

Editorial

The Economic Burden of Dengue

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Historically, dengue has been considered an unimportant public health problem because mortality rates were low and epidemics occurred only infrequently. In the years after World War II, great progress was made in controlling infectious diseases of all kinds, especially vector-borne diseases, and the war on infectious disease was declared won in the late 1960s.¹ Coincident with this success in disease control was the economic recovery in some countries of Southeast Asia, and urban growth increased as people from rural areas migrated to the cities to find work. The lack of planning, inadequate housing, water, sewage, and waste management in these cities created ideal conditions for dengue viruses and their mosquito vector *Aedes aegypti*, both of which had been spread widely in the region during World War II, to thrive.² The result was the emergence of epidemic dengue hemorrhagic fever. During the 1950s and 1960s, the disease was limited to a few countries in Southeast Asia, but as economic growth expanded, the cities and epidemic dengue also grew, because little effort was made to control the mosquito vector. In the 1970s and accelerating in the last two decades of the 20th century, epidemic dengue expanded regionally and globally. Epidemics increased in both frequency and magnitude, and the viruses became hyperendemic (cocirculation of multiple virus serotypes) in most major cities of the tropics. Despite this alarming emergence of a severe and fatal form of epidemic dengue, the disease was still considered a minor public health problem by policymakers.

In 2012, dengue is the most important vector-borne viral disease of humans and likely more important than malaria globally in terms of morbidity and economic impact. The latest studies estimate 3.6 billion people living in areas of risk, over 230 million infections, millions of cases of dengue fever, over 2 million cases of the severe disease, and 21,000 deaths.³ In addition to the public health and economic costs, there is a major social impact in those countries where large epidemics occur, often disrupting primary care for hospitalized patients.⁴ Given the dramatic urban growth and lack of adequate surveillance for dengue in tropical developing countries in the past 50 years, it is likely that even these figures underestimate the true disease burden of dengue.

Thus, ignored for many years, only recently has the potential magnitude of the dengue problem been acknowledged by policymakers and funding agencies. This acknowledgment has resulted in excellent progress in understanding dengue virus biology and development of dengue vaccines and antiviral drugs but not economic impact of the disease. As the pipeline of dengue vaccine candidates, a number of which are already in clinical trials, has grown, it has become apparent that vaccine access will require more and better studies on the actual cost of

dengue to endemic communities. In recent years, many studies have been conducted in different Asian and American countries in attempts to measure the economic impact of dengue on a community. Although most have contributed valuable information on the subject, none has provided comprehensive data on the actual cost of dengue disease. The work by Halasa and others⁵ provides one of the best studies to date on that subject.

Working in collaboration with the Puerto Rico Department of Health and the US Centers for Disease Control and Prevention Dengue Branch in Puerto Rico, the investigators conducted a comprehensive review of 100 laboratory-confirmed dengue patients who experienced the disease between July of 2008 and March of 2010. The study included both adults and children and hospitalized and ambulatory care patients. Records were reviewed for each patient, who was then subjected to a comprehensive interview about their illness and how it impacted their activities. The work by Halasa and others⁵ measured the cost, both direct and indirect, of dengue in six categories of cases and went to considerable effort to validate their data. The results, perhaps not surprisingly, show the economic burden of dengue in Puerto Rico to be very high. This study is the first study to show the societal distribution of the economic cost of dengue, with the individual household bearing the largest burden (48%) compared with only 24% by the government and 22% by insurance.⁵ The total annual cost of dengue between 2002 and 2010 was \$46.45 million (\$418 million during the 9-year period).⁵

Clearly, there is a need to conduct more comprehensive studies of this kind in other dengue-endemic countries of the world. These kinds of data are needed to allow policymakers and public health officials to make informed decisions on the cost efficacy of dengue control programs. The private sector also needs comprehensive economic analyses to guide decision-making in vaccines and antiviral drug development. Finally, international funding agencies require these kinds of data to establish priorities in public health funding.

Studies of this kind will always have limitations, and this study was no exception. However, the work by Halasa and others⁵ clearly identified the most important limitations, such as recall bias and not being able to estimate the cost of tourism and deaths associated with dengue. The latter two limitations, however, would add to the overall cost of dengue, driving the cost even higher. The fact that the study was supported by a private vaccine manufacturer might raise questions about conflict of interest by some people. In my mind, however, this possibility is not an issue because of the detailed methodology used and the reputation of the Brandeis group as the leader in research on the economic impact of dengue.

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REFERENCES

1. Henderson DA, 1993. Surveillance systems and intergovernmental cooperation. Morse SS, ed. *Emerging Viruses*. Oxford, UK: Oxford University Press, 283–289.
2. Gubler DJ, 1997. Dengue and dengue hemorrhagic fever: its history and resurgence as a global public health problem. Gubler DJ, Kuno G, eds. *Dengue and Dengue Hemorrhagic Fever*. London, UK: CAB International, 1–22.
3. Beatty ME, Letson GW, Margolis HS, 2008. Estimating the global burden of dengue. Abstract book: dengue 2008. Proceedings of the 2nd International Conference on Dengue and Dengue Haemorrhagic Fever; Phuket, Thailand, 2008.
4. Gubler DJ, 2002. Epidemic dengue/dengue hemorrhagic fever as a public health, social and economic problem in the 21st century. *Trends Microbiol* 10: 100–103.
5. Halasa Y, Shepard D, Zeng W, 2012. Economic cost of dengue in Puerto Rico. *Am J Trop Med Hyg* 86: 745–752.