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# Comparing climatic and socioeconomic factors inside and outside the high-risk spatial clusters of Chkiungunya and Zika in Brazil

Chikungunya and Zika diseases are caused by viruses from the families Togaviridae and Flaviviridae, respectively. These diseases are subject to climate change, as temperature and precipitation variations can affect the survival, reproduction and distribution of the virus and its vector. Chikungunya and Zika have been reported in over 115 and 92 countries, respectively. The Brazilian Ministry of Health has reported continuing transmission in Brazil, and when comparing 2022 and 2021, there was an increase in chikungunya and Zika cases of 78.9% and 42.0%, respectively. The objectives are identifying high-risk areas for these arboviruses in the 5,570 Brazilian municipalities between 2015 and 2021 and their relationship with climate and socioeconomic factors. The databases were obtained from the Brazilian Notifiable Diseases Information System. High-risk spatial clusters were identified based on scan statistics using sex and age indirectly standardized data and the Poisson probability distribution. The maximum size of the cluster population was obtained with the Gini index. We used the mean t-test to compare the temperature, precipitation, and socioeconomic variables between the inside and outside municipalities of the high-risk spatial clusters. We identified 38 (accounting for 707 municipalities) and 53 (accounting for 520) high-risk clusters for chikungunya and Zika, respectively. Zika clusters were distributed mainly in the center-west Brazilian region, and chikungunya clusters were the most spread in the northeast. The t-test showed that municipalities included in high-risk clusters for both diseases had higher maximum and minimum temperatures than those not included. This corroborates other studies that show temperature influencing Aedes distribution patterns and, consequently, the diseases incidence. The probable temperature increase in the future may indicate an increased in the occurrences of these diseases. Municipalities included in chikungunya high-risk clusters had lower proportions of households with water supply, sewage systems, and garbage collection, and worse socioeconomic level than those not included. The municipalities in high-risk spatial clusters presented lower precipitation levels for chikungunya and higher level for Zika. This contradictory result may be a consequence of a stronger relationship of chikungunya with the socioeconomic level than Zika. The lower level of precipitation in the chikungunya high-risk clusters could be related to areas with extremely dry conditions and harmful socioeconomic levels, favoring the inadequate water storage. Both conditions lower and higher precipitation levels, favor the increase of the number of artificial and/or natural breeding sites and the occurrence of arboviruses. Find Zika clusters mainly in the center-west could be related to the highest proportion of municipalities with disposal of solid waste in dumps in this region. Furthermore, this region is presenting the most significant increase in the infestation of Ae. albopictus, which is considered a secondary vector of Zika virus. In conclusion, it was possible to select areas at high-risk for arboviruses for directing and optimizing the implementation of surveillance and control measures. This is important because the vector control and medical costs associated with these diseases are high. In addition, our results indicate that climate change and socioeconomic factor had to be taken into account for disease control.

**Audience Take Away Notes**

- The importance of climate and socioeconomics in the distribution of arbovirus diseases

- Zika and Chkiungunya have different distributions in Brazil

- The municipalities inside the high-risk clusters for both arboviruses had higher maximum and minimum temperatures than the outside

- The municipalities inside the chikungunya high-risk clusters had worse socioeconomic levels and lower precipitation levels

- The municipalities inside the Zika high-risk clusters had higher precipitation levels and the highest proportion of municipalities with disposal of solid waste in dumps

**Biography**

Dr. Raquel Gardini Sanches Palasio graduated as a biologist in 2007 at University Center Foundation Santo Andre. She was a trainee in Superintendence for Endemic Disease Control at the Laboratory of Biochemistry and Molecular Biology, Brazil, in 2009-2011. She graduated as master's degree in 2013 from the State University of Campinas, Brazil. She received her Ph.D. degree in 2019 at the University of Sao Paulo. In 2022, she began postdoctoral fellowship supervised by Dr. Francisco Chiaravalloti-Neto at the Laboratory of Spatial Analysis in Health at same University.