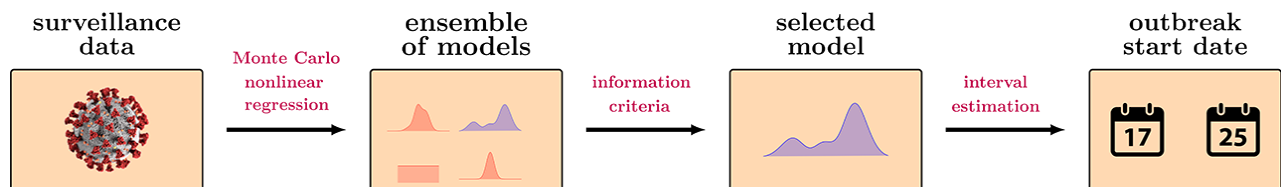11 March 2022

Statistical framework picks out starting dates and possible triggers of COVID-19 waves

Ashley Piccone

Combining surveillance data, nonlinear regression, and information criteria to make a statistical model of pandemic waves

COVID-19 dynamics are different from many diseases in that there have been multiple waves of disease outbreak within the span of a year. Characterizing the triggers of these outbreaks can help inform policy and prevent future spread.

Gianfelice et al. developed a statistical framework to fit COVID-19 surveillance data patterns and infer the starting date of each outbreak using nonlinear regression and information criteria. The model provided an upper bound, or final date, for the start of each outbreak.

"We know that the virus was circulating before the first notification because, in new diseases, typically, the first case that is identified is not the first case that really occurred," said author Americo Cunha Jr. "We focused on a specific date for the start of community transmission."

The team used Rio de Janeiro as a case study because of the city's data availability and large carnival event in February 2020. The event likely had an influence on the spread of the disease, as they found the original strain of the coronavirus was already spreading at that time, a month before it was first recognized in Brazil.

"The importance of understanding the dates is to distinguish between the triggers," said Cunha. "The date can forecast an event that started the outbreak — it could be a holiday or a regional party, but you may also have the introduction of a new virus strain or different social behaviors."

The authors plan to use the model for more cities in Brazil and hope others will use it for cities across the globe to identify commonalities in coronavirus spread.

Source: "The starting dates of COVID-19 multiple waves," by Paulo Roberto de Lima Gianfelice, Ricardo Sovek Oyarzabal, Americo Cunha Jr, Jose M.V. Grzybowski, Fernando da Conceição Batista, and Elbert E. N. Macau, *Chaos* (2022). The article can be accessed at https://doi.org/10.1063/5.0079904.

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