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Correspondence

Have measures against COVID-19 helped to reduce dengue cases in Brazil?

To the Editor,

Dengue fever is the most prevalent vector-borne disease in the Americas and the second most prevalent in the world, reaching over 1.5 million cases in 2019 just in Brazil alone [1]. Currently, all Brazilian states report dengue cases and the incidence has been progressively increasing over the past decade. The State of Sao Paulo is particularly vulnerable because it is the most populous in the country, with approximately 45 million inhabitants, and is highly connected within Brazil and around the world. Its main airport, the Sao Paulo-Guarulhos International Airport, is the largest in Brazil, with non-stop passenger flights to 103 destinations in 30 countries, and 52 domestic flight routes [2]. Sao Paulo's status as an air traffic hub could facilitate the rapid spread of viruses such as dengue. Over the past 25 years, there has been a steady increase in the incidence of dengue in this region [1].

Currently, Brazil is also facing an epidemic of coronavirus disease (COVID-19), with the first cases reported in the end of February 2020. The incidence of dengue tends to increase at the beginning of the year due to the rainy season and high temperatures and peaks in March or April. This temporal pattern means that the COVID-19 epidemic started shortly before dengue reached it seasonal peak thus resulting in simultaneous outbreaks of the two conditions [3]. In the first weeks of 2020, there was an increase in the number of dengue cases reported, exceeding the number reported during the corresponding weeks in 2019. A possible explanation is that this early peak in 2020 could be due to the 2019 epidemic, as in 2016 the number of dengue notifications was higher than average following the 2015 epidemic. Sao Paulo, the epicenter of COVID-19 epidemic in Brazil, however, curiously after the 10th epidemiological week showed an abrupt decrease in dengue notifications (see Fig. 1), coinciding with the intensification of COVID-19 epidemic and, subsequently, the country's measures to control it. To contain the spread of COVID-19, measures of social distancing were adopted, including the avoidance of social contact in workplaces, schools, and other public spheres, and isolation was recommended for the most affected municipalities of Sao Paulo [4].

Given this scenario of abrupt change in the behavior of dengue epidemiological data, two main hypotheses can be raised. First, and more obvious, is that there was under-notification of dengue cases, as has been suggested by others [5]. This reduction could be attributable to the mobilization of epidemiological surveillance teams to respond to the emergence of COVID-19 pandemic after the confirmation of the first cases in Brazil, causing a delay or underreporting of cases of dengue. Furthermore, most of the febrile dengue cases overlap in health centers along with cases of COVID-19, sharing clinical features [2]. If we add the possibility of some false negatives by rapid dengue tests, confusing cases of dengue with COVID-19 could have serious implications not only for the patient but also for public health.

The second hypothesis is that reduced mobility as a result of social isolation due to COVID-19 could have helped to reduce the true incidence of dengue in Brazil. Its known that the introduction of dengue into new populations is mediated by travel of infected individuals to areas that can support transmission, because mosquito vectors move only short distances during their lifetime [6]. For example, comparing urban mobility through the road infrastructure of highways in the State of Sao Paulo with the pattern of dengue dispersion, it is possible to notice an overlap of the dispersion clusters of dengue cases with large state highways (see Fig. 1). In the 20 km buffer around the main highways dengue occurs throughout the year in 87 of the 109 municipalities (about 80%). The decreased incidence of dengue after the 10th epidemiological week in 2020 may be related to decreased mobility as a result of measures implemented to control the COVID-19 epidemic. Measures of social distance and reduced mobility adopted after the first COVID-19 cases may have altered the patterns of dispersion of the dengue virus in the State of Sao Paulo. It is necessary to carry out in-depth studies considering urban mobility data and evolution of the frequency of dengue cases during and after the period of COVID-19 epidemic. This unique situation of social isolation that we are currently experiencing provides a valuable opportunity to test hypotheses such as this, and to potentially improve dengue control strategies in the country.

Ethics approval and consent to participate

The ethical approval or individual consent was not applicable.

Availability of data and materials

All data and materials used in this work were publicly available.

Consent for publication

Not applicable.

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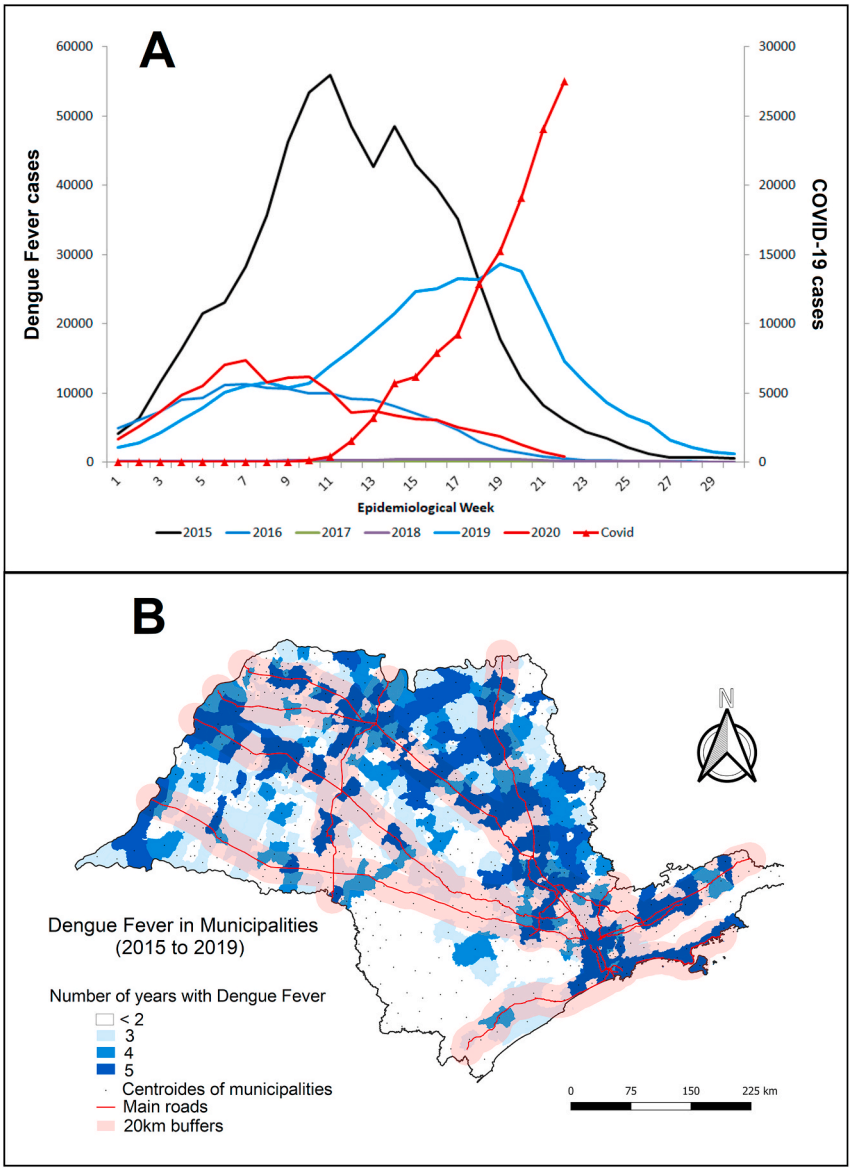

Fig. 1. Incidence of dengue in the State of Sao Paulo. **(A)** Incidence of dengue in the State of Sao Paulo, Brazil between 2015 and 2020 according to epidemiological week and year. After the 10th epidemiological week in March 2020, there was a sharp decrease in the number of dengue notifications, coinciding with the intensification of COVID-19 epidemic and, subsequently, the country's measures to control it. **(B)** Sao Paulo State highway network and dengue occurrence. In the 20 km buffer around the main highways dengue occurs throughout the year in 87 of the 109 municipalities (about 80%). It clusters of high incidence of dengue are located along large state highways, indicating that human mobility plays an important role in the spread of dengue within the State.

Authors' contributions

All authors conceived the study, discussed the results, drafted the first manuscript, critically read and revised the manuscript, and gave final approval for publication.

Declaration of competing interest

The authors declared no competing interests.

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