Targeted methods to control SARS-CoV-2 spread

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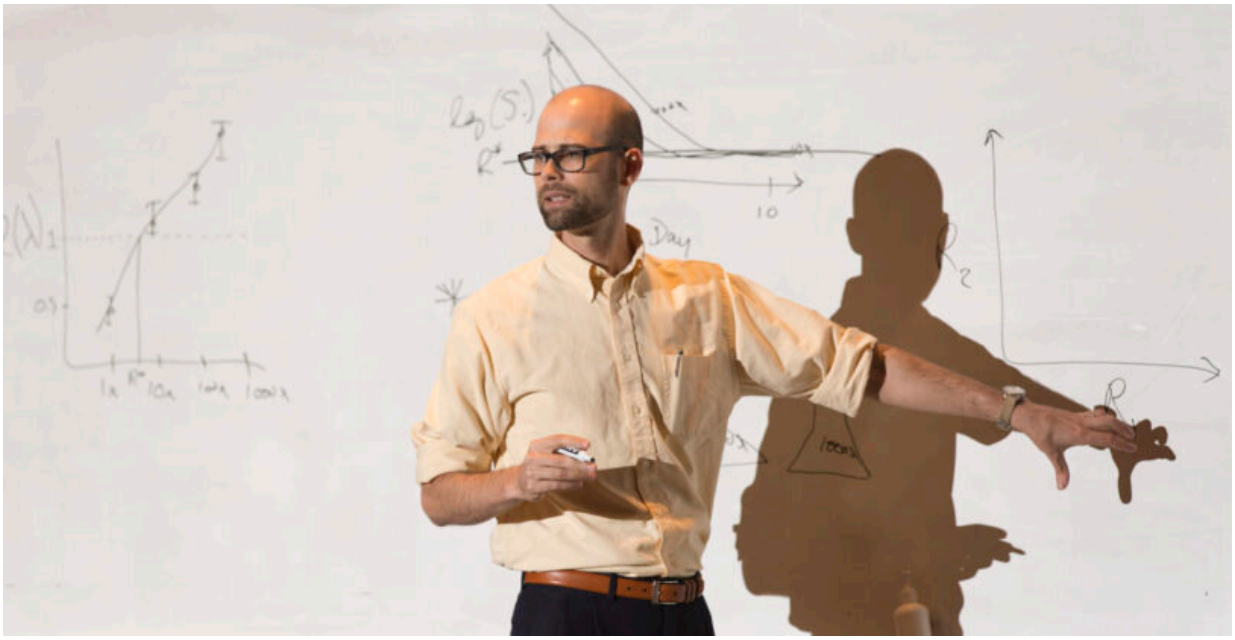

John Drake in the Ecology Auditorium at UGA. Credit: Andrew Davis Tucker

At the beginning of the COVID-19 pandemic, intense social distancing and lockdown measures were the primary weapon in the fight against the spread of SARS-CoV-2, but they came with a monumental societal burden. New research from the Center for the Ecology of Infectious Diseases and the College of Public Health at the University of Georgia explores if there could have been a better way.

Published in the journal *Proceedings of the Royal Society B*, the research analyzes more palatable alternatives to the kind of social distancing mandates that threw a wrench at how businesses, schools and even family gatherings work. The alternatives—widespread testing, contact tracing, quarantines, certification for non-infected people and other public health policy measures—can slow the spread when combined together, but only with significant investments and broad public compliance.

"I understand why government leaders quickly enacted strict social distancing mandates as the COVID-19 pandemic was rapidly spreading in 2020," said lead author John Drake, director of the Center for the Ecology of Infectious Diseases and Distinguished Research Professor in the Odum School of Ecology. "This was the best that we could do at the time. However, school and workplace closures, gathering limits and shelter-in-place orders have had extreme economic consequences. These are harsh, and we really need to find alternative solutions."

Drake worked with other researchers to develop two models. One targeted how to find infected people to limit transmission through active case finding (through testing of at-risk individuals), thorough contact tracing when cases arise, and quarantines for people infected and their traced contacts.

The second model focused on a strategy of limiting exposure by certifying healthy individuals.

"Each model was tested independently and in combination with general non-pharmaceutical interventions (NPIs)," said co-author Kyle Dahlin, a postdoctoral associate with the center.

For this study, those interventions were defined as behavioral or generalized interventions that can be broadly adopted, such as wearing a

face mask, hand washing, enhanced sick leave, micro distancing and contactless transactions.

"When we ran the model to evaluate the effectiveness of only using social distancing measures, like workplace closures, after the onset of the first wave, approximately half of the population eventually became infected," said study co-author Andreas Handel, associate professor of biostatistics and epidemiology in UGA's College of Public Health who helped design the models. "When we combined social distancing with general interventions, SARS-CoV-2 transmission was slowed, but not enough for complete suppression."

When they tested the model that actively looked for infection, they found that active case-finding had to identify approximately 95% of infected persons to stop viral spread. When combined with NPIs, like face masks, the fraction of active cases that needed to be located dropped to 80%. Considering that during the first wave of the pandemic in 2020, only 1% to 10% of positive cases were found, such an approach by itself wouldn't work.

The researchers also determined that adding contact tracing and quarantine to active case finding and general NPIs did not drastically change the model's success.

The model that targeted healthy people to limit exposure determined that to successfully control viral spread, SARS-CoV-2 test validity had to occur within a very narrow window of seven to 10 days with a waiting time of three days or less, and NPIs had to be strictly adopted. Otherwise, a large outbreak would occur.

Pej Rohani, Regents' and Georgia Athletic Association Professor of Ecology and Infectious Diseases in the Odum School and College of Veterinary Medicine, said that the models' conclusions indicated the

need for continued research.

"These models are important because infectious disease ecologists and epidemiologists need to understand how SARS-CoV-2 transmission can be reduced using measures that do not have extreme societal consequences," he said.

The CEID's research highlighted the importance of a robust and widespread testing program, the general adoption of NPIs like face masks, and targeted measures to globally control the ongoing pandemic. These approaches are still extremely important as vaccines continue to be distributed.

More information: John M. Drake et al, Five approaches to the suppression of SARS-CoV-2 without intensive social distancing, *Proceedings of the Royal Society B: Biological Sciences* (2021). DOI: 10.1098/rspb.2020.3074

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