

**Dengue in the cooling off period of the COVID-19 epidemic in Brazil: from the shadows to the spotlight**

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Dear Editor

Brazil has been endemic for dengue virus (DENV) for decades, but the current panorama of registered cases and deaths by dengue fever in the country is particularly alarming when compared to the same period in the last couple of years<sup>1</sup>. As of the epidemiological week (EW) 19, 855,910 probable cases of dengue were reported, with 323 deaths<sup>1</sup>. This represents an increase of 68.4% in comparison with the entire year of 2021, as it recorded 508,212 cases<sup>2</sup>.

Despite the interventions to reduce the mosquito population, the epidemic has now reached regions that have not reported large outbreaks before, such as the States of the Southern region of the country. Although the COVID-19 pandemic is among the causes of such a burden, we discuss here the impact of the pandemic on the social, health and economic spheres, which ended up leading to this expressive increase in the number of dengue cases. Other reasons that may have an impact on the rise of dengue cases are also pointed out.

Irrespective of the pandemic consequences, in 2022, the climate has been favorable for dengue, with intense and prolonged rains. There has also been a switch from DENV2 to DENV1 as the dominant serotype. Clade replacement in Dengue virus is associated with an increased number of cases and deaths in endemic regions due to differential susceptibility to cross-reactive immune responses<sup>3</sup>. Brazil faced a similar situation during the 2015 epidemics with DENV1 dominating, and in 2019, when DENV2 that was already present, finally replaced DENV1, causing almost 1.7 million cases (Table 1). The dominance of DENV2 since 2019 may have increased overall susceptibility to serotype 1, allowing for a complete switch to DENV1 by 2022, resulting in an explosive epidemic. Despite the astonishing number of cases observed in Brazil fit the hypothesis of a serotype switch, other factors certainly influenced the current epidemiological scenario. During the last two years, the world has been dealing with an unprecedented public health situation. The emergence of the new coronavirus at the end of 2019 exposed

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**Table 1** - Registered dengue cases and deaths in Brazil in the last 10 years<sup>6</sup>.

Year	Number of cases	Deaths	Circulating Serotypes
2013	1,452,489	674	DENV-4
2014	589,107	475	DENV-1
2015	1,649,008	986	DENV-1
2016	1,294,583	701	DENV-1
2017	252,054	185	DENV-2*/DENV-1
2018	205,791	201	DENV-2*/DENV-1
2019	1,557,452	840	DENV-2
2020	979,764	528	DENV-2*/DENV-1
2021	508,212	230	DENV-1*/DENV-2
2022**	855,910	214	DENV-1

\*Main circulating serotype; \*\*Data available until Epidemiological Week 19 of 2022.

Brazil to unique health, social and economic challenges. Brazil has become the second country in the world in terms of absolute deaths from COVID-19 (behind only the US) and is among the first in terms of total number of cases<sup>4</sup>. The healthcare systems were directed to the management of people infected by SARS-COV-2, resulting in a sharp drop in non-COVID healthcare attention in the public health systems, leading to the underreporting of all other diseases.

In addition, the COVID-19 pandemic may have contributed to the decrease in the number of dengue notifications in other ways. For comparison, the number of dengue notifications in Brazil until EW10-2020 exceeded the number of cases observed in EW11-2019<sup>5</sup>. A sudden drop in the number of notifications, however, was noticed from EW10-2020 onwards<sup>6</sup>. At that time, several States implemented actions to combat COVID-19, such as closing non-essential services, banning agglomerations and reducing the availability of public transport. Measures that limit the spatial mobility likely influenced the dengue dynamics, as 0.72 million fewer dengue cases were predicted for 2020 due to COVID-19-related actions to reduce mobility<sup>7</sup>.

The SARS-COV-2 pandemic has also affected the population at economic levels. The unemployment rate in Brazil has skyrocketed amidst the COVID-19 pandemic. In April 2021, the unemployment rate reached 14.7%, the highest rate reported in the indicated period<sup>8</sup>. In the same way, poverty and extreme poverty reached levels only comparable to those seen a decade ago<sup>8</sup>. Although the link between dengue and poverty is still a matter of debate, the main poverty indicators related to dengue incidence include socioeconomic status, housing conditions and water supply, which are key factors to control mosquito breeding<sup>9</sup>.

Even so, the current situation is alarming and the number of cases keeps rising, setting up a whole new situation. The number of cases registered so far is only comparable to those registered in 2013 and 2015, when approximately 1,500,000 cases were reported. Fortunately, we are probably reaching the peak of infections, since the highest incidence rates of dengue in Brazil are in the first half of the year, during the rainy season (although the climate and the rainfall dynamics are different in the various regions of Brazil)<sup>10</sup>. In summary, despite the daily reports of COVID-19 new cases and deaths, dengue remains one of the biggest challenges to the Brazilian Health Care system. We advise sustained surveillance and dedicated governmental efforts to control mosquitoes. The 2022 dengue epidemic exposes the importance of taking the country's global public health situation very seriously.

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## AUTHORS' CONTRIBUTIONS

CSS and CMR contributed equally to the manuscript.

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