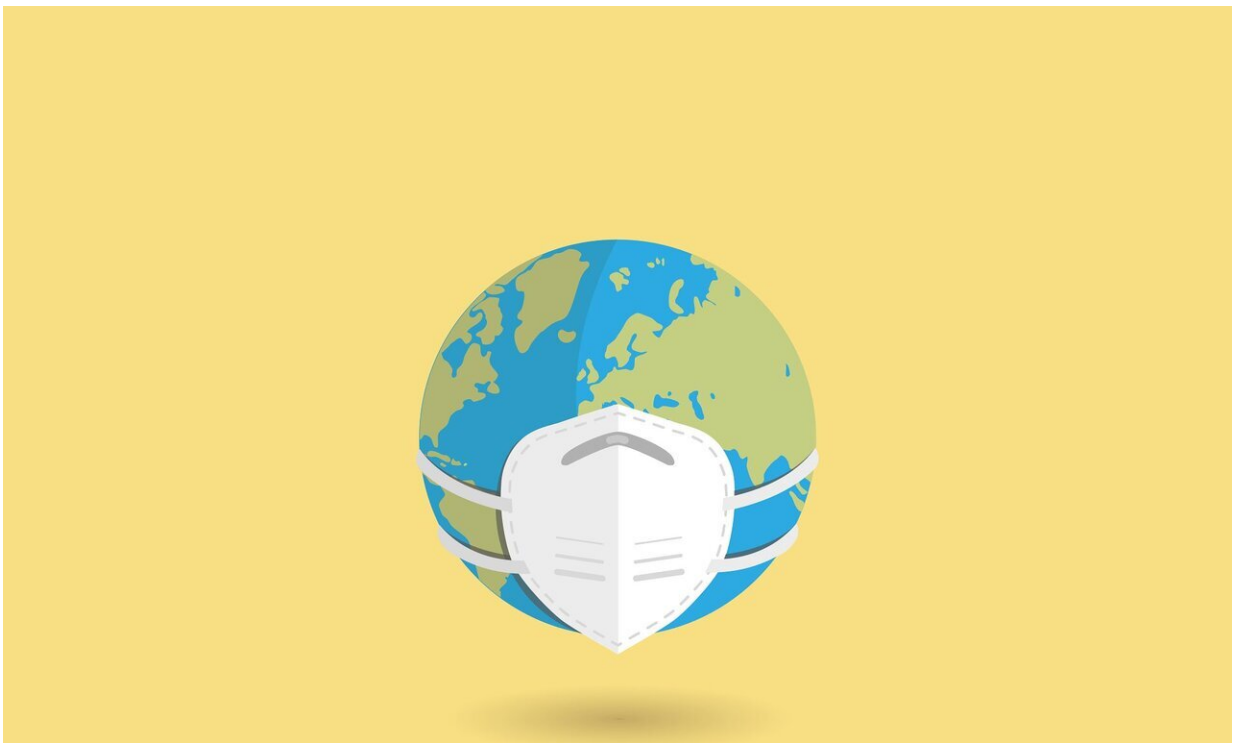


A framework to better evaluate and plan regional, national and global pandemic responses

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In the early months of the COVID-19 pandemic, local and national governments worldwide set strict limits on human mobility. But as governments responded with different policies at different times, it

became increasingly difficult to control the spread of the virus, particularly in bordering regions. With the Delta variant now spreading in the U.S., governments will need to carefully coordinate policies that are more effective than those designed to combat the spread of COVID-19.

New research published in *Science Advances* from Sinan Aral, David Austin Professor of Management and professor of information technology and marketing at the MIT Sloan School of Management, along with Michael Zhao and David Holtz, looks at how the tightening and relaxing of mobility restrictions in selected counties within the U.S. impacted mobility in other counties.

"Our paper establishes a method for 'interdependent program evaluation' that allows regions, states and nations to evaluate pandemic responses in an interdependent way, and to therefore coordinate regional, national and global pandemic responses," says Prof. Aral.

The paper recommends a two-step process for implementing [policy](#):

1. estimate behavioral and geographic spillovers
2. tailor consultation and coordination between states and regions based on the sizes of the estimated policy spillovers between those states and regions

This research involved data from a variety of different sources, including the mobility data of more than 22 million mobile devices, daily data on state-level closure and reopening policies, social media connections among 220 million U.S. Facebook users and county-level census data, among others. Researchers used the data to measure the direct impacts of a state's COVID-19 closure and reopening policies on its own mobility patterns; the spillover effects of other, socially-connected states' closure and reopening policies on its own mobility

patterns; and the impacts of both origin- and destination-county closure and reopening policies on cross-county mobility. Spillover effects, in the context of this research, are seen when policy impacts extend into other regions beyond where the policy originates.

The research did not measure the impact of a specific policy against another, but instead grouped many different policy interventions into three general classes of policies based on their level of restrictiveness, including "initial policies" (moderately restrictive), "shelter-in place" (more restrictive shelter-in-place or stay-at-home orders) and "reopening."

In addition to measuring the direct effects on a state's own mobility levels, researchers measured the effect of other geographically and socially connected states' policies on each states' mobility levels. Researchers also measured the effect of different policies on cross-state mobility patterns, such as looking at how travel from one state to another is affected when one state has begun reopening, while another still has a shelter-in-place order.

The paper suggests the presence of both social and geographic spillovers related to governmental responses to COVID-19 in the U.S., estimating that while state closures directly reduced mobility by 3–4%, additional closures of other states further decreased mobility in the focal state by 8–14%. Likewise, while a state reopening directly increased mobility by 2-3%, reopening in other states increased mobility in the focal state by 12–21%. Travel from locked-down origins to open destinations increased by 12-29% and travel from reopened origins to locked down destinations decreased by 6–7% for nearby counties and by 14-18% for distant counties.

For example, in the weeks following San Francisco County's lockdown, travel in the county from other counties decreased, whereas in the weeks

following the same county's reopening, inbound travel from other countries increased. The same pattern was also seen for Chatham County, GA.

The research finds that if reopenings cause substantial increases in mobility and exhibit strong spillover effect, countries that reopen without national coordination could face significant difficulty in controlling the resurgent spread of the coronavirus and future pandemics.

"Both the Delta variant and the next global pandemic will require a much better response than the one we mustered in 2020," says Prof. Aral. "The key to the effectiveness of our response will be the idea that pandemic outcomes are interdependent and that pandemic response must be coordinated. Without that, we will see the next novel coronavirus bouncing back and forth without containment."

In addition to being useful for developing [pandemic](#) response policies, the framework presented in this research could also be applied to policies such as firearms legislation, policing, criminal law enforcement, legislation governing the labeling and spread of online misinformation and interventions aiming to fight against climate change.

More information: Michael Zhao et al, Interdependent program evaluation: Geographic and social spillovers in COVID-19 closures and reopenings in the United States, *Science Advances* (2021). [DOI: 10.1126/sciadv.abe7733](https://doi.org/10.1126/sciadv.abe7733)

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