

MALARIA RISK

Estimating clinical episodes of malaria

Arising from: R. W. Snow, C. A. Guerra, A. M. Noor, H. Y. Myint & S. I. Hay *Nature* **434**, 214–217 (2005)

Estimates of the disease burden caused by malaria are crucial for informing malaria control programmes. Snow and colleagues claim that their estimate of 515 million cases of malaria caused by *Plasmodium falciparum* globally is up to 50% higher than that reported by the World Health Organization (WHO), and 200% higher for areas outside Africa¹. However, this comparison refers to the WHO's estimates from 1990 and 1998, and not to the range of 300 million to 500 million that the WHO has used since 2000 (ref. 2). Both groups agree that the burden of malaria disease outside Africa, especially in South Asia, is greater than was estimated in the 1990s.

A new global map of populations living at risk of malaria transmission, produced in 2004 and funded in part by the WHO's Roll Back Malaria department (WHO/RBM), forms the basis of new estimates both by Snow and colleagues¹ and the WHO/RBM². Both current sets of estimates reflect the consensus that cases recorded and reported in national health information systems capture far less than the full burden of malaria in most parts of the world.

In October 2004, a group of independent experts reviewed the WHO/RBM's new estimation method and concluded that, even with the best available data, it is preferable to present any malaria incidence estimate as a range⁴. An important reason for this conclusion is that the research studies used as input are normally

conducted in areas where malaria transmission is greatest, and during the season of peak malaria transmission. Extrapolation from these studies may therefore result in a picture that is not truly representative of the entire region. In addition, the population-at-risk map may not be totally accurate, given fluctuations in malaria transmission patterns in response to environmental change, development and vector control⁴.

The WHO's global burden estimate for 2004 of 350 million to 500 million cases, of which 270 million to 400 million are due to infection by *P. falciparum*², is generally consistent with the 300 million to 660 million range for *P. falciparum* proposed by Snow and colleagues¹. The somewhat smaller range estimated by the WHO is likely to be due to our inclusion of the impact of preventive interventions (insecticide-treated mosquito nets and indoor residual spraying), the coverage of which has increased since 2000. Further, for selected areas with highly unstable malaria transmission, the WHO's estimate takes into account case numbers reported through routine health information systems, which often reflect both passive and active case detection and, in these settings, may provide a more reliable and up-to-date picture than extrapolations made from published research in sometimes distant sites.

The WHO is working with countries to improve their capacity for collecting the data

required for future national-level incidence estimates. Data will be obtained from national surveys and sentinel surveillance sites, as well as from health information systems. These efforts should improve the precision of burden estimates at all levels and allow us to assess, in the second half of this decade, whether the ongoing increase in coverage of effective prevention and treatment measures are bringing us closer to the global goal of reducing the burden of malaria by half by the year 2010.

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Estimation of the malaria burden

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Accurate estimates of the global burden of malaria are important for planning, monitoring and advocacy. Snow *et al.*¹ attempt to address the shortcomings of previous estimates of the incidence of malaria caused by *Plasmodium falciparum* by combining current and historical data. However, we believe that the design of their model and its inputs have led to a significant overestimate of the malaria burden outside Africa — as in the example of the World Health Organization (WHO) western Pacific region (WPR), for which their model predicts 60 times the 2002 incidence reported by national malaria-control programmes².

The reliance by Snow *et al.* on three broad categories of malaria risk — hypo-, meso-, and hyper/holoendemic malaria — would seem to

be the likely basis for this overestimate. The 1968 map³ that Snow *et al.* used to obtain these endemic zones was developed from estimates of maximum malaria prevalence between the late nineteenth century and the 1960s and included some *P. vivax* infections. Snow *et al.* laid this over a current (2002) WHO map of malaria distribution, modified according to travel advice and some national statistics. However, the scale of this WHO map indicates only broad areas where transmission may be found. The reduction of prevalence in highly endemic areas by one step from its historical maximum to account for control methods and deforestation, and the further reduction of one step in urban areas of more than 1 million inhabitants¹, seems arbitrary and assumes that

transmission in smaller cities and towns is equal to that in forested areas. Hypoendemic areas outside major cities remain unchanged from the pre-1968 map, unless national figures were known to show absence of transmission. Despite the stated methods, holo/hyperendemic zones still also appear in calculations¹.

The predominant vectors of malaria in southeast Asian countries of the WPR are associated with forests⁴. In the past 50 years, deforestation has removed much of this habitat⁵. Furthermore, although the proportion of the population living in urban areas has greatly increased, urban and peri-urban malaria is uncommon in Asian countries, and virtually absent in the Philippines, Malaysia and the Mekong region. Many people currently living in areas that were highly endemic for malaria on the Lysenko and Semashko map³ are therefore at low or no risk of malaria. Malaria incidence in remaining transmission areas is geographically highly heterogeneous^{6–9}.

We conclude that the prediction by Snow *et al.* of 15.03 million cases in the WPR, based predominantly on an estimated population of