# Dengue and primary care: a tale of two cities

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Dengue virus infection is increasingly being recognized as the world's major emerging tropical disease.[1] Every year about 2.5 billion people worldwide are at risk of dengue. The disease infects an estimated 50 to 100 million individuals and, in some years, is responsible for around as many as 500 000 hospital admissions.[1,2] An average 22 000 people die annually from the disease, three times more than influenza A H1N1 killed in 2009.[1–3]

Brazil is responsible for the highest number of annually reported cases of dengue to the World Health Organization, having reported about 3.5 million cases between 2000 and 2005. This represents 78% of all reported cases in the Americas (approximately 4.5 million cases) and 61% of cases in the world (approximately 5.7 million).[2,4]

Most of the recent dengue epidemics in Brazil have been concentrated in the city of Rio de Janeiro (Rio). Interestingly, Niterói, a neighbour city to Rio, has been much less affected by the recent epidemics.

Three variables are traditionally associated with a high historical incidence of dengue, contributing to an elevated local *Aedes aegypti* infestation rate: (i) vapour pressure (a combined variable of humidity and temperature), (ii) population density, and (iii) environmental availability of disposable recipients that accumulate (rain) water.[1,5,6] Though sharing the same climate (vapour pressure = 68) and having similar population density (approximately 4000 people/km²) and sanitation rates,[7] Rio had twice the dengue incidence (2036 cases per 100 000 inhabitants) than Niterói (1038 cases per 100 000 inhabitants) in 2008.[7,8]

In Niterói, the past 20 years have seen an increase in primary health care coverage from less than 1 to 77.4%. This was paralleled by a significant reduction, not only in the *Aedes aegypti* domiciliary infestation rate (from approximately 10% in 1986 to 1.7% in 2006), but also in the incidence of dengue cases during these years (from 1383 cases per 100 000 inhabitants in 1986 to 189 cases per 100 000 inhabitants in 2006). Conversely, only 7.2% of Rio's population had primary-care coverage in 2008 (the lowest among Brazilian state capitals),[7] and two aforementioned dengue indicators have not changed significantly in the last 20 years (*Aedes* infestation rate: from around 10% in 1986 to 7.2% in 2006; incidence: from 205 cases per 100 000 inhabitants in 1986 to 232 cases per 100 000 inhabitants in 2006).

Even though temporal differences in reporting capacity between Rio and Niterói cannot be ruled out as possible explanations for the above findings, this possibility is rather improbable. In fact, Niterói reporting capacity seems to have improved, not decreased, with primary-care implementation.[9]

Since Rio was the Brazilian capital until 1960, the city health system is still strongly based around its federal and state hospitals and primary care is almost nonexistent.[7] Conversely, Niterói was one of the first Brazilian cities to fully implement primary health care.[9] The similarity in climate matched with the differences in health care between Rio and Niterói make this a unique opportunity to study the effect of the latter variable on dengue epidemic dynamics.

Brazil is currently undergoing one of the most profound health-care reforms taking place in the world.[10] Established in 1994, the centre of this reform is the Family Health Strategy, which is aimed at fully implementing primary care in the country.[10] Because prefectures adhere voluntarily to the programme, it is completely possible, though uncommon, that two neighbour cities like Rio and Niterói could be in such different stages of implementation.

Each one of the local family health strategy teams include 8 local health agents who live in the community. They are the key contacts between the health team and the community. Educating people and looking for potential foci of the mosquito inside homes, these local agents are essential in combating potential foci of *Aedes aegypti*, having visited 82% of all Niterói homes in 2007. Conversely, only 8% of Rio's homes were visited by local health agents in 2007.

Vapour pressure is considered to be the single best natural predictor for the potential for dengue occurrence at any given place.[5] In fact, this variable can explain almost 90% of the variability on dengue incidence around the world.[5] However, there is a major problem with this approach: places were vapour pressure is high are mainly located in highly inequitable developing economies – possibly making this approach ecologically biased. In fact, most of these developing countries have not yet fully implemented comprehensive primary-care systems, a concept that should also include policies that aim for socioeconomic equity, according to the Alma-Ata Declaration of 1978.[11]

It seems that the association of chaotic urbanization with a poor primary-care system is essential to translate the vapour pressure-related effect on dengue into its real occurrence. In this sense, Niterói is not only a lesson for Rio, but also for many other tropical cities that lack a comprehensive primary health care system. ∎

## References

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