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Reply



To the Editor:

In our recent article, we characterized 192 children who presented to urgent care clinics or were hospitalized for concern for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection or multisystem inflammatory disorder in children (MIS-C). We reported symptomatology, viral load, ACE2 expression, and antibody responses in this pediatric population. High viral loads were detected in respiratory secretions from the children, particularly within the first 2 days of illness. We also found that children with SARS-CoV-2 infection have very mild cold-like symptoms, indistinguishable from those in children without SARS-CoV-2 infection. These results underscore the critical need for further research to understand the role of children in transmission in household, community, and school settings.

Our results support the published literature reporting that children with SARS-CoV-2 infection have mild or no symptoms.¹ In our study, 11 children presented for SARS-CoV-2 testing because of exposure to an infected individual rather than because of symptoms. Three children (27% of those presenting for exposure alone) were confirmed to be infected, with a median viral load of 6.3 log₁₀ RNA copies/mL, which is comparable to the viral load seen in symptomatic children within the first 2 days of illness. The ages of these children were 8, 16, and 17 years. The number of asymptomatic individuals included in this study was small, primarily because of the limited resources available for viral testing at the time of this study (March to June 2020) with clinical guidance recommending quarantine rather than viral testing. However, a case series in Korea of 91 children exposed to adults with coronavirus disease 2019 (COVID-19) found that only 8.5% of these children had symptoms concerning for COVID-19 before testing, and 22% of them remained completely asymptomatic for the duration of their infection.² The viral load was not quantified in this Korean case series. Asymptomatic or presymptomatic individuals of all ages are increasingly recognized as a potential source of transmission.^{3,4} A better understanding of viral transmissibility by asymptomatic but infected children would be highly informative, especially as schools reopen.

We report that the viral load in children in the first 2 days of illness is significantly higher than that in adults hospitalized within 7-26 days of infection. We did not find that children have higher viral loads than adults in general, although other studies have suggested this finding.⁵ When stratified for time, there are no apparent differences between adults and children, although our sample size of adults in our cohort

with <7 days of symptoms is small. We report that in children, viral load in the respiratory secretions decreases over time, aligning with reports of decreasing viral load in infected adults over time.⁶

We did not report any viremia in our MIS-C cohort and we do not consider MIS-C a barrier to opening schools. Children generally fare well with acute infection with SARS-CoV-2 but in rare cases can develop the postinfectious inflammatory illness MIS-C.⁷ However, our findings suggest that acutely infected children can shed virus in their respiratory secretions at high levels, and safety precautions must be in place.

We included 17- to 22-year-old individuals in our cohort because adolescents and young adults are commonly cared for by pediatricians. College-aged individuals present their own challenges and barriers to adapting prevention control measures, and these considerations must be in place as classes start in colleges. Reopening schools without appropriate safety measures to limit SARS-CoV-2 spread could undermine the intended goal of keeping schools open for in-person education, as has been seen in a number of colleges already.^{8,9} However, many schools have reportedly reopened without experiencing outbreaks, demonstrating that schools can open safely as long as safety precautions are in place and community rates of COVID-19 are monitored.

The impact of school closure on the mental health and well-being of children is undeniable. We agree that the repercussions of the COVID-19 pandemic are widespread, and that economic, social, and mental health implications should not be overlooked. Vulnerable populations are the hardest hit by this pandemic, across all age groups. Policy makers must find ways to provide services and education in a way that is safe for the community. We agree that indiscriminately closing schools is not necessary and could be harmful to children's well-being. Until highly effective therapies or vaccines are universally available, physical barriers (mask-wearing, social distancing, quarantining), frequent hand-washing, and/or frequent viral testing are the only available measures to limit the spread of disease. Administrators of daycare facilities, elementary schools, high schools, and colleges will need to work with policy makers to continue to safely provide educational, nutritional, and other critical services, and adaptations will likely need to change over time to respond to local transmission rates and COVID-19 incidence.

Our study did not directly assess person-to-person transmission; therefore, we cannot state whether there is a correlation between viral load and transmission. Earlier transmission studies suggest that children play a minimal role in the spread of infection even though they are as likely as adults to be infected by SARS-CoV-2.¹⁰ In fact, a surveillance study conducted in Switzerland in March-April 2020 reported that a child developed symptoms before any other household contact in 8% of households, but child-child or child-adult transmission could not be confirmed.¹¹ Of note, Switzerland closed its schools on March 13, at the

very beginning of the outbreak. It is likely that children were essentially quarantining, limiting their potential to spread infection. Similarly, an Australian study found low rates of infection in children after in-person school safety modifications were implemented.¹² These studies may be limited by the challenges of contact tracing in cases of asymptomatic infection. Although well-designed studies screening large pediatric cohorts and contacts of SARS-CoV-2–infected children would be highly informative, our findings of high viral loads suggest a prudent approach to safely open schools that includes implementing measures to minimize the risk of viral spread.

Ultimately, the risk of school-based outbreaks will depend on both the extent and adherence to infection control measures, as well as on our collective ability to bring community prevalence to a low level. Safe school reopening is only one of many factors critical to bring community prevalence to below target levels. We need widely available SARS-CoV-2 testing and studies focused on understanding and reducing transmission. We need to learn from successes of some communities and identify challenges in others. Ultimately, until we have a vaccine and/or effective antiviral treatments, we must do what we can to mitigate the spread of this pandemic.

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