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Determining the Optimal Length of Quarantine—Transmission, Social, and Economic Considerations

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Elsewhere in *JAMA Network Open*, Liu et al[1] used data from 4 universities to empirically estimate the length of time between exposure to COVID-19 and a positive test. They highlight that 13.1% of individuals who went on to test positive were negative and asymptomatic on day 7. Conversion times were shorter for individuals in strict quarantine (7.1% negative and asymptomatic on day 7) and longer for those in nonstrict quarantine (16.0%), likely a result of repeated exposure to infected household. As of December 2021, current US Centers for Disease Control and Prevention (CDC) guidelines for test-based quarantine recommend that individuals test on day 5 and, if the results are negative, may shorten quarantine from 10 or 14 to 7 days.[2] However, on the basis of their results, Liu et al[1] suggest extensions in test-based quarantine to 8 days for strict quarantine and 10 days for nonstrict quarantine.

In the study by Liu et al,[1] the use of frequently tested US cohorts to better understand progression to infection is novel and provides important insights beyond model-based estimates, which may not incorporate common implementation challenges such as continued household exposure. However, the recommendation that the CDC extend test-based quarantine guidance from 7 to 10 days for nonstrict quarantine merits additional context and discussion.

Quarantine of exposed contacts is a mainstay of infectious disease control. While restrictive, the benefits of quarantine clearly outweigh the costs when there is a serious disease threat, a controllable outbreak in its early stages, and a small number of affected contacts, especially when inconvenience to contacts is weighed against population-level consequences of unchecked community spread. However, the burden of quarantines over the past 2 years of the COVID-19 pandemic has been substantial, particularly among those with high risk of exposure. With 51.5 million diagnosed cases of COVID-19 in the US as of late December 2021 and a mean of perhaps 5 contacts per case, the CDC's initial, cautious recommendation of a 14-day quarantine would have indicated nearly 10 million person-years of quarantine.[3,4] Understandably, this led to calls for less-restrictive quarantine options, including the 7-day, test-based quarantine on which the study by Liu et al[1] focuses. Nevertheless, from this population perspective, even the 7-day option is highly disruptive.

While the CDC explained that their test-based reduced quarantine recommendation was based on estimated transmission risk,[2] this should not be the only consideration in determining the optimal length of quarantine. As Liu et al[1] point out, there are 2 major limitations of overly restrictive quarantine policies: harms to the quarantined (ie, psychological, social, logistical, and financial) and, as a result, decreased adherence, obviating potential transmission benefits. While a substantial body of work has explored disease control outcomes of quarantine, there has been far less quantification of quarantine's harms and unintended consequences, and only a few rigorous evaluations of less restrictive alternatives.

Available evaluations, however, are promising. Consider, for example, the test-to-stay approach in kindergarten through grade 12 education. Quarantines have been immensely disruptive in schools, with approximately 1 million students quarantined in the United Kingdom during summer of 2021.[5] A cluster randomized trial found that substituting such quarantines with daily rapid antigen tests of infected contacts was associated with minimal increases in transmission, while markedly reducing the number of lost school days.[6] US-based studies have had similar findings.[7,8]

This success of test-to-stay in schools and its recent embrace by the CDC[9] raises an important question: could a similar approach be used as an alternative to quarantine in other settings? If daily testing is infeasible with current US testing supplies, could alternatives that combine high-quality personal protective equipment like N95 masks with a single, strategically timed test have similar transmission outcomes? In some cases, such alternatives may come with a higher risk of transmission, including those described by Liu et al[1], but this must be weighed against both the benefits of fewer restrictions to contacts and the likelihood that a greater number of individuals would be willing to follow such a protocol.

Such questions merit investigation prior to population-level rollout, but the present study[1] suggests a promising approach for rigorously piloting and refining alternative quarantine policies and understanding their transmission impacts: randomized or cluster randomized trials in frequently tested cohorts, such as universities, which could coordinate with the CDC and state and local health departments to evaluate different approaches. Further research in the general population should similarly investigate costs of and adherence to quarantine and potential alternatives.

While we hope that COVID-19 quarantines will soon fade into memory, the experience of the past 2 years suggests we may continue to grapple with them in the near future. In doing so, we should seek to understand both the benefits and costs of measures used to reduce transmission and be willing to innovate on traditional approaches to controlling infectious disease.

ARTICLE INFORMATION

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