Naimark and colleagues\(^1\) use a simulation model calibrated to the COVID-19 pandemic in Ontario, Canada, to estimate the association of opening kindergarten through grade 12 (K-12) schools with total infections across the city. They projected that schools opening was associated with a much smaller impact than other community-based nonpharmaceutical interventions (NPIs). This research adds to a growing body of literature addressing the risk of COVID-19 in K-12 schools and the association of in-person school with the trajectory of the pandemic.\(^2\)

In March of 2020, COVID-19 shuttered schools across the world. Despite heroic efforts by educators and families to pivot to online learning, students were often limited by a lack of devices, adequate internet service, and adult support at home. Many students simply vanished from schools altogether. The resulting educational gaps exacerbated preexisting racial and economic disparities. In addition, even children with the resources needed to attend online learning experienced the loss of noneducational services provided at school, such as food, mental health services, and detection and reporting of abuse. The lack of in-person schooling has been associated with adverse physical and mental health outcomes, including both obesity and undernutrition, depression, anxiety, substance use, suicidality, and physical and emotional abuse. School closures have threatened access to vital services for children; before the COVID-19 pandemic, 35% of adolescents who received mental health services received them exclusively in the school setting.\(^3\) The economic impact has been devastating as well, with women bearing a disproportionate burden.

Balancing the educational needs and emotional well-being of children with the risk of COVID-19 for educators, staff, students, and families is not straightforward. Although children are at lower risk for severe COVID-19 illness than adults, Black, Latino and Latina, and Indigenous children have experienced more severe COVID-19 than White children in the US. Asymptomatic or mildly symptomatic children may carry infection home and place household members at risk. Educator and staff safety is also critical: 25% to 50% of US educators have at least 1 risk factor for severe COVID-19, and the risk of COVID-19 is higher among Black, Latino and Latina, and Indigenous educators than White educators,\(^4\) as for all US adults.

With these competing risks in mind, a debate about whether schools could reopen safely in the context of a still-ongoing pandemic took hold in the fall of 2020. This debate quickly became politicized, fueled by the early absence of empirical data to answer 2 fundamental questions: First, are students, educators, and staff at greater risk of acquiring COVID-19 by being physically present in school? Second, does opening schools increase the spread of COVID-19 in the community?

Let us address the first question of whether students, educators, and staff at greater risk of acquiring COVID-19 by being in the building than they would be if they were not at school. With ongoing community transmission, it is expected that adults or children bring COVID-19 into the schools. How often such introductions occur is a function of current community COVID-19 incidence rates and out-of-school activities and exposures. Most early US data from the 2020 to 2021 school year focused on the risk of these introductions, such as national or state dashboards that report school-associated cases (ie, any student or adult associated with a school who receives a diagnosis of COVID-19).\(^5\) Such dashboards have generally demonstrated similar or lower risks among children and adults who have been present in school buildings, compared with general population rates.

A more important component of this question is, with mitigation measures in place, such as universal masking, physical distancing, cleaning of surfaces, hand hygiene, and adequate ventilation, what is the risk that someone who enters a school building with COVID-19 will transmit it to another...
person? This question requires detailed contact tracing and assessment by school staff and local health officials about whether transmissions likely occurred inside or outside of school. Although we lacked US data on in-school transmission for most of the fall semester, they are now emerging rapidly: recent reports from Chicago, Illinois, the mid-Atlantic and Southeast regions, North Carolina, and Wisconsin suggest low rates of in-school transmission. Notably, most in-school transmissions have been associated with breakdowns in mask adherence, especially in staff workrooms and breakrooms, or attending school or work while symptomatic. Student-to-staff transmission has been rare; most adult infections have been acquired from other adults, often when unmasked while eating or drinking, underscoring the importance of workplace safety measures for schools and policies that support staff to stay home when ill, without fear of reducing accrued sick leave or burdening colleagues.

Most studies from the US have not included regular screening testing of asymptomatic students, educators, and staff. Many districts are now moving toward routine asymptomatic screening, as was recently announced for Massachusetts public schools. This will not only provide additional protection, by identifying and promptly isolating introductions of COVID-19 into schools, but also will be a source of current, school-specific information about the effectiveness of mitigation measures and the risk of in-school transmission.

Now let us turn to the second question of whether opening schools increases the spread of COVID-19 in the community. Two types of studies have attempted to address this question: observational epidemiological studies and simulation modeling studies. Epidemiological studies attempt to correlate temporal trends in COVID-19 outcomes with population-level interventions, such as school closing and opening, bans on large gatherings or travel, restrictions on dining, and stay-at-home orders (ie, lockdowns). US and European studies have shown equivocal results about the association of school closure or opening with COVID-19 incidence, hospitalization, and deaths, compared with other NPIs. Each of these studies has shared a fundamental limitation: the concurrent implementation of multiple NPIs. It is rare to find a setting in which school closure or opening was implemented in isolation, thus making it difficult to distinguish the impact of school opening from those of many other simultaneous measures.

Simulation modeling studies create a synthetic population using observed data and then estimate the impact of various interventions using both observed data and assumptions about the impact of each NPI and the potential additive, synergistic, or antagonistic effects of combining NPIs. A large number of modeling studies have shown equivocal findings about the association of school closings with community COVID-19 rates. The study by Naimark et al adds to the approximately half of published simulation modeling studies that demonstrate a smaller impact associated with school opening compared with other NPIs. The authors found that loosening of other restrictions would likely lead to a far greater increase in community rates in Ontario than opening schools. Importantly, in sensitivity analyses, the effectiveness of in-school mitigation measures (eg, masking) was the most important assumption associated with this conclusion: without stringent mitigation measures, they found that schools can become accelerators of total community COVID-19 rates.

In summary, a strong body of evidence now suggests that in-school transmission is rare when mitigation measures can be implemented well, demonstrating that we can keep educators, staff, and students safe. Given the importance of in-person learning—not only for education, but also for physical and mental health—it is critical to provide public K-12 schools with the resources needed to implement masking, distancing, cleaning, and ventilation, as well as financial, technical, and logistical support for regular screening of staff and students, contact tracing, and appropriate isolation and quarantine. This study by Naimark et al adds support to the recent recommendation from the US Centers for Disease Control and Prevention that we as a society should prioritize in-person schooling over many nonessential activities—such as indoor dining, bars, and casinos—so we can keep our children and educators safely in school.
Using Data and Modeling to Understand the Risks of In-Person Education

ARTICLE INFORMATION

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Conflict of Interest Disclosures: None reported.

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