Study shows equatorial regions in Brazil less affected by 2009 influenza pandemic

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The death toll of the 2009 influenza pandemic in equatorial climates may have been much lower than originally thought, according to a study supported by the National Institutes of Health's Fogarty International Center. The paper, published in *PLoS ONE*, challenges the idea that the pandemic was deadlier in the tropics, which harbor nearly half of the world's population and which have the highest burden of infectious disease.

The study may have a direct bearing on global estimates of pandemic burden and on the assessment of immunological, socioeconomic and environmental drivers of the outbreak, according to Fogarty researcher Dr. Wladimir J. Alonso, who led the study. The authors stressed that comparing disease burden as reliably as possible is critical in areas with competing health priorities and limited resources, as is the case for Brazil and other countries in the equatorial region.

Alonso's group of epidemiologists found evidence of far milder and delayed influenza pandemic mortality towards areas of Brazil closer to the equator. "We found that respiratory mortality was substantially higher during the pandemic in the southern and richer half of Brazil, where its circulation coincided with the colder winter months," said Alonso. "But even more puzzling, little or no difference from pre-pandemic mortality levels was identified in equatorial regions."

To arrive at these estimates, the researchers investigated laboratory-confirmed pandemic deaths in each Brazilian state and estimated the

mortality burden caused by the pandemic that was above what would be expected in an average year. The analytical approach they employed determined baseline mortality in pre-pandemic years by considering the usual variability—including that of seasonal epidemics—in each location, and let them compare the impact of the pandemic across areas with different climatic and epidemiological profiles.

The observed difference in pandemic mortality spanned more than 2,700 miles and was independent of social and demographic factors, with lower-income states being less affected by the pandemic. The findings also suggested that, similar to seasonal influenza, climate played a key role in the dynamics of the outbreak.

The researchers included data going back to 1996, using mortality statistics from two independent sources maintained by the Brazilian government. "Brazil represents a unique opportunity, as it has a large population dispersed across climate zones and yet also exposed to uniform immunization and mitigation efforts," said Dr. Cynthia Schuck-Paim, director of Origem Scientifica Ltd. Data Analysis in Sao Paulo, Brazil, and the lead author of the article.

According to Alonso, the study is the first to generate such results. "The finding that the severity and timing of circulation of this pandemic strongly depended on latitude does not imply that future pandemics will behave similarly," Alonso said. "Research on other past pandemics, such as the flu that swept the globe in 1918 and killed an estimated 50 million people, is also crucial for the elaboration of better preparedness plans."

Provided by National Institutes of Health

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