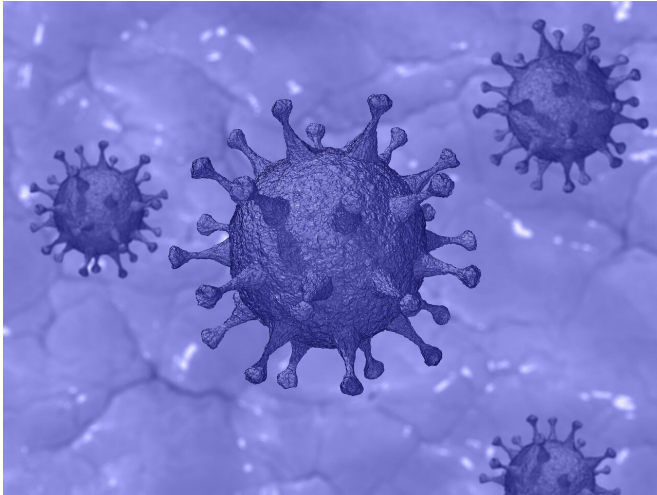


COVID-19 will likely get worse in the winter, thanks to biology and behavior

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Pennsylvania is at the beginning of a fall COVID-19 surge, the state's health secretary said Wednesday, matching experts' predictions that cooler weather will worsen the coronavirus' spread.

That's likely both because of biology and behavior, though scientists say the latter may matter more.

"As it gets colder, people spend more time indoors and that will increase their risk of exposure to the [virus](#)," said Nate Wardle, a spokesperson for the department of health.

Health Secretary Rachel Levine noted that around the country, small gatherings tend to be driving case count increases, "and I feel like we're seeing that in Pennsylvania," she said Wednesday.

The choices people make in fall and winter - whether to meet indoors, continue to wear masks, or maintain distance - are likely going to be the biggest determinants of how serious a cold

weather surge could be, according to a Princeton study released in September but not yet peer reviewed, said Rachel Baker, postdoctoral research associate at the Princeton Environmental Institute and the study's lead author.

"Indoor gatherings are going to be higher risk," she said, due to indoor air being more stagnant than air outside. "If we think the virus can be partly airborne then being indoors you sort of trap it."

Baker believes the newness of this virus also means [seasonal changes](#) that normally decrease viral spread are less impactful. Human immune systems have no familiarity with COVID-19, she said, which might be why summer, typically a less friendly environment for viruses, didn't squelch the pandemic. The study notes the virus has spread effectively in environments ranging from India's [monsoon season](#) to winter in Wuhan.

Baker's study, which focused on New York City, also found that the level of immunity people acquire after recovering from COVID-19 will also matter in how the virus spreads this winter, particularly in areas that were hit hard this spring.

Any effect climate may have on the virus' rate of transmission is, "something we're only going to be able to tease out after we've seen one full year of spread of SARS-CoV-2," said Stephen Kessler, a research fellow in the department of immunology and infectious diseases at Harvard T.H. Chan School of Public Health, in a conference call Wednesday.

In fact, the reasons climate affects any viruses are not completely understood. Generally, researchers believe temperature and humidity play roles in how well the virus can survive in the air, and thus make its way into your body.

Critical to a virus' resilience outside a body is the integrity of its lipid sheath, a fatty substance with a

gel-like consistency in cooler air, according to National Institutes of Health research on flu viruses. Like butter in a hot pan, that layer becomes more liquid and less protective of the virus in warmer weather. Drier air may also help a virus' spread, a 2007 study on the flu from Mount Sinai School of Medicine in New York City found, possibly because lower humidity dries out the nose's protective mucus and allows viral particles to stay aloft longer, since they are less likely to be weighed down by water particles in a dry environment.

Those findings, though, have exceptions depending on the virus, and aren't universally accepted. There also isn't enough research yet to clarify whether they apply to COVID-19.

An April study published in the medical journal *The Lancet* found the virus didn't survive as well in higher temperatures. In September, researchers from the University of Nicosia in Cyprus looked at the effects of temperature, humidity, and wind on COVID-19 and found saliva droplets contaminated with the virus evaporated faster in high temperatures. The study also found low humidity caused droplets to evaporate more quickly.

If climate has any effect on the virus' spread it will probably be most pronounced in a few months, Kessler said. Flu season tends to be from August to October, but seasonal coronaviruses similar to COVID-19 hit hardest in colder months.

"Seasonal coronavirus transmission peaks pretty reliably in the northern hemisphere some time in December or January," Kessler said. "We're a little bit more likely to see these resurgences of infection a little bit later in the year."

Most recently, a group of researchers from Boston Children's Hospital published a study in *Nature* this month that evaluated the virus' spread in China. Researchers concluded the effects of temperature and humidity on the pandemic were negligible, at best.

"Sustained transmission and rapid growth of cases were observed over a range of temperatures and humidity conditions ranging from cold and dry provinces in China, such as Jilin and Heilongjiang,

to tropical locations, such as Guangxi and Taiwan," the study found.

What seemed to matter most in slowing transmission rates, the study found, were nonpharmaceutical interventions. In other words, keep wearing a mask and limiting indoor gatherings.

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