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New Study Provides Robust Evidence that COVID-19 is a Seasonal Infection

By using a statistical method designed to detect transitory associations as well as a mathematical model, the authors show that climate played a strong role in modulating viral transmission during the pandemic waves in both hemispheres

Barcelona, October 21, 2021- A new study led by ISGlobal, an institution supported by “la Caixa” Foundation, provides robust evidence that COVID-19 is a **seasonal infection linked to low temperatures and humidity**, much like seasonal influenza. The results, published in *Nature Computational Science*, also support the considerable contribution of airborne SARS-CoV-2 transmission and the need to shift to measures that promote “air hygiene”.

A key question regarding SARS-CoV-2 is whether it is behaving, or will behave, as a seasonal virus like influenza, or whether it will be equally transmitted during any time of the year. A **first theoretical modelling study suggested that climate was not a driver** in COVID-19 transmission, given the high number of susceptible individuals with no immunity to the virus. However, some observations suggested that the initial propagation of COVID-19 in China occurred in a latitude between 30 and 50° N, with low humidity levels and low temperatures (between 5° and 11 °C).

“The question of whether COVID-19 is a genuine seasonal disease becomes increasingly central, with implications for determining effective intervention measures,” explains **Xavier Rodó**, director of the **Climate and Health programme** at ISGlobal and coordinator of the study. To answer this question, Rodó and his team first analysed the association of temperature and humidity in the initial phase of SARS-CoV-2 spread in **162 countries across five continents**, before changes in human behaviour and public health policies were put into place. The results show a negative relationship between the transmission rate (R_0) and both temperature and humidity at the global scale: **higher transmission rates were associated with lower temperatures and humidity**.

The team then analysed how this association between climate and disease evolved over time, and whether it was consistent at different geographical scales. For this, they used a statistical method that was specifically developed to identify similar patterns of variation (i.e. a pattern-recognition tool) at different windows of time. Again, they found a strong negative association for short time windows between disease (number of cases) and climate (temperature and humidity), with **consistent patterns during the first, second and third waves of the pandemic at different spatial scales**: worldwide, countries, down to individual regions within highly affected countries (Lombardy, Thüringen and Catalonia) and even to the city level (Barcelona).

The first epidemic waves waned as temperature and humidity rose, and the second wave rose as temperatures and humidity fell. However, **this pattern was broken during summertime in all continents**. “This could be explained by several factors, including mass gatherings of young people, tourism, and air conditioning, among others,” explains **Alejandro Fontal**, researcher at ISGlobal and first author of the study.

When adapting the model to analyse transient correlations at all scales in countries in the Southern Hemisphere, where the virus arrived later, the same negative correlation

was observed. The **climate effects were most evident at temperatures between 12° and 18°C and humidity levels between 4 and 12 g/m³**, although the authors warn that these ranges are still indicative, given the short records available.

Finally, using an epidemiological model, the research team showed that **incorporating temperature into the transmission rate works better for predicting the rise and fall of the different waves**, particularly the first and third ones in Europe. “Altogether, our findings support the view of COVID-19 as a true seasonal low-temperature infection, similar to influenza and to the more benign circulating coronaviruses,” says Rodó.

This seasonality could contribute importantly to the transmission of SARS-CoV-2, since low humidity conditions have been shown to reduce the size of aerosols, and thereby increase airborne transmission of seasonal viruses such as influenza. “This link warrants an **emphasis on ‘air hygiene’ through improved indoor ventilation** as aerosols are capable to persist suspended for longer times,” says Rodó, and highlights the **need to include meteorological parameters in the evaluation and planning of control measures**.

Reference

Fontal A, Bouma MJ, San José A, Lopez L, Pascual M, Rodó X. Climatic signatures in the different COVID-19 pandemic waves across both hemispheres. *Nature Comput Sci.* 2021. <https://doi.org/10.1038/s43588-021-00136-6>

About ISGlobal

The Barcelona Institute for Global Health, ISGlobal, is the fruit of an innovative alliance between the “la Caixa” Foundation and academic and government institutions to contribute to the efforts undertaken by the international community to address the challenges in global health. ISGlobal is a consolidated hub of excellence in research that has grown out of work first started in the world of health care by the Hospital Clínic and the Parc de Salut MAR and in the academic sphere by the University of Barcelona and Pompeu Fabra University. Its working model is based on the generation of scientific knowledge through Research Programmes and Groups, and its translation through the areas of Training and Analysis and Global Development. ISGlobal has been named a Severo Ochoa Centre of Excellence and is a member of the CERCA system of the Generalitat de Catalunya.

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