**Title**

The economic burden of dengue: no longer invisible nor unavoidable

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In the *Lancet Infectious Diseases*, Donald Shepard and colleagues estimate the global economic burden of dengue, the world’s most common arbovirus infection 1. Their report is well-timed. Both the incidence and the geographic range of dengue transmission have expanded rapidly over the past three decades as a consequence of urbanisation, population growth, climate change and international travel. Shepard and colleagues build on estimates from the Global Burden of Disease study, also recently published in *Lancet Infectious Diseases* 2, which suggest that there are now almost 60 million symptomatic dengue cases a year. Estimates from other groups put this number as high as 100 million 3.

Even the most intensive vector control efforts in a high-income city like Singapore do not seem able to permanently interrupt dengue transmission 4. However, a number of innovative preventive technologies have recently become available that may increase the array of options to reverse the upward trend in dengue incidence. These interventions include the first dengue vaccine to be licensed (Dengvaxia®) 5, as well as mosquitoes that have been genetically modified to be sterile 6 or resistant to dengue virus 7. The population impact of these interventions is complex and setting-dependent. Hence every country considering them will need to evaluate their risk-benefit profile in the context of local factors.

Evaluating the case for dengue prevention is complicated because dengue mortality is relatively low, especially in settings where patients can expect prompt access to care. The Global Burden of Disease study estimated that dengue causes about 10,000 deaths a year, which implies a case-fatality risk of about 0.02%, compared to about 0.2% for malaria 8. Other studies estimate higher case-fatality risks, although not dramatically higher. For instance a meta-analysis of dengue studies in Latin American and the Caribbean found a pooled case-fatality risk of 0.05% 9. Low mortality may contribute to dengue receiving less attention than other tropical diseases such as malaria which rank higher in terms of traditional measures of disease burden such as the number of years of life lost to death or disability 10. Yet the considerable acute morbidity caused by dengue, which commonly occurs in irregular outbreaks, puts a huge strain on health services, household finances and the wider economy. Hence the case for dengue control will need to be evaluated largely with reference to economic measures of dengue burden, of exactly the kind that Shepard and colleagues have presented.

Shepard and colleagues assembled an array of datasets to inform cost estimates in 141 countries and territories with active dengue transmission. Input data included country-level estimates of dengue episodes from the Global Burden of Disease study, healthcare utilisation from Demographic and Health Surveys, an expert panel survey, as well as 47 country-level economic studies, many of them conducted by the Shepard group and its international collaborators. Even then, data gaps remained for most countries in the study, which were plugged by somewhat heroic extrapolation, using a range of explanatory variables including region, level of health care provision, infant mortality and GDP per capita. Hence their methodology is not beyond criticism, although the shortcomings are arguably unavoidable.

On the other hand, the importance of the results is beyond doubt. By using reasonably consistent methods across settings, the results allow comparisons between countries and regions to be properly drawn for the first time. In particular, the study highlights the cost of dengue in Africa and South Asia where dengue transmission is ongoing but cases are substantially underreported due to low awareness and poor surveillance 11. These data shortcomings may have contributed to underinvestment in developing dengue control measures that are appropriate for those settings. For example, there has yet to be any trials of Dengvaxia® in Africa or South Asia. Yet Shepard and colleagues’ figures imply that the economic burden of dengue in those regions (measured as a proportion of the GDP of the region) is comparable to that in South-East Asia. In Africa, they find that most costs fall outside the hospital sector, and indeed a large proportion of them are borne by families. Of course such comparisons need to be caveated since the estimates in Africa and South Asia are informed by the least local data.

Shepard and colleagues’ estimates will not eliminate the need for local data collection, particularly in areas where data are still lacking. However, they provide impetus to consider the case for dengue prevention in every endemic region in the world.

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