

# Dengue: factors driving the emerging epidemic

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## Dear editor

I have read with great interest the article “Epidemiology of dengue: past, present and future prospects” by Murray et al.<sup>1</sup> Dengue viruses are usually transmitted by *Aedes* mosquitoes, which are highly sensitive to environmental conditions. Temperature, rainfall, and humidity are critical to mosquito survival and reproduction; the higher temperatures minimize the required time for virus replication and dissemination in the mosquito.<sup>2</sup> I accept that dengue will increase in the future as the article outlines, as climate change will contribute to a substantial increase in the number of people, and the proportion of the global population at risk of dengue fever.<sup>3</sup>

Despite the impact of climate change, I strongly believe more factors have contributed to the increase of dengue disease: social and environmental factors; the increase of urbanization; the lack of and/or poor health services; and the expansion of international travel and trade are all linked to the increase of dengue fever.<sup>4</sup> There is still uncertainty regarding the impact of climate change on dengue vectors’ expansion. I agree with the idea that human adaptation to environmental factors, such as drought, through the instillation of water storage tanks, may significantly contribute to the expansion of the disease, other than climate change factors.<sup>5</sup>

The World Health Organization (WHO) described dengue as a “neglected” tropical disease in its Dengue Prevention and Control Strategy 2012–2020, due to the lack of global coordination efforts, researches and political will.<sup>6</sup> From my point of view, I consider that “neglect” is a reason the disease expanded to new regions, infecting new populations, and exposing more people to the risk of infection.

In conclusion, this letter addresses the impact of climate change on dengue disease and discusses other contributing factors that influence the vulnerability of populations to the health impact of climate change.

I agree that the expansion of dengue is multifactorial; climate change is one of the factors, but not the dominant one, since other factors may variously contribute, depending on the situation, and where and how the disease exists. The major factors may include: the unprecedented population growth associated with the urbanization increase in tropical, developing countries; substandard housing; overcrowding; and water and sewer quality.<sup>7</sup>

## Disclosure

The author reports no conflicts of interest in this communication.

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## Authors' reply

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### Dear editor

We appreciate the interest and response generated by our recently published article, "Epidemiology of dengue: past, present and future prospects".<sup>1</sup>

We agree with the author of the correspondence that the reasons for the recent decades' global expansion of dengue are multifactorial. As our review article summarizes, dengue expansion in the past decades has been driven by many factors, of which climate is only one.<sup>1</sup> Human population dynamics such as urbanization, changing patterns of settlement, population growth, international travel, migration, and commercial trade, combined with anthropogenic changes in ecological habitats and neglected vector control, have all contributed to the increased dengue incidence and geographic expansion.<sup>1</sup> The increase in dengue over the last half century is thus a result of the combination of factors that all constitute a matrix of broader "global change".<sup>1,2</sup> Of all the factors mentioned, our personal opinion is that the rapidly increasing global connectivity through travel is one of the main factors for dengue emergence into currently uninfected areas,<sup>3-6</sup> and that uncontrolled urbanization is the main factor for the exponential increase of dengue cases in endemic countries.<sup>5,7</sup>

Climate change, including human adaptation to climate change, may have an increasing impact on the temperature-dependent survival range and seasonality of dengue vector mosquitoes, including the availability of breeding sites, both natural and artificial.<sup>8</sup> In this manner, dengue vector expansion may indirectly be a result of climate change having altered patterns and behaviors of human settlement.<sup>1</sup> Climate-related factors such as rainfall, humidity, and temperature have been shown to correspond with mosquito vector and dengue activity;<sup>9</sup> however, the degree to which climate change is a primary factor driving the growth in dengue incidence remains uncertain and presents an area of ongoing research.<sup>10</sup>

### Disclosure

The authors report no conflicts of interest in this communication.

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