Introduction

Dengue is an endemic disease that is rapidly growing worldwide. A recent study estimates that 380 million annual infections occur around the world. Dengue has become one of the major diseases affecting the Brazilian public health. The rising incidence of the disease and its unpredictable outbreaks result in a significant economic impact in the health system and society. In Brazil, tourism revenue is an important part of the GDP, and the Ministry of Health has already recognized the importance of dengue on tourism revenue.

Objective

To estimate the economic impact of a dengue outbreak (incidence of 3,000 dengue cases/100,000 hab) on national and international tourism revenues in Brazil.

Methodology

Step 1: Literature Review

The review was extended to international literature due to the lack of detailed analysis published on the impact of dengue in tourism in Brazil. Most publications estimate the economic impact on tourism (non-observational) considering the impact of Chikungunya outbreak in French Reunion Island and Mauritius in 2005.

In Brazil, estimation was provided by authorities to the local media during the dengue outbreak in 2008. In 2015, dengue outbreaks were the single country significantly impacted on the tourism in some states and cities, which canceled the Carnival festival in order to prioritize the use of resources in disease control programs.

Step 2: Tourism Estimation

Tourism data was obtained from the Ministry of Tourism and non-scientific data published by the authorities in Brazil.

To estimate the economic impact of a dengue outbreak (incidence of ≥300 dengue cases/100,000 hab.) on national and international tourism revenues in Brazil. To estimate the economic impact of a dengue outbreak (incidence of ≥300 dengue cases/100,000 hab.) on national and international tourism revenues in Brazil.

Step 3: Calculation of Impact

Economic impact of dengue outbreak in tourism, which is poorly reported in the literature, causes significant revenue losses for Brazil. Considering a conservative decrease of 4% in tourism in Brazil due to dengue outbreak was assumed. Variation of this parameter was done in the sensitivity analysis.

Table 1. Summary of observational and non-observational studies from literature review.

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<th>Study</th>
<th>Country</th>
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<th>% Travelers for tourism</th>
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Figure 1. Dengue outbreak impact on international tourism (a) and national tourism (b) and total economic impact of dengue outbreak in Brazil

Discussion

Non observational studies have evaluated the revenue lost on tourism a dengue outbreak could represent, based on the impact reported in the findings from observational data. In comparison with Brazil, results provided by this analysis, the tourism revenue for Brazil would be the highest, even considering a conservative impact of 4%. Limitations of these studies include those directly associated with the assumptions made for national tourism.

Conclusion

Dengue outbreak impact on tourism, which is poorly reported in the literature, causes significant revenue losses for Brazil. Considering a conservative decrease of 4% in tourism in Brazil due to dengue outbreak, we obtained an economic impact of dengue of US$ 94 million from international tourists and US$ 0.56 billion from local tourists in Brazil, in 2013, totaling US$ 0.63 million (2013). This economic impact could reach US$ 4.5 billion when the decrease of tourist flow is 15%.

These findings can help policy-makers decide on the introduction of a dengue vaccination in Brazil and could be used for the development of the first dengue vaccine. Also, considering that in addition to a public health cost burden, dengue outbreak could impact the value of real estate in the epidemic regions.

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