

In endemic settings, behavioral adjustments can fully compensate increasing infection risk: Study

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To reduce the transmission during the COVID-19 pandemic and to lower infection rates, so-called non-pharmaceutical intervention (NPI)

measures such as mask-wearing and social distancing were prescribed in many regions of the world.

These measures have since been loosened, and compliance with them is largely left up to each individual. But how can such individual decision-making affect a long-term infection levels? Researchers at the University of California, Berkeley, U.S. and the Max Planck Institute for Evolutionary Biology in Plön, Germany, are investigating this question.

The study, titled "Dynamics in a behavioral-epidemiological model for individual adherence to a nonpharmaceutical intervention," was [published](#) in the *Proceedings of the National Academy of Sciences*.

The authors developed a coupled epidemiological and behavioral model that takes into account both epidemiological development and individual decision-making for adherence to an NPI. Using this model, the authors examined possible long-term behavioral-epidemiological trajectories. They found that there are three possible stable scenarios: either no one complies, everyone complies, or there is an intermediate level of partial compliance with the NPI.

"Surprisingly, if partial compliance with the NPI is the long-term outcome, we find that the number of infections does not depend on the transmission rate at all due to behavioral compensation," said first author Chadi M. Saad-Roy, Miller Research Fellow at the Miller Institute for Basic Research in Science at the University of California, Berkeley, adding, "This finding has a number of important implications."

Factors influencing the transmission rate and the role of vaccination

"Many factors can affect [transmission rates](#), from increasing rates

through evolution of the virus to decreasing rates through prescribed additional NPIs," said co-author Arne Traulsen, director of the Department of Theoretical Biology at the Max Planck Institute for Evolutionary Biology. "Our work suggests that such a change in [transmission](#) rate is not per se associated with a change in infection rate."

NPIs are often used in conjunction with pharmaceutical interventions, such as vaccination. The authors therefore included vaccination in their model. "Even in the situation of partial adherence, where the infection rate does not depend on the [transmission rate](#), we find that vaccination reduces the [infection](#) rate," Saad-Roy added.

"More generally, we also find situations where there is a potential tension between individual and societal perspectives, and suggest strategies to reduce this tension. Overall, this work shows the importance of considering the potential impact of individual choices on epidemic dynamics," Traulsen said.

More information: Chadi M. Saad-Roy et al, Dynamics in a behavioral–epidemiological model for individual adherence to a nonpharmaceutical intervention, *Proceedings of the National Academy of Sciences* (2023). [DOI: 10.1073/pnas.2311584120](https://doi.org/10.1073/pnas.2311584120)

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