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Data and Policy to Guide Opening Schools Safely to Limit the Spread of SARS-CoV-2 Infection

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On March 11, 2020, less than 2 weeks after community transmission of the severe acute respiratory syndrome coronavirus 2 (SARS CoV-2) was identified in the US, the World Health Organization declared that the novel coronavirus (COVID-19) outbreak was a global pandemic. By March 25, 2020, all kindergarten to grade 12 (K-12) public schools in the US had closed for in-person instruction. After initial closures, many schools pivoted to online education for the remainder of the school year. For the fall 2020 school term, there was tremendous geographic and district-to-district variation in mode of K-12 educational delivery. Among 13 597 of 14 944 districts that provided school reopening plans, 24% were fully online, 51% were using a hybrid model, and 17% were fully open for in-person instruction (some districts included options for parents to opt out); 51% of districts had students participating in school sports programs.¹

The COVID-19 pandemic has greatly affected K-12 schools across the US. Accumulating data now suggest a path forward to maintain or return primarily or fully to in-person instructional delivery. Actions include taking steps to reduce community transmission and limiting school-related activities such as indoor sports practice or competition that could increase transmission risk.

As the COVID-19 pandemic rapidly evolved in the spring and summer of 2020, congregate settings experienced rapid and widespread SARS-CoV-2 transmission, including both residential congregate settings (eg,

long-term care facilities, correctional facilities) and high-density occupational settings (eg, meat and poultry processing facilities). Planning for the 2020/2021 school year included much uncertainty about the risk of transmission in school settings. While the benefits of in-person school attendance were well understood, the appropriate evaluation of its risks vs benefits was hampered by limited information about transmission risk in classroom settings. Closing schools could adversely affect students' academic progress, mental health, and access to essential services; however, if SARS-CoV-2 rapidly spread in classrooms, opening schools might accelerate community transmission of the virus. There were no simple decisions for parents, teachers, administrators, or public officials.^{2,3}

As many schools have reopened for in-person instruction in some parts of the US as well as internationally, school-related cases of COVID-19 have been reported, but there has been little evidence that schools have contributed meaningfully to increased community transmission.⁴ A case-control study of exposures among children aged 0 through 18 years with (n=154) and without (n=243) SARS-CoV-2 infection in Mississippi found that having attended gatherings and social functions outside the home as well as having had visitors in the home was associated with increased risk of infection; however, in-person school attendance during the 14 days prior to diagnosis was not.⁵ In the fall of 2020, 11 school districts in North Carolina with more than 90 000 students and staff were open for in-person education for 9 weeks.⁶ During this time, within-school transmissions were very rare (32 infections acquired in schools; 773 community-acquired infections) and there were no cases of student-to-staff transmission. Similarly, in a report released by CDC on January 26, 2021, with data from 17 K-12 schools in rural Wisconsin with high mask adherence (4876 students and 654 staff), COVID-19 incidence was lower in schools than in the community.⁷ During 13 weeks in the fall of 2020, there were 191 COVID-19 cases in staff and students, with only 7 of these cases determined to result from in-school transmission.

A European Centre for Disease Prevention and Control report from December 2020 that included findings from 17 country-level surveys found that 12 countries reported from 1 (Latvia) to 400 (Spain) school-based clusters of 2 or more epidemiologically linked SARS-CoV-2 infections, but that overall cluster sizes were small (most <10 cases) and could often not be definitively linked to in-school vs community-based transmission. The investigators concluded that these data, together with the observation that rates of infection among teachers and nonteachers were generally similar, indicated that schools were not associated with accelerating community transmission.⁴

While these data are encouraging overall, large outbreaks have occurred with apparent transmission in schools. In Israel, within 2 weeks of schools reopening in mid-May 2020, a large high school outbreak occurred when 2 students with epidemiologically unrelated infections attended classes while mildly symptomatic.⁸ Testing of more than 99% of at-risk students (n=1164 eligible; 1161 tested) and staff (152 eligible; 151 tested) identified 153 and 25 cases of SARS-CoV-2 infection, respectively (attack rates of 13.2% and 16.6%). Contributing factors to this outbreak included crowded classrooms with insufficient physical dis-

tancing (eg, student density in classrooms exceeded recommended values), exemption from face mask use, and continuous air conditioning that recycled interior air in closed rooms during a heat wave.

However, the preponderance of available evidence from the fall school semester has been reassuring insofar as the type of rapid spread that was frequently observed in congregate living facilities or high-density worksites has not been reported in education settings in schools. Preventing transmission in school settings will require addressing and reducing levels of transmission in the surrounding communities through policies to interrupt transmission (eg, restrictions on indoor dining at restaurants). In addition, all recommended mitigation measures in schools must continue: requiring universal face mask use, increasing physical distance by dedensifying classrooms and common areas, using hybrid attendance models when needed to limit the total number of contacts and prevent crowding, increasing room air ventilation, and expanding screening testing to rapidly identify and isolate asymptomatic infected individuals. Staff and students should continue to have options for online education, particularly those at increased risk of severe illness or death if infected with SARS-CoV-2.

Nonetheless, some school-related activities have increased the risk of SARS-CoV-2 transmission among students and staff. Numerous media reports of COVID-19 outbreaks among US high school athletic teams suggest that contact during both practices and competition, and at social gatherings associated with team sports, increase risk. On January 26, 2021, CDC released a brief report describing the initial investigation of a COVID-19 outbreak associated with a high school wrestling tournament that occurred in December 2020 and included 10 schools and 130 student-athletes, coaches, and referees.⁹ Among the 130 tournament participants, 38 (30%) had laboratory-confirmed SARS-CoV-2 infection diagnosed, but less than half the participants were tested. At least 446 contacts of these cases have been identified: 62 household contacts and 384 school athletic, classroom, and other contacts. Secondary transmission occurred among household contacts (18 SARS-CoV-2 infections among 30 tested) and other contacts (23 SARS-CoV-2 infections among 65 tested) and 1 death was reported in a contact, but the full investigation of secondary transmission is ongoing. In recognition of the risk for increased transmission, some states have halted or postponed school athletics.¹⁰

Paradoxically, some schools have used a fully online model for educational delivery while continuing in-person athletic programs. Even though high school athletics are highly valued by many students and parents, indoor practice or competition and school-related social gatherings with limited adherence to physical distancing and other mitigation strategies could jeopardize the safe operation of in-person education. While there are likely many factors, the pressure to continue high school athletics during the pandemic might be driven at least in part by scholarship concerns; colleges and universities recruiting athletes for the 2021/2022 academic year should consider approaches that do not penalize students for interruptions to high school sports related to the pandemic to avoid incentivizing activities posing high risk for SARS-CoV-2 infection.

Decisions made today can help ensure safe operation of schools and provide critical services to children and adolescents in the US. Some of these decisions may be difficult. They include a commitment to implement community-based policies that reduce transmission when SARS-CoV-2 incidence is high (eg, by restricting indoor dining at restaurants), and school-based policies to postpone school-related activities that can increase risk of in-school transmission (eg, indoor sports practice or competition). With 2 vaccines now being distributed under Emergency Use Authorizations and more vaccine options anticipated to be available in the coming months, there is much hope on the horizon for a safer environment for schools and school-related athletic activities during the 2021/22 school year. Committing today to policies that prevent SARS-CoV-2 transmission in communities and in schools will help ensure the future social and academic welfare of all students and their education.

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February 8, 2021

Determining SARS-Cov-2 Transmission in Schools

Stephen Friedman, MD, MPH |

There is a dearth of evidence to conclude that transmission in schools does not pose a risk to teachers or to increased community spread. In the North Carolina study, identification of cases in schools was limited to those reported to the local dashboard rather than systematic testing of students and teachers. In the Wisconsin study, incidence in schools was compared to community incidence. Community incidence reflects COVID-19 in adults rather than in children. A more apt comparison would have been incidence in schools to age-specific incidence in the community.

Rather than deciding to reopen with in-person education ...

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Peter Liepmann, MD | Retired

As Dr. Friedman points out, the MMWR study (reference 7) compared whole school infection rates, mostly children, to community adult infection rates, and falls victim to Simpson's Paradox to draw an erroneous conclusion.

Using their data, the cumulative staff infection rate from Aug 31- Nov 1 was 60% higher than the community rate they report from the same period (58/654, or 8868/100k, vs 5466/100k) (Whole state adults age 25-55 rates give similar figures.)

Wisconsin's cumulative state rate for children <18 y was 1808/100k for the same period.

The cumulative curves for Wood County and the state are very similar ...

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Jonata Paulino, Mestrado | Universidade

Hi. Your article is very interesting and I would like to replicate it in my city. Would it be possible to make the code available so that I could make the necessary adaptations?

Thanks.

CONFLICT OF INTEREST: None Reported

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