Medical Xpress

New study shows link between weather and spread of COVID-19

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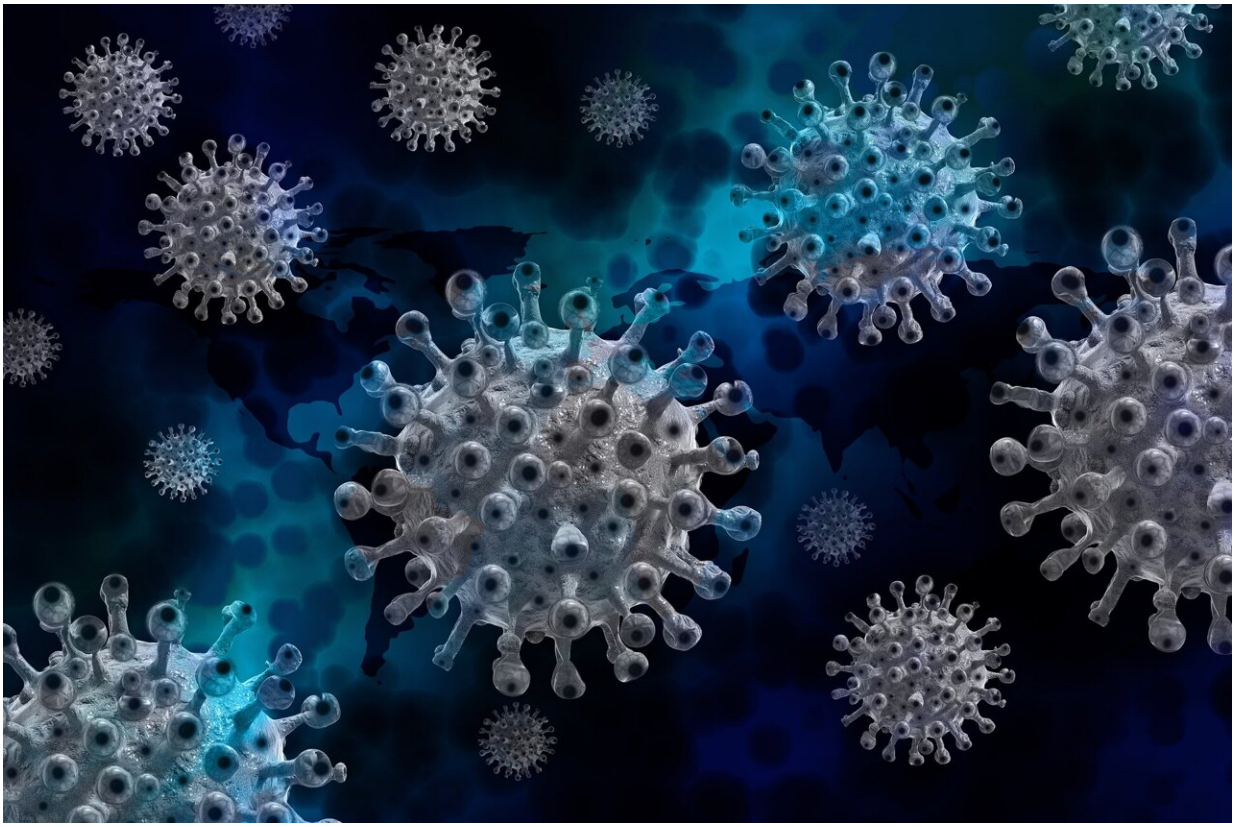

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A new meta-analysis of over 150 research papers published during the early stages of the COVID-19 pandemic has shown the link between the weather and the spread of the illness.

The study, published in the journal Weather, Climate, and Society, was conceived and conducted at The University Manchester and led by Ling Tan, a visiting scientist at the Centre for Crisis Studies and Mitigation. The team started with 158 studies that were published early in the pandemic using data before November 2020.

Because many viral respiratory diseases show seasonal cycles, weather conditions could affect the spread of COVID-19. Although many studies tried to examine this possible link, their results were often inconsistent.

Tan performed meta-regression analysis on the data from previously published articles to make sense of this large body of data derived from locations all around the world, using inconsistent research methods, and using a variety of different datasets with varying study quality. The results were exceptionally revealing.

From this large dataset, the team found several principal findings, including that 80 of the 158 studies did not state the time lag between infection and reporting, rendering these studies ineffective in determining the weather–COVID-19 relationship.

The data also showed Asian countries had more positive associations for air temperature than other regions, possibly because the temperature was undergoing its seasonal increase from winter to spring during the rapid outbreak of COVID-19 in these countries showing how correlation does not necessarily imply causation. Higher solar energy was also associated with reduced COVID-19 spread, regardless of statistical analysis method and geographical location.

"What was most surprising to me was that over half of the studies we examined (80 out of 158) did not say that they accounted for the time lag between the weather on the day the people were infected and the day when their COVID-19 illness was reported. We know this could be as

much as two weeks," says Professor David M. Schultz.

Lead author Ling Tan said: "The public generally believes that there is a negative relationship between temperature and COVID-19, such as the higher the temperature, the slower the spread of the pandemic. However, previous studies did not consistently get this result. We found two reasons for this. First, most of these studies use a simple analysis approach called linear regression, which would produce a straight line for all temperatures. But, the stability of the virus may be maximum at moderate temperatures, for example; very low and very high temperatures may make the virus inactive, for which linear regression would be an inappropriate analysis."

"Second, the rapid outbreak of the COVID-19 pandemic in some countries in the early stages would overwhelm the more subtle weather effects. Thus, we recommend that future studies use nonlinear regression models to capture the association between weather and COVID-19."

Professor David Schultz, who was a co-author on the study said: "What was most surprising to me was that over half of the studies we examined (80 out of 158) did not say that they accounted for the time lag between the weather on the day the people were infected and the day when their COVID-19 illness was reported. We know this could be as much as two weeks. Thus, these studies were either poorly designed or poorly communicated. Thus, we had to throw these studies out of further analysis because we couldn't trust their results."

The results from the meta-regression analysis surprised the researchers who began to see links with sunlight on the virus spread. "We were able to show across these remaining 78 studies that higher solar energy was associated with reduced COVID-19 spread, regardless of statistical analysis method and the geographical location of the study, possibly due to the benefits of ultraviolet radiation and vitamin D on reducing

COVID-19 spread or because sunlight inactivates the virus." said Professor Schultz.

This research also suggests best practices that should be considered in future studies of disease and weather conditions.

More information: Ling Tan et al, How is COVID-19 affected by weather? Meta-regression of 158 studies and recommendations for best practices in future research, *Weather, Climate, and Society* (2021). DOI: 10.1175/WCAS-D-21-0132.1

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