



Changing seasons might affect the transmission of SARS-CoV-2.

WHY COVID OUTBREAKS LOOK SET TO WORSEN THIS WINTER

It's unclear whether COVID-19 is seasonal like the flu – but out-of-control clusters are likely to grow.

By Smriti Mallapaty

Winter is approaching in the Northern Hemisphere, and researchers warn that COVID-19 outbreaks are likely to get worse, especially in regions that don't have the virus's spread under control.

"We are looking at some pretty sobering and difficult months ahead," says David Relman, a microbiologist at Stanford University in California.

Infections caused by many respiratory viruses, including influenza and some coronaviruses, swell in winter and drop in summer. Researchers say it's too early in the COVID-19 pandemic to say whether SARS-CoV-2 will become a seasonal virus. But growing evidence suggests that a small seasonal effect will probably contribute to bigger outbreaks in winter, on the basis of what is known about how the virus spreads and how people behave in colder months.

People will interact more often indoors in places with poor ventilation, which increases the risk of transmission, says Mauricio Santillana, a mathematician at Harvard Medical School in Boston, Massachusetts, who models disease spread.

But even if there is a small seasonal effect, the main driver of increased spread will be the vast number of people who are still susceptible to infection, says Rachel Baker, an epidemiologist at Princeton University in New Jersey. That means people in places that are going into summer shouldn't be complacent, either.

"By far the biggest factor that will affect the size of an outbreak will be control measures such as social distancing and mask wearing," says Baker.

Seasonal trends in viral infection are driven by multiple factors, including people's behaviour and the properties of the virus. Laboratory experiments reveal that SARS-CoV-2 favours cold, dry conditions, particularly out of direct sunlight. For instance, artificial ultraviolet radiation can inactivate SARS-CoV-2 particles on surfaces¹ and in aerosols², especially in temperatures of around 40°C. Infectious virus also degrades faster on surfaces in warmer and more humid environments³. In winter, people tend to heat their houses to around 20°C, and the air is dry and not well ventilated, says Dylan Morris, a mathematical biologist at Princeton. "Indoor conditions in the winter are pretty favourable to viral stability."

To assess whether infections with a

particular virus rise and fall with the seasons, researchers typically study its spread in a specific location, multiple times a year, over many years. But without the benefit of time, they have tried to study the seasonal contribution to SARS-CoV-2 transmission by looking at infection rates in various places worldwide.

A study⁴ published on 13 October looked at the growth in SARS-CoV-2 infections in the first four months of the pandemic, before most countries introduced controls. It found that infections rose fastest in places with less UV light, and predicted that, without any interventions, cases would dip in summer and peak in winter.

But Francois Cohen, an environmental economist at the University of Barcelona in Spain, says that testing was limited early in the pandemic, and continues to be unreliable, so it is impossible to determine the effect of weather on the spread of the virus so far.

Climate effect

Baker has tried to tease apart the effect of climate on the seasonal pattern of cases during the course of a pandemic, using data about the humidity sensitivity of another coronavirus. She and her colleagues modelled⁵ the rise and fall in infection rates over several years for New York City with and without a climate effect, and with different control measures. They found that a small climate effect can result in substantial outbreaks when the seasons change if control measures are only just working.

If SARS-CoV-2 can survive better in cold conditions, it's difficult to disentangle that contribution from the effect of people's behaviour, says Kathleen O'Reilly, a mathematical epidemiologist at the London School of Hygiene and Tropical Medicine. "Flu has been around for hundreds of years, and the specific mechanism as to why you have peaks of flu in the winter is still poorly understood," she says.

Over time, seasonal effects could play an important part in driving infection trends, as more people build up immunity. This could take up to five years through natural infection, or less if people are vaccinated, says Baker.

But whether a seasonal pattern emerges at all will depend on factors that are yet to be understood, including how long immunity lasts and how likely it is that people can be reinfect, says Colin Carlson, a biologist who studies emerging diseases at Georgetown University in Washington DC.

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