

Is Dengue Epidemic Related to Socioeconomic Factors?

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Abstract

We analysed the dengue epidemic in two Brazilian cities in 2002 by conducting a spatial analysis of incidence and reproduction numbers across different planning areas. To explore the impact of urban indices, such as the Human Development Index (HDI) and the number of trips, on the disease, we calculated the correlations between these indices and the characteristics of the disease. Our results indicate that the lack of strong correlations between the measured factors suggests that the transmission process should be regarded as a whole for the city.

Keywords: Dengue; Reproduction numbers; Urban indices; Mobility; Correlations

About the Study

Neglected Tropical Diseases (NTDs) are a group of infectious diseases that primarily affect the poorest populations with limited access to health services, especially those living in remote rural areas and slums. Currently, the World Health Organization (WHO) has classified 20 diseases as priority NTDs. These diseases collectively impact over 1.7 billion people globally, particularly the most vulnerable populations. The consequences can be severe, leading to outcomes such as fatalities, lifelong disabilities and permanent disfigurement. Some of these diseases can be easily prevented through the mass administration of drugs and in recent years, there has been significant progress in reducing their burden and incidence. However, others remain far from being eliminated or even controlled, continuing to be truly neglected. Addressing the epidemics of these diseases represents a critical challenge set forth by the United Nations, with a goal to be achieved by 2030 as outlined in target 3.3 of the Sustainable Development Goals. The 2030 Agenda for NTDs focuses on both the progress made and the persistent challenges in combating these public health issues, underscoring the need for continued commitment and resource allocation. Dengue is a NTD transmitted by the *Aedes aegypti* genus mosquitoes and it is prevalent in tropical and subtropical countries. Nowadays, there is no specific treatment available and management primarily involves pain relief medications. The WHO reported alarming figures for 2023, with over 6.5 million cases documented across more than 80 countries, leading to more than 7,300 fatalities linked to the disease. In Brazil, vaccination is being gradually rolled out since 2024. This highlights the urgency in addressing dengue as a significant public health challenge. In this context, we seek to thoughtfully investigate whether socioeconomic factors that may contribute to the emergence of a dengue epidemic within a fully susceptible population. The dynamics of dengue

transmission are inherently complex, involving interactions between human communities and mosquitoes, the vectors of the virus. We utilized a mathematical model put forth by one of our team members [1] to analyze the dynamics of the disease. Data from the Brazilian National Notifiable Diseases Information System (SINAN) were employed, focusing on two large cities in Brazil that exhibit distinct geo climatic conditions and organizational structures. We analyzed the correlations between various factors associated with the dengue epidemic and two socioeconomic variables. Our findings revealed a non-appreciable correlation in both urban centers examined [2]. This suggests that cities should be considered as integrated entities, where the dynamics of the viruses transmission dominate over the effects of human social structures. The agenda emphasizes the need for a deeper understanding of these relationships to develop effective public health strategies [3-6]. We believe that this is an important contribution of our work because it gives clues on what to take into account when defining public policies.

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