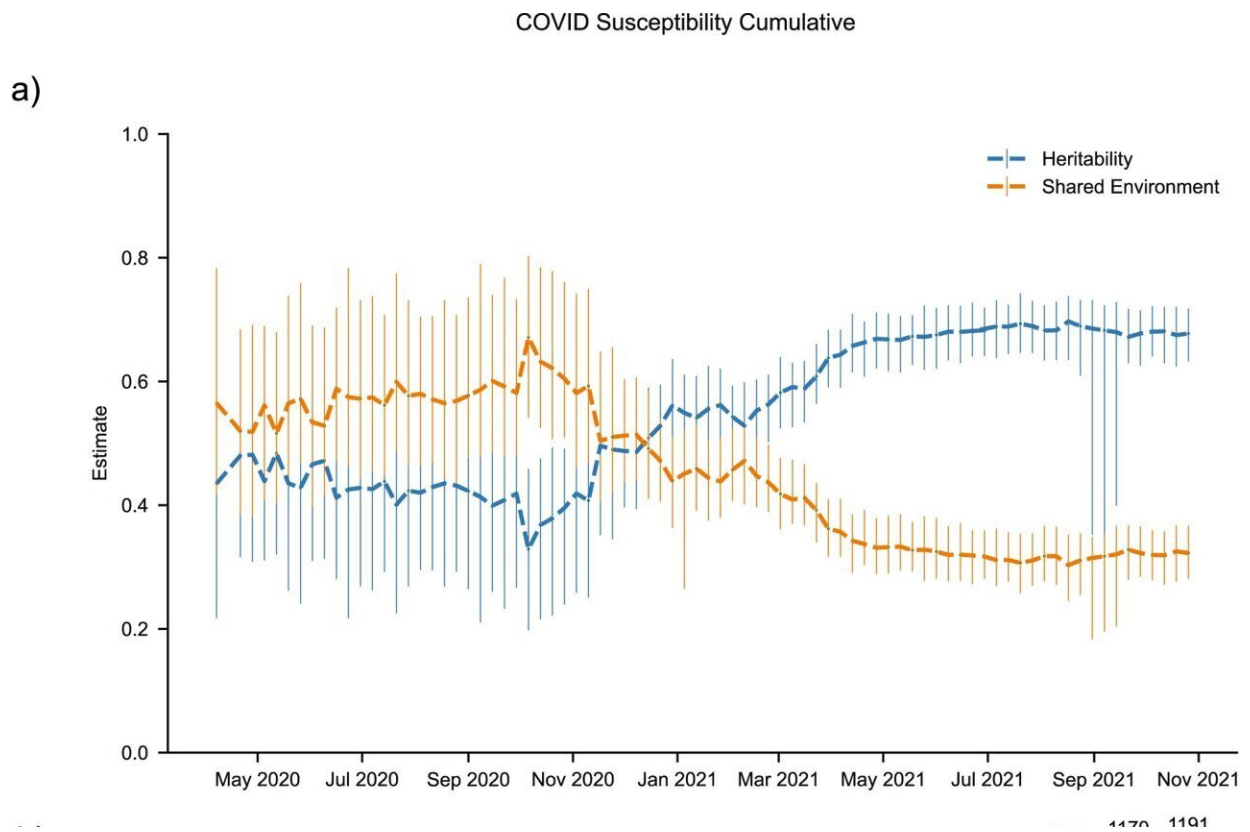


Investigators explore what factors increase susceptibility to COVID-19

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Heritability and shared environment estimates over time for SARS-CoV-2 susceptibility. a) Cumulative heritability and shared environment estimates with 95% CI. Center points are the heritability and shared environment estimates from the model associated with the median, significant heritability estimate. $n = 3174$ patients. b) Bar chart shows the number of families in each analysis. c) Bar chart with daily 7 day average cases in New York City. Credit: *Nature Communications* (2024). DOI: 10.1038/s41467-023-44250-7

Investigators in the Department of Computational Biomedicine at Cedars-Sinai wanted to find out which factors influenced susceptibility to COVID-19 infection and disease severity the most. Was it genetics? Or was it home environment, meaning the germs circulating throughout your everyday life?

Their [findings](#), published in the journal *Nature Communications*, suggest that more was in play than either factor alone.

"Our results suggest that initially, differences in shared [home environment](#) influenced who was infected with COVID-19 more than [genetic differences](#)," said Katie LaRow Brown, MA, first author of the study and a Ph.D. candidate at Columbia University who collaborated with Cedars-Sinai on this study.

"Over time, however, the importance of these differences in shared home environment decreased—and the importance of genetics increased—eventually eclipsing shared home environment."

COVID-19 has infected more than 340 million people in the U.S., underscoring the urgency in conducting therapeutic research and uncovering potential treatments. However, until this study, little was known about how an individual's environment and genetic background impacted their experience with the virus.

Using [electronic health records](#) from New York-Presbyterian/Columbia University Irving Medical Center, investigators identified 12,764 patients who received conclusive results—either positive or negative—from a PCR test for COVID-19. These patients belonged to 5,676 families with an average of 2.5 [family members](#) who had a bout of COVID-19. The time frame studied was Feb. 21, 2020, to Oct. 24, 2021.

The investigators' analysis found that at the start of the pandemic,

genetics accounted for 33% of variation in susceptibility. By the second half of the research study, however, genetics accounted for 70% of variation in susceptibility.

When measuring patients' severity of COVID-19, investigators also found that a patient's genetics were more of a factor than his or her home environment. Disease severity was defined by length of hospital stay. Genetics explained 41% of variation while shared environment explained 33%.

"We were especially surprised by the percentages of susceptibility," said Nicholas Tatonetti, Ph.D., senior and corresponding author of the study, vice chair of Operations in the Department of Computational Biomedicine and an associate director of Computational Oncology at Cedars-Sinai Cancer. "Since this is an infectious disease, we assumed that home environment differences would explain most variation for the entirety of the study."

While Tatonetti says his team of investigators cannot know for certain, they suspect that over time, discrepancies between people's home environments changed in important ways.

"This work also suggests that the specific genetic factors influencing susceptibility and severity have not been fully identified," said Tatonetti. "This is very important in terms of directing resources and defining future research goals."

Jason Moore, Ph.D., chair of the Department of Computational Biomedicine and a professor of Medicine, said the study provides critical information and insights for future pandemics.

"The age-old debate of what matters most—genetics or your environment—continues through the work of this important study," said

Moore.

More information: Kathleen LaRow Brown et al, Estimating the heritability of SARS-CoV-2 susceptibility and COVID-19 severity, *Nature Communications* (2024). [DOI: 10.1038/s41467-023-44250-7](https://doi.org/10.1038/s41467-023-44250-7)

Provided by Cedars-Sinai Medical Center

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