

Q&A on malaria mortality estimates

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1. How many people die of malaria every year?

It is difficult to answer this question with a large degree of certainty. Malaria is most prevalent in countries of sub-Saharan Africa where disease surveillance and vital registration systems are weak. Most high-burden countries can only register a small fraction of cases and deaths. Nevertheless, ministries of health need to know the severity of the problem, and the extent to which malaria prevention and control programmes are working, which is the primary reason why WHO produces malaria burden estimates. UN agencies, donor organizations and implementing partners, including NGOs and campaign organizations, also use WHO's estimates to make strategic planning, procurement and funding decisions. WHO has produced estimates for malaria cases and deaths every year since 2000. These estimates include lower and upper bounds, as well as a point estimate. According to WHO's latest estimates, released in the World Malaria Report in December 2011, approximately 216 million cases of malaria occur in the world (with an uncertainty range of 149 million to 274 million) and the disease kills about 655,000 people (with an uncertainty range of 537 000 to 907 000). This translates to one child dying every minute from malaria.

2. How does WHO produce its malaria burden estimates?

WHO uses different modeling and estimation methods for different groups of countries to estimate malaria cases and deaths. To give one example: in high-burden countries of the WHO African Region where data reporting is not sufficiently complete, the case estimates are derived from an estimate of the number of people living at high, low or no risk of malaria. Malaria incidence rates for each of these population groups are inferred from longitudinal studies of malaria incidence. Incidence rates are adjusted according to the percentage of the population living in urban settings and the expected impact of vector control programmes. Meanwhile, under-five deaths for the same group of countries are estimated using verbal autopsies. (A verbal autopsy is a method of finding out the cause of a death based on an interview with the next of kin or other caregivers.) Deaths among those aged five and over are derived through mathematical modeling, based on under-five death rates. (To find out more about how malaria cases and deaths are estimated for other groups of countries, please see pages 72-73 of the World Malaria Report 2011, and pages 131-140 of the World Malaria Report 2008.) In its malaria burden estimation, WHO works closely with a range of partners: the UN Inter-agency Group on Child Mortality Estimation, the Child Health Epidemiology Reference Group and the Roll Back Malaria Monitoring and Evaluation Reference Group. Country-specific estimates are made available to partners and researchers following a review by the relevant national authorities.

3. Why are there different estimates regarding the malaria burden?

Malaria burden estimates are also produced through independent research studies - the two largest ones being the Malaria Atlas Project (MAP) at the University of Oxford, UK, and the Global Burden of Diseases, Injuries and Risk Factors 2010 study, coordinated by the Institute for Health Metrics and Evaluation (IHME), in Seattle, USA. These studies use different assumptions and varying interpretations of underlying data. The MAP project has set up a spatial database based on medical intelligence, satellite-

derived climate data and parasite prevalence rates. The IHME study collected data for the 1980-2010 period, adjusting available malaria mortality data in line with trends in parasite prevalence, antimalarial drug resistance and vector control efficacy. The uncertainty ranges produced by WHO, MAP and IHME overlap in many settings and therefore are not statistically different, even if the point estimates appear numerically different. Nevertheless, the WHO and IMHE estimates do differ significantly on estimates for mortality in children over five years of age and adults, especially in Africa. This is due to the fact that the IHME study uses verbal autopsy to identify cause of death for all ages. WHO does not use this method to estimate over-five and adult malaria deaths as there is no scientific consensus around the reliability of verbal autopsies for these age groups.

4. How do the IHME findings published in February 2012 compare to the findings of WHO's World Malaria Report 2011?

The IHME study entitled "Global malaria mortality between 1980 and 2010: a systematic analysis" published in the *Lancet* on 3 February 2012 raised many questions about the differences between malaria burden estimates. The IHME study estimates 1.24 million annual deaths from malaria (range: 0.93 million - 1.69 million) while WHO's point estimate is 655 000 for 2010 (range: 537 000 to 907 000). In most settings and ages, the two studies' uncertainty intervals overlap and there are many similarities between the trends. The total number of malaria deaths is seen as falling consistently - in both studies - after prevention and control interventions were scaled up after 2004. According to both methods, about 90% of malaria deaths occur in Africa. The most important difference between the estimates is regarding deaths in those over five years of age in Africa. According to IHME, malaria killed an estimated 435 000 people in this age group in 2010; while according to WHO it killed 55 000. In this context, it is worth recalling the significant body of scientific evidence and consensus about the development of partial immunity to malaria in stably endemic areas, which has demonstrated that children over five years of age and adults are substantially protected against severe disease and death. Moreover, carefully conducted prospective hospital-based studies in a variety of settings suggest that the proportion of older adults dying from malaria is lower than would be expected from the IHME estimates.

5. What is WHO doing to improve malaria burden estimates?

WHO constantly strives to improve its burden estimates and works with partners including the UN Inter-agency Group on Child Mortality Estimation, the Child Health Epidemiology Reference Group and the Roll Back Malaria Monitoring and Evaluation Reference Group. WHO's new Malaria Policy Advisory Committee, which met for the first time in February 2012, has decided to convene an evidence review group to advise on burden estimation methodology. WHO collaborates closely with governments of endemic countries to achieve consensus on methods for estimating the burden of disease using all available data. WHO is also supporting malaria-endemic countries in strengthening their disease surveillance and health information systems to enable national decision-makers and international donors to deliver better and more targeted public health interventions to the communities in need. The fact that WHO and Roll Back Malaria partners need to rely on estimates for malaria cases and deaths - rather than primary collected data - highlights the need for greatly improved malaria diagnostic testing, surveillance and vital registration.