoring effective control programmes.

Burden of Disease:

- Malaria is the 8th most important cause of DALYs worldwide
- There is significant overlap between poverty and malaria transmission
- Economically, the impact of malaria in some countries may cost as much as 40% of the health expenditure.

Programme Activities:

Malaria Consortium is engaged in several programmes where disease patterns are monitored including malariometric surveys.

Malaria Consortium works extensively in areas prone to epidemics of malaria and in areas of complex emergency, such as post conflict regions of northern Uganda, Ethiopia Chad and Southern Sudan.

References:

1. Korenromp, E (2005) Malaria incidence estimates at country level for the year 2004. Roll Back Malaria Monitoring and Evaluation Reference Group.

2. Snow, R., Guerra, C., Noor, A., Myint, H. & Hay, S. (2005) The global distribution of clinical episodes of Plasmodium falciparum malaria. Nature 434, 214-217.

3. WHO World Malaria Report 2005 , WHO/HTM/MAL/2005.1102

4. Meek, S., Hill, J. & Webster, J. (2001) The evidence base for interventions to reduce malaria mortality in low and middle-income countries. Commission on Macroeconomics and Health Working Group 5.

5. Breman, J., Alilio, M & Mills, A. Eds. (2004) The intolerable burden of malaria: II What's new, what's needed. American Journal of Tropical Medicine and Hygiene 71 (2) Supplement: 1-282.

6. Malaria at a Glance. (2001) World Bank Series.

7. Economic Costs of Malaria. Roll Back Malaria Information Sheet 10.

8. Epidemic Prediction and Response. Roll Back Malaria Information Sheet 8.

9. Grover-Kopec, E.K., Blumenthal, M.B., Ceccato, P., Dinku, T., Omumbo, J.A. & Connor, S.J. (2006) Web-based climate information resources for malaria control in Africa. Malaria Journal 5: 38.

10. Warrell, D. & Gilles, H. eds Bruce-Chwatt's Essential Malariology, Arnold, 2002, 4th Ed.