

# Data-Driven Reopening of Urban Public Education Through Chicago's Tracking of COVID-19 School Transmission

Marielle J. Fricchione, MD; Jennifer Y. Seo, MD, JD; M. Allison Arwady, MD, MPH

## ABSTRACT

Reopening in-person education in public schools during the coronavirus 2019 (COVID-19) pandemic requires careful risk-benefit analysis, with no current established metrics. Equity concerns in urban public schools such as decreased enrollment among largely Black and Latinx prekindergarten and special needs public school students already disproportionately impacted by the pandemic itself have added urgency to Chicago Department of Public Health's analysis of COVID-19 transmission. Close tracking within a large school system revealed a lower attack rate for students and staff participating in in-person learning than for the community overall. By combining local data from a large urban private school system with national and international data on maintaining in-person learning during COVID-19 surges, Chicago believes in-person public education poses a low risk of transmission when the operational burden imposed by the second wave has subsided.

**KEY WORDS:** COVID-19 transmission, emerging infectious diseases, epidemiology, school health, urban public schools

The Chicago Department of Public Health (CDPH) focused coronavirus disease 2019 (COVID-19) investigational resources on individual pediatric cases from the earliest days of the outbreak.<sup>1</sup> As some youth-focused settings such as day cares began to reopen locally in June 2020, followed by youth educational, recreational, and sports camps in late June and July, CDPH set a high priority on evaluating the potential for COVID-19 spread in youth settings. CDPH piloted a pediatric COVID-19 investigations team and then established a formal youth settings response team, led by 2 medical directors, 2 epidemiologists, infection prevention

specialists, and case investigators. Beginning July 13, 2020, CDPH encouraged youth settings within the city (day cares, schools, and any setting providing youth activities, including private and Chicago Park District camps) to report every COVID-19 case diagnosed among students, teachers, and staff, rather than the 2 or more linked cases already required by Chicago public health order,<sup>2</sup> to help prevent COVID-19 transmission in schools and ensure efficient case investigation and contact tracing.

The CDPH youth settings team hypothesized that prioritizing interviews of laboratory-reported pediatric cases, paired with rapid reporting of individual cases, would facilitate early identification of youth setting-associated cases, particularly schools. This, in turn, would allow rapid notification and strict quarantining and testing of exposed cohorts and help determine the risk of pediatric transmission in group settings, with layered mitigation strategies in place.

## Chicago Department of Public Health Role in Local School Reopening

As prekindergarten (pre-K)-12 schools began to create reopening plans in July and August, CDPH expectations for COVID-19 reporting were posted on Chicago's coronavirus Web site and shared with school administrators who contacted CDPH for

**Author Affiliation:** Chicago Department of Public Health, Chicago, Illinois.

The authors acknowledge the CDPH COVID-19 Bureau and Pediatrics Investigation/Youth Settings team, especially epidemiologists Katherine Doyle and Stephanie Gretsch, the Archdiocese of Chicago, and all the families impacted by COVID-19 including those who participated in case investigation and contact tracing.

The authors declare no conflicts of interest.

**Correspondence:** Marielle Fricchione, MD, 2160 W. Ogden Ave, Chicago, IL 60612 (Marielle.Fricchione@cityofchicago.org); Jennifer Seo, MD, JD, Chicago Department of Public Health, 333 S. State St, Chicago, IL 60604 (Jennifer.Seo@cityofchicago.org); or Allison Arwady, MD, MPH, Chicago Department of Public Health, 333 S. State St, Chicago, IL 60604 (Allison.Arwady@cityofchicago.org).

Copyright © 2020 Wolters Kluwer Health, Inc. All rights reserved.

DOI: 10.1097/PHH.0000000000001334

COVID-19–related guidance.<sup>3</sup> In addition, the Office of the Mayor disseminated this guidance to school administrators preparing for hybrid or in-person education via CDPH-led webinars and e-mail communications. Local guidance was informed by the US Centers for Disease Control and Prevention (CDC), the Illinois State Board of Education, and the Illinois Department of Public Health (IDPH).

Chicago Public Schools (CPS), the country's third largest school district (serving 355 156 students at 642 schools in 2019), elected to provide all-remote learning for the first quarter (September 7 to November 4, 2020). CDPH and a Mayor's Office school workgroup did not place limitations on the reopening of private, religious, or charter schools, if strict mitigation measures were in place. Strict mitigation measures included universal masking, social distancing, hand hygiene, cleaning and disinfecting, daily self-reported or documented symptom monitoring, and an established contact tracing liaison to CDPH to ensure rapid notification and quarantine of exposed cohorts. The largest system in the city that opened schools to in-person learning was the Archdiocese of Chicago school system (the Archdiocese).

The Archdiocese school system is the largest private school system in the country (serving >78 000 students in both the city and the suburbs). As classes began in August 2020, the Archdiocese reported having nearly 19 500 students in school in person in Chicago, along with 2750 teachers and staff members at 91 schools inclusive of pre-K to eighth-grade schools and 3 high schools. Demographics of a sample of 21 000 students who reported race/ethnicity to the Archdiocese on intent-to-return surveys were 20% Black, 29% Latinx, 44% White, and 7% other. The Archdiocese Office of Catholic Schools outlined strict mitigation measures required by all schools by CDPH's reopening framework guidance including mandatory masking, physical distancing, daily on-site temperature and symptom checks, access to hand hygiene supplies in every room, and quarantining of an entire cohort whenever a positive individual was identified within that cohort. No student or teacher test-based screening was required. The Archdiocese had a certification process for every school and on-site visits to ensure compliance with mitigation strategies. In addition, a dedicated team centralized the management of student and staff COVID-19 self-reports, conducted same-day within-school contract tracing and direct quarantines in consultation with CDPH, and worked with school leadership to correct any reported lapses in adherence to the public health guidelines. CDPH conducted analyses of COVID-19 transmission in the Archdiocese schools to inform a broader public school reopening plan.

## Methods

The Archdiocese reported individual suspect and confirmed COVID-19 cases through a school-focused confidential online case report form ([redcap.link/chicovidreport](https://redcap.link/chicovidreport)), and the youth settings response team provided case management support by phone as needed. The Archdiocese conducted ongoing quality assurance regarding implementation of mitigation strategies and sent 2 reminders by system e-mail listserv regarding following public health guidance outside of school throughout the study period. School-associated cases were defined as confirmed or probable COVID-19 cases (based on the CDC COVID-19 Interim Case Definition, approved August 5, 2020) that occurred when school was in session AND one of the following:

- The case was in the school during his or her infectious period (2 days prior to symptom onset or test date through 10 days after his or her symptom onset or test date); or
- The case was in the school within 14 days of an infectious case.

Non-school-associated cases were removed from the analysis, as they would not have exposed the school and could not have contributed to transmission. School-associated cases were reviewed weekly by the youth settings team to review both the school interview records and the case/family interview records to classify the likely location of transmission (eg, school, household, community, or other). The number of school-associated cases, number of reporting schools by type, number of clusters or outbreaks (defined as  $\geq 2$  cases with an epidemiological link within the facility as determined by CDPH facility/case investigation),<sup>2</sup> and hypothesized location of transmission for each cluster or outbreak were tracked weekly. Archdiocese school-associated cases from August 17, 2020 (the start date of the Archdiocese school year), to October 4, 2020, and location of transmission as determined by public health investigation were included in this report.

## Results

Thirty-one Archdiocese schools reported 59 COVID-19 cases (20 staff members and 39 students), with 1 to 8 cases reported per school (median: 1). Thirty-three students were considered school-associated cases by CDPH of which 17 (51.5%) Female and 16 (48.5%) Male. Student age range was 4 to 17 years (median age: 10 years). Of staff, CDPH classified 14 as school-associated cases.

Among the total 47 school-associated cases, 3 clusters were identified. Two involved only staff and one involved a student and a staff member. Two of the 3 clusters were associated with nonadherence to physical distancing outside of class time. There was one cluster in which we could not rule out transmission in the classroom setting.

When CDPH noted multiple cases at a single school, it was most commonly siblings. The most common locations of transmission for school-reported cases were outside school settings, such as family parties, sports team gatherings, and other out-of-school social events.

The Archdiocese schools' COVID-19 attack rate from August 17 to October 4, 2020, for students was 0.2% (33 cases among estimated student population of 19 500), while the COVID-19 attack rate for all Chicago children (0-17 years of age) from August 17 to October 4, 2020, was 0.4% (2147 cases among pediatric population of 548 999<sup>4</sup>). The COVID-19 attack rate for staff was 0.5% (14 cases among an estimated staff population of 2750) lower than the COVID-19 attack rate for working-age adults in Chicago (0.7%; 12 354 cases among a population of working-age adults [18-64 years] of 1 807 277<sup>4</sup>) within the same time period.

This analysis was performed in a background of moderate to high COVID-19 disease incidence city-wide but during a plateau in case incidence between Chicago's first and second waves. From August 17, 2020, to October 4, 2020, citywide, the average 7-day rolling average (7DRA) incident case count was 316 (range, 250-358; equivalent to 9.3-13.3 daily infections per 100 000 population). The average 7DRA test positivity was 4.8% (range, 4.1%-5.3%).

## Discussion and Conclusion

Data collected in the nation's largest Catholic school system suggest that implementation of layered mitigation strategies creates a low- but not zero-risk environment for in-person learning in public schools. Chicago data revealed a lower attack rate for students and school staff than for the city overall during a period of moderate to high COVID-19 incidence. The median number of cases reported per school was also 1, suggesting minimal identifiable in-school transmission and matching our citywide private and charter school case investigation findings. Limitations of data include applicability to high schools, given the small number of Archdiocese-affiliated high schools open at the time. Frequent and clear communication at multiple levels—between the school system leadership and its schools, between the schools and their staff and families, and between the school system and the

local public health department—was likely a key factor in ensuring mitigation measures were properly implemented.

The American Academy of Pediatrics,<sup>5</sup> CDC,<sup>6</sup> and pediatricians nationwide agree that COVID-19-related school closures have had negative impacts on children. This is not just related to missing the social-emotional and developmental benefits of routine and education but also for our nation's most vulnerable children, missed preventive medical care and immunizations, increased hunger,<sup>7</sup> abnormal sleep patterns,<sup>8</sup> increased obesity, and increased risk of child abuse.<sup>5</sup> Most recently, in April to October 2020, increased mental health-related emergency department visits were also seen in children.<sup>9</sup>

Healthy Chicago 2025<sup>10</sup> is an updated CDPH strategic plan focused on closing the racial life-expectancy gap in Chicago and continuing CDPH's pursuit to achieve health equity at all levels. CDPH views education, especially of the city's most vulnerable students, not only as an essential service but also as a way to improve health equity for students during a pandemic that has disproportionately impacted Latinx and Black residents. Issues of equity have been central to discussions about returning CPS pre-K and special education students to the classroom. CPS has experienced its largest enrollment loss in more than 2 decades, including a 44% decline in Black, 29% decline in Latinx, 22% decline in White, and 9% decline in Asian pre-K students.<sup>11</sup>

The Midwest, including Chicago, is currently experiencing a second COVID-19 surge. Rather than defining a specific test positivity or case rate threshold, CDPH has continued to support in-person education for schools that can maintain strict mitigation strategies amid increased operational burden. A return to CPS classrooms has been delayed because of concerns surrounding this increased operational burden shared by other local school systems, such as increased teacher/staff absenteeism, slowed contact tracing, decreased testing availability, and increased testing turnaround times, which all impact a school's ability to ensure layered mitigation strategies during a COVID-19 surge. However, given CDPH's locally collected data and the national experience described by other large urban school districts,<sup>12</sup> CPS has planned a return to the classroom beginning with pre-K and special needs students on January 11, 2021. CDPH supports this plan as long as the case doubling time has improved, reflecting a stabilization of the local outbreak. Metrics such as citywide test positivity used by other large urban public school systems have not been proven to improve safety and increase the risk of interrupting education. Most recently, New York City has decided to reopen elementary school and special

## Implications for Policy & Practice

- Reopening schools for in-person learning during the COVID-19 pandemic requires careful risk-benefit analysis, with no current established public health metrics.
- Data from the nation's largest Catholic school system reveal that implementation of layered mitigation efforts can support the goal of reopening in-person education in a safe but not zero-risk environment.
- Increasing COVID-19 case doubling time can be considered as a proxy for stabilization of the local outbreak and decreased operational burden associated with higher risk in-person education.

education and discounted the meaningfulness of the previous metrics.<sup>13,14</sup> By combining local data from a large urban private school system described earlier with national<sup>15-17</sup> and international<sup>18-20</sup> data on maintaining in-person learning during COVID-19 surges, Chicago is prepared to safely move forward with in-person public education when the operational burden imposed by the second wave has subsided.

## References

1. Mannheim J, Gretsch S, Layden JE, Fricchione MJ. Characteristics of hospitalized pediatric coronavirus disease 2019 cases in Chicago, Illinois, March-April 2020. *J Pediatr Infect Dis Soc.* 2020;9(5):519-522.
2. City of Chicago Public Health Order No. 2020-2. [https://www.chicago.gov/content/dam/city/sites/covid/health-orders/CDPH%20Order%202020-2%203rd%20Amended%20FINAL%209.30.20\\_ASigned.pdf](https://www.chicago.gov/content/dam/city/sites/covid/health-orders/CDPH%20Order%202020-2%203rd%20Amended%20FINAL%209.30.20_ASigned.pdf). Updated October 1, 2020. Accessed November 30, 2020.
3. Chicago Department of Public Health. Interim guidance on management of COVID-19 cases in preK-12 schools. [https://www.chicago.gov/content/dam/city/depts/cdph/HealthProtectionandResponse/COVID\\_GUIDANCE/Interim%20Guidance%20on%20Management%20of%20COVID-19%20Cases%20in%20PK-12%20Schools\\_102120.pdf](https://www.chicago.gov/content/dam/city/depts/cdph/HealthProtectionandResponse/COVID_GUIDANCE/Interim%20Guidance%20on%20Management%20of%20COVID-19%20Cases%20in%20PK-12%20Schools_102120.pdf); [www.chicago.gov/coronavirus](http://www.chicago.gov/coronavirus). Updated October 21, 2020. Accessed November 30, 2020.
4. US Census Bureau. 2018 American Community Survey: 1-year population estimate, Chicago City, Illinois. <https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2018>. Accessed November 22, 2020.
5. American Academy of Pediatrics. COVID-19 planning considerations: guidance for school re-entry. <https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/covid-19-planning-considerations-return-to-in-person-education-in-schools>. Accessed November 22, 2020.
6. Centers for Disease Control and Prevention. COVID-19: community, work & school. Indicators for dynamic school decision-making. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/indicators.html>. Updated September 15, 2020. Accessed December 10, 2020.
7. Dooley DG, Bandyopadhyay A, Tschudy MM. Low-income children and coronavirus disease 2019 (COVID-19) in the US. *JAMA Pediatr.* 2020;174(10):922-923.
8. Stern M, Wagner MH, Thompson LA. Current and COVID-19 challenges with childhood and adolescent sleep. *JAMA Pediatr.* 2020;174(11):1124.
9. Leeb RT, Bitsko RH, Radhakrishnan L, Martinez P, Njai R, Holland KM. Mental health-related emergency department visits among children aged <18 years during the COVID-19 pandemic—United States, January 1-October 17, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(45):1675-1680.
10. Chicago Department of Public Health. Healthy Chicago 2025: closing our life expectancy gap 2020-2025. [https://www.chicago.gov/content/dam/city/depts/cdph/statistics\\_and\\_reports/HC2025\\_917\\_FINAL.pdf](https://www.chicago.gov/content/dam/city/depts/cdph/statistics_and_reports/HC2025_917_FINAL.pdf). Published September 17, 2020. Accessed November 22, 2020.
11. Leone H. CPS will phase students back into buildings starting with preschool and special education; union calls the plan "reckless" and "illegal." *Chicago Tribune*. October 16, 2020. <https://www.chicagotribune.com/coronavirus/ct-covid-19-cps-second-quarter-plan-20201016-rbm2wibhxfafpks3kq2slutosu-story.html>. Accessed November 22, 2020.
12. Rubinstein D, Goodman JD. Surprising results in initial virus testing in N.Y.C. schools. *The New York Times*. <https://www.nytimes.com/2020/10/19/nyregion/schools-coronavirus.html>. Updated November 18, 2020. Accessed December 9, 2020.
13. Shapiro E. How de Blasio backed himself into a corner on closing schools. *The New York Times*. November 24, 2020. <https://www.nytimes.com/2020/11/24/nyregion/deblasio-school-reopening.html>. Accessed November 30, 2020.
14. Goodman JD. How New York City plans to keep children safe as schools reopen. *The New York Times*. December 7, 2020. <https://www.nytimes.com/2020/12/07/nyregion/nyc-school-reopening.html>. Accessed December 9, 2020.
15. Kocielek LK, Muller WJ, Yee R, et al. Comparison of upper respiratory viral load distributions in asymptomatic and symptomatic children diagnosed with SARS-CoV-2 infection in pediatric hospital testing programs. *J Clin Microbiol.* 2020;59(1):e02593-20.
16. Gilliam WS, Malik AA, Shafiq M, et al. COVID-19 transmission in US child care programs. *Pediatrics.* 2020:e2020031971. doi:10.1542/peds.2020-031971.
17. Coronado F, Blough S, Bergeron D, et al. Implementing mitigation strategies in early care and education settings for prevention of SARS-CoV-2 transmission—eight states, September-October 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(49):1868-1872.
18. Insights for Education. COVID-19 and 6 months of school closures. COVID-19 and schools: what we can learn from six months of closures and reopening. <https://education.org/facts-and-insights#f09a6e46-8c5f-4d01-8297-d2a3f6c8f873>. Published October 1, 2020. Accessed December 1, 2020.
19. Ismail SA, Saliba V, Bernal JL, Ramsay ME, Ladhani SN. SARS-CoV-2 infection and transmission in educational settings: a prospective, cross-sectional analysis of infection clusters and outbreaks in England. *Lancet Infect Dis.* 2020. doi:10.1016/S1473-3099(20)30882-3.
20. UNESCO, UNICEF, and the World Bank. *What Have We Learnt? Overview of Findings From a Survey of Ministries of Education on National Responses to COVID-19*. Paris, New York, Washington DC: UNESCO, UNICEF, World Bank; 2020. <https://data.unicef.org/resources/national-education-responses-to-covid19>. Accessed December 10, 2020.