Recent controversies about wearing masks and getting vaccinated to slow the spread of COVID-19 highlight the potential for individual rights and decision making to create widespread—and potentially detrimental—community-level outcomes. Many Americans now refuse to wear masks (Lang, Erickson, and Jing-Schmidt 2021; Pro et al. 2021) or receive a vaccine (Beleche et al. 2021; Sgaier 2021) despite evidence of their effectiveness at slowing disease spread. The disproportionate effect of the delta variant on the unvaccinated underscores the individual-level effects of noncompliance, but the rapid increase in illness and death have contributed to a wider public health crisis in the United States. Although there is widespread discussion of individual effectiveness, there is much less work demonstrating the collective spillover effects of pandemic mitigation efforts.

We contribute to this conversation and the literature on epidemic threshold patterns (Moody, Adams, and Morris 2017) by visualizing the proportion of unvaccinated people who would become infected at different combinations of mask wearing and vaccination in a hypothetical community (Figure 1). Each panel in the figure represents a different type of social network for the community: either a large number of social connections (i.e., high degree) or a small number of social connections (i.e., low degree) and either a highly clustered community or a community with little clustering (i.e., characterized by random network ties).

We find a common pattern across all assumptions: below some joint threshold of mask and vaccination rates, almost all unvaccinated people will eventually become infected, and beyond that threshold there is a steep drop leading to widespread community-level protection. What differs across settings is the timing and shape of the drop-off after crossing the threshold. The authors conclude that masking and vaccination are sensible and in the best interest of the population.

Keywords
COVID-19, disease spread, masking, vaccination
crosses the threshold, even the unvaccinated will be safe as the infection effectively dies out. But, given that we cannot know where that threshold lies in any given community, we must keep promoting mitigation until transmission wanes.

Although a one-size-fits-all approach to masking and vaccination might seem a blunt instrument, given the unknowability of potential transmission network structure, it is the safest approach. That is, mandates will be most important in dense but clustered communities, and we typically do not know which communities those are. It follows that the approach of the Centers for Disease Control and Prevention and other federal agencies for universal masking (which has virtually no negative externalities) and vaccination (whose potential side effects are rare and minimal) are both sensible and in the best interest of the population.

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**Supplemental Material**

Supplemental material for this article is available online.

**References**

Beleche, Trinidad, Joel Ruhter, Allison Kolbe, Jessica Marus, Laina Bush, and Benjamin Sommers. 2021. “COVID-19 Vaccine Hesitancy: Demographic Factors, Geographic Patterns, and Changes over Time.” May 2021. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services.
Lang, Jun, Wesley W. Erickson, and Zhuo Jing-Schmidt. 2021. “#Maskon! #Maskoff! Digital Polarization of Mask-Wearing in the United States during COVID-19.” *PLoS ONE* 16(4):e0250817.

Moody, James, Jimi Adams, and Martina Morris. 2017. “Epidemic Potential by Sexual Activity Distributions.” *Network Science* 5(4):461–75.

Pro, George, Krista Schumacher, Randolph Hubach, Nickolas Zaller, Zachary Giano, Ricky Camplain, Carolyn Camplain, et al. 2021. “US Trends in Mask Wearing during the COVID-19 Pandemic Depend on Rurality.” *Rural and Remote Health* 21:6596.

Sgaier, Sema K. 2021. “Meet the Four Kinds of People Holding Us Back from Full Vaccination.” *The New York Times*. May 18, 2021. Retrieved October 29, 2021. https://www.nytimes.com/interactive/2021/05/18/opinion/covid-19-vaccine-hesitancy.html.

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