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School-level data on COVID-19 cases, quarantines, and student absenteeism during the COVID-19 pandemic: understanding missingness

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Abstract

Availability of school-based infectious disease surveillance data (eg, COVID-19 cases, student absences) based on experiences during the COVID-19 pandemic were studied using a national sample of public kindergarten through 12th grade schools ($n = 1602$). Based on surveys administered to school administrators throughout the 2021–2022 school year, we found high levels of missingness data for school-level COVID-19 cases, quarantines, and student absenteeism, increasing missingness over time, and variations in missingness by school characteristics (eg, school size) and protocols (eg, having a school-based system to report at-home COVID-19 tests). For the same sample of schools, using data requests to health departments, we found similarly high levels of missingness of school-level COVID-19 case data and varying approaches in data collection. Developing nationally standardized case definitions—and systems to surveil or collect and monitor school-based infectious disease outcomes early in a public health emergency—may be helpful in producing actionable data.

Keywords

COVID-19; schools; surveillance; infectious disease

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Conflict of interest

The other authors declare no conflicts.

Introduction

Throughout the COVID-19 pandemic, schools were tasked with making decisions on the implementation of COVID-19 prevention and surveillance strategies. Early in the pandemic, the Centers for Disease and Control and Prevention (CDC) provided guidance on COVID-19 prevention in schools that underscored the importance of early detection and control of COVID-19 outbreaks in schools through school-based surveillance of COVID-19 cases.¹ However, the pandemic evolved with Delta and Omicron variant surges, overwhelming the monitoring capacity of both schools and health departments. Given changing population immunity due to vaccines and infections, the availability of COVID-19 therapeutics, and increasing availability of at-home COVID-19 tests, many health departments and schools shifted away from universal case investigation and contact-tracing models and adjusted case reporting based on local need and resources.²

Even before the COVID-19 pandemic, the capacity for school-based surveillance of infectious diseases had been tested, often during outbreaks of infectious diseases such as norovirus.³ Beyond traditional measures of infectious disease burden, such as cases and hospitalizations, use of school-based syndromic surveillance measures (eg, absenteeism, illness-related absenteeism) as potential signals of disease burden has increased, often under the direction of local health departments.^{4–16} Yet, from a national perspective, we have a limited understanding of school-based data collection and monitoring of infectious disease outcomes (eg, case and absenteeism data) because such efforts may be constrained due to lack of partnerships, expertise, financial resources, and infrastructure; staff shortages; and competing priorities experienced by health departments and schools. In particular, health departments' capacity to lead infectious disease surveillance in schools may be especially constrained when other congregate settings require more intensive efforts (eg, nursing homes). Understanding the availability—or lack thereof—of school-based infectious disease data during different time points in the COVID-19 pandemic can provide insight into the feasibility of school-based surveillance, as well as factors associated with capturing such data.

The CDC initiated the National School COVID-19 Prevention Study (NSCPS), a mixed-method study to evaluate the use and effectiveness of COVID-19 prevention strategies by kindergarten through 12th grade (K-12) public schools and monitor school-based COVID-19 trends during the pandemic.¹⁷ As part of the NSCPS, we recruited a nationally representative sample of public K-12 schools and their corresponding health departments to compile school-level COVID-19 case, quarantine, and student absenteeism data. In the present study, we wanted to determine the availability of school-based infectious disease surveillance data (eg, cases, quarantines, absences) during the 2021–2022 school year, document the varied approaches to collecting such data, and elucidate factors associated with missingness. Additionally, we aimed to provide insight into the feasibility of rapidly organizing a national data collection system to collect school-level COVID-19 case, quarantine, and student absenteeism data to inform federal decision-making during the pandemic and provide considerations for future data collections to respond effectively during public health emergencies.

Methods

Data

School-level survey data: The NSCPS evaluated use of COVID-19 prevention strategies among K-12 public schools during the COVID-19 pandemic. One NSCPS component was a series of longitudinal surveys delivered to a nationally representative sample of K-12 public schools, each completed by a school administrator (eg, a principal). Our stratified random sample of public K-12 schools—using strata defined by school level (elementary, middle, high), National Center for Education Statistics (NCES) locale, and region—resulted in a sample of 1602 schools. During the 2021–2022 school year, 4 surveys were administered to the sample: wave 2 (October 05–November 19, 2021); wave 3 (December 6, 2021–January 23, 2022); wave 4 (February 14–March 27, 2022); and wave 5 (April 04–May 27, 2022). Wave 1 focused on the 2020–2021 school year and is excluded from analyses. Each survey assessed the implementation of COVID-19 prevention strategies and related outcomes (eg, cases). This study was approved by the institutional review board of ICF, a research and evaluation consulting firm, in accordance with CDC's policies and federal law.

Measures

School-level COVID-19 case data acquired from health departments: During the summer of 2022, we contacted the health departments of all 50 states and the District of Columbia to request school-level COVID-19 case data for each school in their jurisdiction for the 1602 schools in the NSCPS sample. In some cases, state health department liaisons referred us to local health departments that provided the data. For agencies that responded to the data request affirmatively, standardized data templates were shared to provide school-level COVID-19 case data for the 2021–2022 school year, by month, for identified schools in their jurisdiction. We sent a short survey to health departments to contextualize provided case data.

Measures

School-level survey data: We examined missingness of 5 school-level measures at each wave: COVID-19 cases among students, COVID-19 cases among staff, COVID-19 quarantines, all-cause absenteeism, and illness-related absenteeism. The NSCPS data were linked with a proprietary database on school characteristics maintained by MDR.¹⁸ School level was categorized as elementary (containing any grade from kindergarten through grade 4), middle (containing any grade from 7 to 8), or high (containing any grade from 10 to 12). The percentage of students eligible for free and reduced-price meals was used as a proxy for school-level poverty and categorized such that high-poverty schools were schools with $\geq 76\%$ of students eligible for free and reduced-price meals, mid-poverty schools had 26%–75% eligible, and low-poverty schools had $\leq 25\%$ eligible.^{19,20} The NCES school locale was categorized as town, suburb, rural, or city; US region was categorized as Northeast, Midwest, South, and West.²¹

We hypothesized several factors potentially would be associated with missingness of school-level COVID-19 case, quarantine, and student absenteeism data. These included school-level protocols and procedures related to identifying, monitoring, and responding to

COVID-19 cases, such as having quarantine protocols. Because of the nationwide variation in requirements for reporting school-level COVID-19 data to other entities, we examined whether the school reported COVID-19 cases to the local or state health department or to a local or state education agency. Additionally, we examined whether the school experienced staff shortages of various occupational groups, because shortages may limit a school's capacity to collect relevant data. Finally, we examined whether the school had an emergency operations plan, because such plans are meant to prepare for and delineate how schools will respond to an emergency situation.²² Table 1 lists complete details on survey wording and construct operationalization.

School-level COVID-19 case data from health departments: Using the school-level COVID-19 case data for the 1602 schools in the NSCPS sample (the invited total sample of schools) acquired from state or local health departments, we created indicators of data availability by month from August 2021 to June 2022. We asked health departments to provide data disaggregated by student cases and staff cases; however, some health departments did not have disaggregated counts and could provide only a combined count of student and staff cases. Thus, we present availability of school-level COVID-19 case data by 3 populations: student cases; staff cases; and student plus staff cases. Additionally, the short survey delivered to health departments assessed details such as how the COVID-19 case data were acquired, whether at-home COVID-19 tests were included, and relevant changes to case reporting during the period of interest.

Analysis

School-level survey data: We present a breakdown of the characteristics of the invited sample of schools and participating sample of schools at each wave, using 26 school-level characteristics. To model predictors of survey nonresponse, we fit a logistic regression model wherein the outcome was not responding to any of the 4 surveys during the 2021–2022 school year, adjusting for school level, NCES locale, region, and school poverty. Other published NSCPS reports have examined differences in survey nonresponse for individual survey waves and combinations of waves.^{23,24}

We calculated 1) the percentage of schools missing data for school-level COVID-19 case, quarantine, and student absenteeism outcomes among the total invited sample of schools; and 2) the participating sample of schools at each survey wave. We fit a series of generalized estimating equations for longitudinal discrete outcome data. The first set of analyses included 5 models to examine how missingness of each school-level outcome varied by school demographic characteristics during the 2021–2022 school year among the full invited sample of NSCPS schools ($n = 1602$). Each model's outcome was a binary indicator of missing data for the 5 school-level COVID-19 case, quarantine, and student absenteeism outcomes. Missingness encompasses both survey nonresponse (ie, the school did not respond to the survey) and item nonresponse (ie, the school responded to the survey but did not provide outcome data). Each of the models adjusted for 5 school-level characteristics (school level, NCES locale, region, school poverty, school size) and survey wave.

We repeated analyses examining how missingness of school-level outcomes varied by school demographic characteristics, but we restricted analyses to participating schools. Therefore, the outcome for each model was a binary indicator of missing data for each of the 5 outcomes and encompassed only item nonresponse. The models adjusted for the same 5 school demographic characteristics (school level, NCES locale, region, school poverty, school size) and survey wave. We then examined associations between 1) missingness of school-level COVID-19 case, quarantine, and student absenteeism outcomes with 2) factors capturing school-level protocols and procedures for identifying, monitoring, reporting, and responding to COVID-19 cases, emergency operations plans, and staff shortages. Wave-adjusted models adjusted for each factor independently and controlled for wave. Fully adjusted models examined each factor independently and further controlled for school level, NCES locale, school poverty, and wave. The generalized estimating equation models were fit in R (version 4.3.1) using *geepack*, and an autoregressive correlation structure was specified.²⁵

School-level COVID-19 case data from health departments: Using data acquired from local and state health departments, we plotted the percentage of schools with available school-level COVID-19 case data by month during the 2021–2022 school year for the schools in the NSCPS sample. We analyzed responses to the short survey that health department contacts completed, describing the school-level COVID-19 case data.

Results

Of the 1602 schools invited to participate in the NSCPS, 437 participated in wave 2 (27.3% response rate), 423 in wave 3 (26.4% response rate), 420 in wave 4 (26.2% response rate), and 412 in wave 5 (25.7% response rate). Most of the invited schools were elementary schools ($n = 833$; 52.0%), followed by middle ($n = 411$; 25.7%) and high ($n = 358$; 22.3%) schools (Table 2). Response rates did not vary substantially by examined school characteristics. Nonresponse to any NSCPS survey in waves 2–5 did not vary by school level, region, and school poverty level (Table 3). City schools had higher odds of not participating in any NSCPS survey in waves 2–5 compared with town schools (odds ratio [OR] = 1.46; 95% CI, 1.00–2.13).

Among the invited sample of schools, we did not have data for school-level COVID-19 cases, quarantines, and student absenteeism from most schools (missingness for outcomes ranged from 81.1% to 96.1%; Table 4). Almost one-third of participating schools had missing data on COVID-19 cases among students (31.6%) and COVID-19 cases among staff (30.7%) at wave 2 (Table 4). Almost 50% of participating schools had missing data on COVID-19 quarantines (48.1%), and more than 50% had missing data on all-cause absenteeism (61.6%) and illness-related absenteeism (78.0%) at wave 2. Missingness for all examined outcomes increased with each survey wave.

Among both the invited and participating samples, middle schools were more likely to have missing data for several outcomes compared with elementary and high schools (Tables 5 and 6). Schools in the South in the invited sample had higher odds of missingness for staff COVID-19 cases compared with schools in the Midwest (OR = 1.45; 95% CI, 1.04–2.01)

and for all-cause absenteeism compared with schools in the Northeast (OR = 1.76; 95% CI, 1.07–2.89). Within the participating sample, schools in the Northeast had lower odds of missingness for all-cause absenteeism than schools in the West (OR = 0.45; 95% CI, 0.26–0.77) and schools in the Midwest (OR = 0.54; 95% CI, 0.33–0.90). Among participating schools, small schools had lower odds of missingness for COVID-19 cases among students and staff and higher odds of missingness for illness-related absenteeism compared with schools that were not small. Furthermore, the odds of missingness were greater for waves 3, 4, and 5 compared with wave 2 for all outcomes, although not all comparisons were statistically significant.

In analyses adjusted for school level, NCES locale, and school poverty, schools that had a system to report if a child has been exposed to COVID-19 had 0.59 (95% CI, 0.39–0.89) times the odds, and schools that had a system to report COVID-19 diagnoses had 0.57 (95% CI, 0.33–0.99) times the odds of having missing data on COVID-19 cases among staff (Table 7). Schools that reported tracking the COVID-19 vaccination status of staff had 1.66 (95% CI, 1.03–2.65) times the odds of having missing data for illness-related absenteeism. Schools that had a system to report positive at-home COVID-19 tests had 72% lower odds of having missing data on COVID-19 cases among students (OR = 0.28; 95% CI, 0.14–0.58), 74% lower odds of having missing data on COVID-19 cases among staff (OR = 0.26; 95% CI, 0.12–0.54), and 68% lower odds of having missing data on COVID-19 quarantines (OR = 0.32; 95% CI, 0.15–0.70). Schools that experienced teacher staff shortages had increased odds of having missingness for 4 of 5 examined outcomes, with adjusted ORs ranging from 1.43 to 1.61. Schools that experienced staff shortages for administrative staff had increased odds of having missingness for illness-related absenteeism (OR = 2.07; 95% CI, 1.00–4.26).

One local health department and 27 state health departments provided school-level COVID-19 case data for 729 of 1602 schools in the NSCPS sample for at least 1 month during the 2021–2022 school year. Among the full invited sample of NSCPS schools, we obtained school-level COVID-19 case data for less than 50% of schools for any given month from August 2021 to June 2022 (Figure 1). Among schools for which health departments provided COVID-19 case data during the 2021–2022 school year for at least 1 month, the availability of COVID-19 case data ranged from 37% to 67% for each month for all 3 populations—students, staff, and combined students and staff.

More than half (61%) of the health departments reported these data were obtained by linking COVID-19 case data to specific schools through case investigation and contact-tracing protocols, and 39% reported the data were obtained through collation of case data that schools obtained themselves through their own reporting systems (Table 8). Other mechanisms whereby school-level COVID-19 case data were obtained by health departments included linking school enrollment data with health department case data; outbreak investigations at schools; and COVID-19 screening testing programs at schools. Half of the health departments reported the school-level COVID-19 case data did not include at-home positive COVID-19 tests, and 36% of health departments reported they did include at-home positive COVID-19 tests; 14% of health departments were unsure. Almost one-third of health departments reported there were changes to school-level COVID-19 case data during the 2021–2022 school year, with changes including deprioritizing collection

of school COVID-19 case data to prioritize settings at higher risk of severe COVID-19 outcomes and no longer requiring schools to report cases to health departments.

Discussion

We found high levels of missingness for school-level COVID-19 case, quarantine, and student absenteeism data assessed in a national sample of public K-12 schools. Furthermore, missingness increased over time and varied by school characteristics. Missingness of these indicators differed by varying school characteristics depending on if we examined the full invited sample or the responding sample of schools, suggesting distinct predictors of survey nonresponse and item nonresponse. For the same sample of schools, based on data requests to state or local health departments in their jurisdiction, we found similarly high levels of missingness of school-level COVID-19 case data, as well as a myriad of approaches used by health departments to obtain school case data. Together, these findings provide insight into the feasibility of school-based infectious disease surveillance and help identify priorities for technical assistance and resources to improve such surveillance during public health emergencies and routine operations.

Missingness was highest for absenteeism measures, followed by COVID-19 quarantines, then COVID-19 cases among students, and then staff. Although absenteeism data may be considered a routine part of school-based data collection, collecting student absenteeism data during the pandemic posed new challenges: a record number of schools experienced high levels of chronic absenteeism, requirements were lacking for capturing attendance in virtual learning platforms, and high numbers of student quarantines and isolations potentially complicated absenteeism data.^{26–28} Based on NSCPS survey data, greater than 50% of schools classified instances wherein a student missed school due to a COVID-19 isolation or quarantine as an excused absence; in contrast, approximately 33% of schools did not classify these instances as absences at all as long as students kept up with their schoolwork (data not shown). Inconsistencies in defining absences—both across schools but also within the same schools over time—may compromise the use of absenteeism data as tracking indicators for infectious disease surveillance. A systematic review of the use of school attendance as syndromic surveillance of infectious diseases found that absenteeism related to influenza-like illness performed the best, followed by illness-related absenteeism; all-cause absenteeism performed the least well.¹⁶ Those findings, in the context of our study documenting that a minority of schools nationally were capturing and were able to provide us all-cause and illness-related absenteeism data, highlight potential challenges in expanding absenteeism-related syndrome surveillance approaches that have been tested in a more localized and controlled context. Other studies have examined the use of wastewater surveillance at specific schools to monitor the spread of infectious diseases, and future studies should consider documenting the feasibility of such approaches across US schools.^{29,30} The National Outbreak Reporting System specifically captures foodborne and waterborne disease outbreaks, certain fungal disease, and enteric disease outbreaks by setting type, including schools.³¹

School-based COVID-19 case data collection is also subject to its own challenges. There were shifts away from school-based contact tracing during surges of COVID-19.^{32,33}

Likewise, we found that teacher shortages were associated with missingness of school-level COVID-19 case data. Effective COVID-19 surveillance may be of particular importance during surges because such data can provide information about individual cases and close contacts of cases requiring intervention (eg, isolation) and health services (eg, testing). Building workforce capacity at schools and health departments and building strong partnerships between schools and health departments are important for future emergency preparedness. In addition, collaboration between schools and other sectors that engage school systems and may play an important role in school emergency preparedness, such as emergency management organizations, public transportation systems, after-school programs, and local health systems and health care providers, is also important.

Notably, the approaches to collecting school-level COVID-19 case data varied substantially. Health departments indicated a myriad of approaches to collecting these data. These included collating school-level COVID-19 case data that schools obtained through their own reporting systems; linking cases to specific schools through contact tracing and case investigation; linking COVID-19 case data with attendance records; and obtaining case data through school-based COVID-19 screening testing programs or outbreak investigations. The Council of State and Territorial Epidemiologists, which conducted a National Data Call in early 2021 to compile various school-associated COVID-19 case and cluster definitions nationwide, found substantial variation.³⁴ Given the data-generating mechanisms and COVID-19 case definitions used, the types of COVID-19 case data collected are expected to vary substantially.

The data quality issues we observed indicate the challenges of organizing data collection systems for school-level infectious disease outcome data to inform federal decision-making during the pandemic. The NSCPS surveys provided essential data on ongoing challenges for schools during a pandemic, use of COVID-19 prevention strategies, their impact on priority populations, and disparities in strategies used.^{23,24,35–37} However, as this study demonstrated, collecting school-based data about cases, absences, and quarantines was subject to high levels of missingness and unstandardized approaches across schools and health departments. In turn, this limited our ability to aggregate data to obtain a national perspective on COVID-19 burden in schools. Developing nationally standardized case definitions and school-based surveillance systems early in an outbreak may be essential for producing actionable data. Additionally, the average response rate for NSCPS waves 2–5 was 26.4%, similar to response rates of other school-based data collections at this time, such as the School Pulse Panel.³⁸ Low response rates limit the representativeness of these data and may reflect school administrators' time constraints during the pandemic. Updating school-based systems used during regular operations (eg, learning management systems) to regularly collect and share data (eg, absenteeism) with local, state, and federal agencies and to be easily adaptable during emergencies to capture pertinent data via low-burden methods may be worthwhile.

This study has limitations. First, we used a school's or health department's ability to provide us with specific outcome data as a proxy for data availability, but it is possible other factors precluded data sharing, such as time constraints, competing responsibilities, concerns about disclosure, and lack of trust in the data. More research is needed to understand

the specific obstacles schools may experience in sharing data. Second, data pertain to the 2021–2022 school year of the COVID-19 pandemic, and findings may not be generalizable to other periods during the pandemic and beyond. Furthermore, low survey response rates may compromise the representativeness of these findings. Third, for the surveys delivered to schools, principals were the primary respondent; their awareness of protocols and data specific to COVID-19 may be limited, especially if data tend to be managed at the district, or higher, level.

Despite these limitations, we provide an overview of the availability of school-level COVID-19 case, quarantine, and student absenteeism data using a national sample of K-12 public schools. We also identified potential barriers and facilitators for maintaining these data, and we outlined the considerable variability in approaches to collecting school-level COVID-19 data. Findings may inform planning school-based data collections during outbreaks or public health emergencies and may underscore the importance of developing clear objectives, standardized approaches and definitions, and investing in developing schools' infectious disease surveillance infrastructure.

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Data availability

The data that support the findings of this study are available on request from the corresponding author through a data user agreement. The data are not publicly available, because they contain information that could compromise the privacy of research participants.

References

1. Centers for Disease Control and Prevention. Guidance for COVID-19 Prevention in K-12 Schools. August 2021 update. <https://cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-guidance.html>
2. Council of State and Territorial Epidemiologists. Revised COVID-19 K-12 School Surveillance Guidance for Identification and Classification of Outbreaks. 2022. Accessed January 26, 2024. <https://preparedness.cste.org/wp-content/uploads/2022/09/CSTE-Interim-COVID-19-School-Surveillance-Guidance-2022-1.pdf>
3. Mattison CP, Calderwood LE, Marsh, et al. Childcare and school acute gastroenteritis outbreaks: 2009–2020. *Pediatrics*. 2022; 150(5):e2021056002. 10.1542/peds.2021-056002 [PubMed: 36278284]
4. Williams NJ, Ghosh TS, Bisgard. Comparison of 3 school-based influenza surveillance indicators. *J Public Health Manag Pract*. 2013;19(2):119–125. 10.1097/PHH.0b013e318252f005 [PubMed: 23358289]

5. Lai J, Hughes HE, Morbey R, et al. Developing a sentinel syndromic surveillance system using school-absenteeism data, example monitoring absences over the 2020 COVID-19 pandemic. *Epidemiol Infect.* 2021;149:e248. 10.1017/S0950268821002399 [PubMed: 34749838]
6. Lawpoolsri S, Khamsiriwatchara A, Liulark, et al. Real-time monitoring of school absenteeism to enhance disease surveillance: a pilot study of a mobile electronic reporting system. *JMIR Mhealth Uhealth.* 2014;2(2):e22. 10.2196/mhealth.3114 [PubMed: 25099501]
7. Southall E, Holmes A, Hill, et al. An analysis of school absences in England during the COVID-19 pandemic. *BMC Med.* 2021;19(1):1–14. 10.1186/s12916-021-01990-x [PubMed: 33390155]
8. Cheng CK, Cowling BJ, Lau, et al. Electronic school absenteeism monitoring and influenza surveillance, Hong Kong. *Emerg Infect Dis.* 2012;18(5):885–887. 10.3201/eid1805.111796 [PubMed: 22516519]
9. Kara E, Elliot A, Bagnall H, et al. Absenteeism in schools during the 2009 influenza a (H1N1) pandemic: a useful tool for early detection of influenza activity in the community? *Epidemiol Infect.* 2012;140(7):1328–1336. 10.1017/S0950268811002093 [PubMed: 22014106]
10. Tan L, Cheng L, Yan, et al. Using daily syndrome-specific absence data for early detection of school outbreaks: a pilot study in rural China. *Public Health.* 2014;128(9):792–798. 10.1016/j.puhe.2014.06.004 [PubMed: 25200208]
11. Aldridge RW, Hayward AC, Field, et al. Are school absences correlated with influenza surveillance data in England? Results from Decipher My Data—a research project conducted through scientific engagement with schools. *PLoS One.* 2016;11(3):e0146964. 10.1371/journal.pone.0146964 [PubMed: 26933880]
12. Mook P, Joseph C, Gates. Pilot scheme for monitoring sickness absence in schools during the 2006/07 winter in England: can these data be used as a proxy for influenza activity? *Eurosurveillance.* 2007;12(12):11–12. 10.2807/esm.12.12.00755-en
13. Kom Mogto CA, De Serres G, Douville Fradet M, et al. School absenteeism as an adjunct surveillance indicator: experience during the second wave of the 2009 H1N1 pandemic in Quebec, Canada. *PLoS One.* 2012;7(3):e34084. 10.1371/journal.pone.0034084 [PubMed: 22479531]
14. Ashton RA, Kefyalew T, Batisso, et al. The usefulness of school-based syndromic surveillance for detecting malaria epidemics: experiences from a pilot project in Ethiopia. *BMC Public Health.* 2015;16(1):1–13. 10.1186/s12889-015-2680-7
15. Temte JL, Barlow S, Goss, et al. Cause-specific student absenteeism monitoring in K-12 schools for detection of increased influenza activity in the surrounding community—Dane County, Wisconsin, 2014–2020. *PLoS One.* 2022;17(4):e0267111. 10.1371/journal.pone.0267111 [PubMed: 35439269]
16. Donaldson AL, Hardstaff JL, Harris JP, et al. School-based surveillance of acute infectious disease in children: a systematic review. *BMC Infect Dis.* 2021;21(1):744. 10.1186/s12879-021-06444-6 [PubMed: 34344304]
17. Centers for Disease Control and Prevention. National School COVID-19 Prevention Study (NSCPS). 2021. Accessed June 16, 2022. <https://www.cdc.gov/healthyyouth/data/nscps/index.htm>
18. MDR Education. Website homepage. 2024. Accessed March 27, 2024. <https://mdreducation.com/>
19. Underwood JM, Pampati S, Everett Jones S, et al. School-level poverty and rurality associated with differences in sexual risk behaviors among U.S. public high school students. *J Adolesc Health.* 2021;69(6):964–969. 10.1016/j.jadohealth.2021.06.005 [PubMed: 34304989]
20. Snyder T, Musu-Gillette L. Free or reduced price lunch: a proxy for poverty. National Center for Education Statistics blog; 2015.
21. National Center for Education Statistics. Locale classifications. 2023. Accessed April 4, 2022. <https://nces.ed.gov/programs/edge/Geographic/LocaleBoundaries>
22. US Department of Education. Guide for Developing High-Quality School Emergency Operations Plans. 2012. Accessed January 26, 2024. https://rems.ed.gov/docs/School_Guide_508C.pdf
23. Pampati S, Rasberry CN, Timpe, et al. Disparities in implementing COVID-19 prevention strategies in public schools, United States, 2021–22 school year. *Emerg Infect Dis.* 2023;29(5):937–944. 10.3201/eid2905.221533 [PubMed: 36990463]

24. Conklin S, McConnell L, Murray C, et al. A longitudinal analysis of COVID-19 prevention strategies implemented among US K-12 public schools during the 2021–2022 school year. *Ann Epidemiol.* 2024;96:40–47. 10.1016/j.annepidem.2024.05.011 [PubMed: 38823566]
25. Højsgaard S, Halekoh U, Yan J. The R package geepack for generalized estimating equations. *J Stat Softw.* 2006;15:1–11. 10.18637/jss.v015.i02
26. Attendance Works. Rising tide of chronic absence challenges schools. Blog post. October 12, 2023. Accessed January 26, 2024. <https://www.attendanceworks.org/rising-tide-of-chronic-absence-challenges-schools/?preview=true>
27. Attendance Works. Monitoring data matters even more: a review of state attendance data policy and practice in school year 2022–23. 2023. Accessed April 24, 2024. https://www.attendanceworks.org/wp-content/uploads/2019/06/Attendance-Works-Policy-Brief-2023_072723.pdf
28. Gross B, Opalka A. Too Many Schools Leave Learning to Chance During the Pandemic. Center on Reinventing Public Education; 2020. Accessed April 21, 2024. <https://files.eric.ed.gov/fulltext/ED605576.pdf>
29. Kappus-Kron H, Chatila DA, MacLachlan, et al. Precision public health in schools enabled by wastewater surveillance: a case study of COVID-19 in an upstate New York middle-high school campus during the 2021–2022 academic year. *PLoS Glob Public Health.* 2024;4(1):e0001803. 10.1371/journal.pgph.0001803 [PubMed: 38198477]
30. Wolken M, Sun T, McCall C, et al. Wastewater surveillance of SARS-CoV-2 and influenza in preK-12 schools shows school, community, and citywide infections. *Water Res.* 2023;231:119648. 10.1016/j.watres.2023.119648 [PubMed: 36702023]
31. Centers for Disease Control and Prevention. National Outbreak Reporting System (NORS). 2023. Accessed July 22, 2024. <https://www.cdc.gov/nors/index.html>
32. Vermont Agency of Education & Department of Health. COVID-19 Prevention and Mitigation Measures for Winter 2022. 2022. Accessed June 18, 2022. https://education.vermont.gov/sites/aoe/files/documents/edu-vdh-memo-french-levine-advisory-covid19-prevention-measures-winter-2022_0.pdf?utm_medium=email&_hsmi=201684628&_hsenc=p2ANqtz-8orJj4qb0HcJ5XdCsuGCp4IRaUyz5RH99IqKco-nuaITkQ4CzSDR118fa4gPgRmXUJWAQpe53MIhwPLhClUBPKezD8w&utm_content=201684628&utm_source=hs_email
33. Connecticut State Department of Education and Department of Public Health. Updated considerations for quarantine, isolation, testing, and contact tracing policies and procedures in pre K-12 schools. Frequently asked questions. 2022. Accessed June 18, 2022. https://portal.ct.gov/-/media/Coronavirus/FINAL-School-Contact-Tracing_Quarantine_Update_12312021.pdf?utm_medium=email&_hsmi=201684628&_hsenc=p2ANqtz-9iHAuP5ZbKOM3k2Xy_adHvslpF4Y_KIh0i-omGO6dTHPI7dftAQ4c7ytMv4iIMkymDMqrBSYTHOxgZgLAizPWniZJYzA&utm_content=201684628&utm_source=hs_email
34. Council of State and Territorial Epidemiologists. Standardized COVID-19 K-12 School Surveillance Guidance for Classification of Clusters and Outbreaks. 2021. Accessed December 19, 2021. <https://preparedness.cste.org/wp-content/uploads/2021/08/CSTE-Standardized-COVID-19-K-12-School-Surveillance-Guidance-for-Classification-of-Clusters-and-Outbreaks.pdf>
35. Pampati S, Rasberry CN, McConnell L, et al. Ventilation improvement strategies among K-12 public schools - the National School COVID-19 Prevention Study, United States, February 14–March 27, 2022. *MMWR Morb Mortal Wkly Rep.* 2022;71(23):770–775. 10.15585/mmwr.mm7123e2 [PubMed: 35679198]
36. Spencer P, Timpe Z, Verlenden, et al. Challenges experienced by US K-12 public schools in serving students with special education needs or underlying health conditions during the COVID-19 pandemic and strategies for improved accessibility. *Disabil Health J.* 2023;16(2):101428. 10.1016/j.dhjo.2022.101428 [PubMed: 36610820]
37. Moore S, Timpe Z, Rasberry, et al. Disparities in the implementation of school-based mental health supports among K-12 public schools. *Psychiatr Serv.* 2024;75(1):17–24. 10.1176/appi.ps.20220558 [PubMed: 37312505]

38. Department of Education Institute of Education Sciences. 2022 School Pulse Panel. <https://ies.ed.gov/schoolsurvey/spp/#tab-3>
39. US Census Bureau. Small Area Income and Poverty Estimates (SAIPE) Program. 2024. Accessed April 10, 2024. <https://www.census.gov/programs-surveys/saipe.html>

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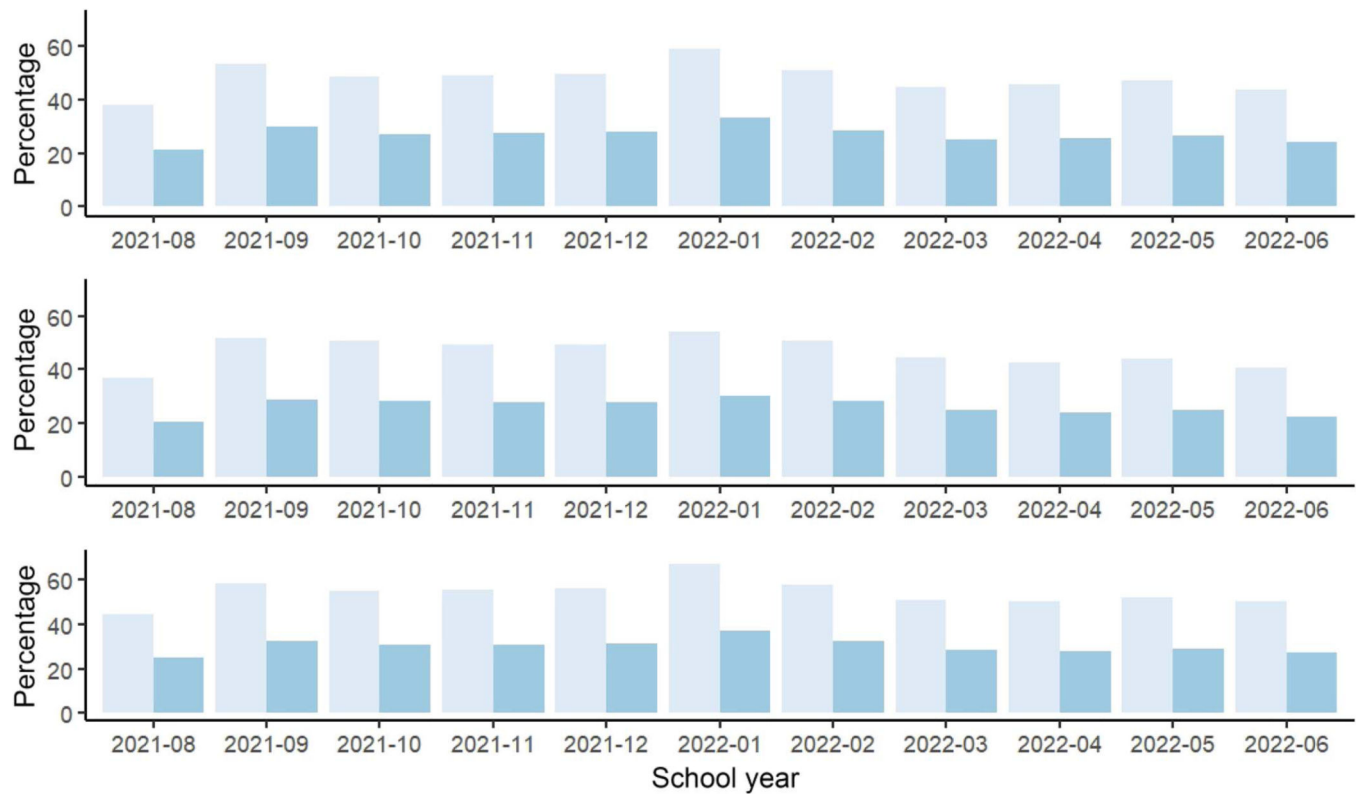


Figure 1.

Availability of school-level COVID-19 case data acquired from local or state health department by month—National School COVID-19 prevention study, 2021–2022 school year, United States. Based on data acquired from local and state and health departments, we plotted the percentage of schools with available school-level COVID-19 case data by month during the 2021–2022 school year for the 1602 schools in the National School COVID-19 prevention study sample (the total sample) and among the 1602 schools for which health departments were able to provide at least 1 month of COVID-19 case data (the responding sample). Health departments were asked to provide data disaggregated by student cases and staff cases. However, some health departments did not have disaggregated counts and could provide only a combined count of student and staff cases.

Table 1.

Constructs, survey items, and operationalization: the National School COVID-19 Prevention Study—2021–2022 school year, United States.

Construct	Survey items	Operationalization
Data missingness category		
COVID-19 cases among students	Since the start of the 2021–2022 school year, approximately how many positive COVID-19 cases were reported or identified among students in your school (even if acquired elsewhere)?	Missing indicator created for each wave
COVID-19 cases among staff	Since the start of the 2021–2022 school year, approximately how many positive COVID-19 cases were reported or identified among teachers and school staff in your school (even if acquired elsewhere)?	Missing indicator created for each wave
COVID-19 quarantines	Since the start of the 2021–2022 school year, how many times have students had to quarantine due to being a close contact of someone with COVID-19 at school? If a student was quarantined on 3 separate occasions, please count that as 3.	Missing indicator created for each wave
All-cause absenteeism	Since the start of the 2021–2022 school year, how many absent days were recorded among all enrolled students (count both excused and unexcused absent days)? Count each individual day (eg, 1 student missing 3 days would be 3 absent days).	Missing indicator created for each wave
Illness-related absenteeism	For the number of absent days recorded since the start of the 2021–2022 school year, how many absent days were for each of the following reasons? Illness, injury, health treatment, or examination (exclude missed days due to quarantining after being a close contact of someone with COVID-19)	Missing indicator created for each wave
Quarantine protocols	Wave 2: At the start of the 2021–2022 school year, did your school have any protocols in place for quarantining students exposed to someone with COVID-19 at school or a school-related activity? Waves 3–5: Currently, does your school have any protocols in place for quarantining students who are determined to be a close contact of someone with COVID-19 at school or a school-related activity? Response options: Yes, No, Don't know Included in waves 2–5	Yes at any wave vs No or Don't know at all responding waves
Contact-tracing protocols	Wave 2: Since the start of the 2021–2022 school year, has your school conducted (or partnered with another organization to conduct) contact tracing for COVID-19 infected students, teachers, or staff? Waves 3–5: Currently, is your school conducting (or partnering with another organization to conduct) contact tracing for COVID-19 infected students, teachers, or staff? Response options: Yes, No, Don't know Included in waves 2–5	Yes at any wave vs No or Don't know at all responding waves
Tracking vaccination status of students	For which groups is your school tracking COVID-19 vaccination status? Students Included in waves 2–5	Indicated “students” at any wave vs did not indicate “students” at all responding waves
Tracking vaccination status of staff	For which groups is your school tracking COVID-19 vaccination status? Teachers and other school staff Included in waves 2–5	Indicated “teachers and other school staff” at any wave vs did not indicate “teachers and other school staff” at all responding waves
Onsite COVID-19 diagnostic testing for students and staff	Wave 2: At the start of the 2021–2022 school year, how was onsite COVID-19 testing used at your school? Mark all that apply. Waves 3–5: Currently, how is onsite COVID-19 testing used at your school? Mark all that apply. • For symptomatic students (A) • For symptomatic teachers/staff (B) • For students identified as close contacts of persons with confirmed or probable COVID-19 (C) • For teachers/staff identified as close contacts of persons with confirmed or probable COVID-19 (D) Included in waves 2–5	Selected A or C and B or D at any wave vs did not select A or C and B or D at all waves

Construct	Survey items	Operationalization
Onsite COVID-19 screening testing for students and staff	Wave 2: At the start of the 2021–2022 school year, how was onsite COVID-19 testing used at your school? Mark all that apply. Waves 3–5: Currently, how is onsite COVID-19 testing used at your school? Mark all that apply. • For screening all or a percentage of students (regardless of vaccination status) on a regular basis (E) • For screening all or a percentage of students who are not fully vaccinated on a regular basis (F) • For screening all or a percentage of teachers/staff (regardless of vaccination status) on a regular basis (G) • For screening all or a percentage of teachers/staff who are not fully vaccinated on a regular basis (H) Included in waves 2–5	Selected E or F and G or H at any wave vs did not select E or F and G or H at all waves
System to self-report COVID-19 diagnoses to school	Wave 2: At the start of the 2021–2022 school year, was there a system for parents to self-report to school administration if any of the following are true? Waves 3–5: Currently, is there a system for parents to self-report to school administration if any of the following are true? • Their child has been diagnosed with COVID-19 Included in waves 2–5	Selected “their child has been diagnosed with COVID-19” at all responding waves vs did not select “their child has been diagnosed with COVID-19” for at least 1 wave
System to report child’s exposure to COVID-19	Wave 2: At the start of the 2021–2022 school year, was there a system for parents to self-report to school administration if any of the following are true? Waves 3–5: Currently, is there a system for parents to self-report to school administration if any of the following are true? • Their child has been exposed to someone with COVID-19 within the past 14 days Included in waves 2–5	Selected “their child has been exposed to someone with COVID-19 within the past 14 days” at all responding waves vs did not select “their child has been exposed to someone with COVID-19 within the past 14 days” for at least 1 wave
System to self-report to school that child is waiting for COVID-19 test results	Wave 2: At the start of the 2021–2022 school year, was there a system for parents to self-report to school administration if any of the following are true? Waves 3–5: Currently, is there a system for parents to self-report to school administration if any of the following are true? • Their child is waiting for COVID-19 test results Included in waves 2–5	Selected “their child is waiting for COVID-19 test results” at all responding waves vs. did not select “their child is waiting for COVID-19 test results” at least 1 wave
System for parent to report positive at-home COVID-19 tests	Currently, is there a system for parents to self-report to school administration if any of the following are true? • Their child had a positive over-the-counter (at-home) COVID-19 test Included in wave 5	Selected “their child had a positive over-the-counter (at-home) COVID-19 test” vs did not select “their child had a positive over-the-counter (at-home) COVID-19 test”
School reports COVID-19 cases to local or state health department	During the 2021–2022 school year, to whom did your school or school district report COVID-19 cases among students or staff in your school? • Local health department • State health department Included in wave 5	Selected “local health department” or “state health department” vs did not select both “local health department” and “state health department”
School reports COVID-19 cases to local or state education agency	During the 2021–2022 school year, to whom did your school or school district report COVID-19 cases among students or staff in your school? • Local education agency • State education agency Included in wave 5	Selected “local education agency” or “state education agency” vs did not select both “local education agency” and “state education agency”
Had an emergency operations plan during 2021–2022 school year	During the 2021–2022 school year, did your school or school district create or update an emergency operations plan, sometimes referred to as an emergency or incident preparedness plan? Emergency operations plans document how schools will prepare, respond, and recover for a range of emergencies (eg, crime, natural disasters). Response options: Yes, No, Don’t know Included in wave 5	Yes vs No or Don’t know
Experienced staff shortages for school nurses or health services staff	For which of the following groups has your school experienced staff shortages during the 2021–2022 school year? • School nurses or health services staff Included in wave 3	Selected “school nurses or health services staff” vs did not select “school nurses or health services staff”
Experienced staff shortages for teachers	For which of the following groups has your school experienced staff shortages during the 2021–2022 school year?	Selected “teachers” vs did not select “teachers”

Construct	Survey items	Operationalization
Experienced staff shortages for administrative staff	For which of the following groups has your school experienced staff shortages during the 2021–2022 school year? • Teachers Included in wave 3 • Administrative staff Included in wave 3	Selected “administrative staff,” vs did not select “administrative staff”

Table 2. Characteristics of schools participating in the National School COVID-19 Prevention Study—2021–2022 school year, United States.

School characteristic	Participating schools									
	Invited schools		Wave 2		Wave 3		Wave 4		Wave 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
School level										
Elementary	833	52.0	236	54.0	235	55.6	234	55.7	227	55.1
Middle	411	25.7	108	24.7	102	24.1	100	23.8	98	23.8
High	358	22.3	93	21.3	86	20.3	86	20.5	87	21.1
Census region										
Northeast	260	16.2	69	15.8	65	15.4	67	16.0	57	13.8
Midwest	402	25.1	120	27.5	121	28.6	125	29.8	129	31.3
South	551	34.4	132	30.2	134	31.7	131	31.2	127	30.8
West	389	24.3	116	26.5	103	24.3	97	23.1	99	24.0
NCES locale ^a										
City	415	25.9	101	23.1	91	21.5	81	19.3	79	19.2
Suburb	462	28.8	129	29.5	129	30.5	129	30.7	132	32.0
Town	179	11.2	57	13.0	56	13.2	58	13.8	59	14.3
Rural	437	27.3	119	27.2	119	28.1	125	29.8	116	28.2
Missing data	109	6.8	31	7.1	28	6.6	27	6.4	26	6.3
Urban status ^b										
No	962	60.0	268	61.3	241	57.0	243	57.9	234	56.8
Yes	640	40.0	169	38.7	182	43.0	177	42.1	178	43.2
City ^c										
City	445	27.8	109	24.9	95	22.5	86	20.5	83	20.1
Non-city	1157	72.2	328	75.1	328	77.5	334	79.5	329	79.9
School size ^d										
Large	1035	64.6	266	60.9	275	65.0	271	64.5	262	63.6
Small	567	35.4	171	39.1	148	35.0	149	35.5	150	36.4
Affluence ^e										
Low or below average	630	39.3	189	43.2	179	42.3	172	41.0	179	43.4

School characteristic	Participating schools									
	Invited schools		Wave 2		Wave 3		Wave 4		Wave 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
Average, above average, or high	972	60.7	248	56.8	244	57.7	248	59.0	233	56.6
% English-limited										
Below median	789	49.3	218	49.9	213	50.4	219	52.1	215	52.2
Above median	813	50.7	219	50.1	210	49.6	201	47.9	197	47.8
Majority White										
No	735	45.9	187	42.8	178	42.1	165	39.3	168	40.8
Yes	867	54.1	250	57.2	245	57.9	255	60.7	244	59.2
Race proportions in school										
Black										
Below median	802	50.1	230	52.6	220	52.0	224	53.3	220	53.4
Above median	800	49.9	207	47.4	203	48.0	196	46.7	192	46.6
Hispanic										
Below median	801	50.0	232	53.1	219	51.8	221	52.6	220	53.4
Above median	801	50.0	205	46.9	204	48.2	199	47.4	192	46.6
Asian										
Below median	803	50.1	219	50.1	211	49.9	212	50.5	214	51.9
Above median	799	49.9	218	49.9	212	50.1	208	49.5	198	48.1
Per student Title I funding										
<\$150	370	23.1	104	23.8	96	22.7	99	23.6	96	23.3
≥\$150	1232	76.9	333	76.2	327	77.3	321	76.4	316	76.7
Poverty level ^f										
Below median	713	44.5	205	46.9	192	45.4	194	46.2	188	45.6
Above median	889	55.5	232	53.1	231	54.6	226	53.8	224	54.4
AIM per pupil expenditure ^g										
Below median	799	49.9	221	50.6	215	50.8	215	51.2	215	52.2
Above median	803	50.1	216	49.4	208	49.2	205	48.8	197	47.8
Current per pupil expenditure ^h										
Below median	694	43.3	191	43.7	185	43.7	182	43.3	180	43.7
Above median	908	56.7	246	56.3	238	56.3	238	56.7	232	56.3

School characteristic	Participating schools									
	Invited schools		Wave 2		Wave 3		Wave 4		Wave 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
AP courses offered ^j										
No	1337	83.5	371	84.9	361	85.3	360	85.7	350	85.0
Yes	350	21.8	66	15.1	62	14.7	60	14.3	62	15.0
Student to computer ratio ^j										
Below median	617	38.5	173	39.6	167	39.5	162	38.6	162	39.3
Above median	985	61.5	264	60.4	256	60.5	258	61.4	250	60.7
Student to teacher ratio ^k										
Below median	694	43.3	188	43.0	174	41.1	182	43.3	173	42.0
Above median	908	56.7	249	57.0	249	58.9	238	56.7	239	58.0
Before- and after-school care ^l										
No	1252	78.2	343	78.5	322	76.1	326	77.6	320	77.7
Yes	350	21.8	94	21.5	101	23.9	94	22.4	92	22.3
% College bound ^m										
Below median	778	48.6	201	46.0	213	50.4	215	51.2	212	51.5
Above median	824	51.4	236	54.0	210	49.6	205	48.8	200	48.5
Career and technical education offered ⁿ										
No	1237	77.2	348	79.6	341	80.6	339	80.7	330	80.1
Yes	365	22.8	89	20.4	82	19.4	81	19.3	82	19.9
Change in enrollment ^o										
Decrease	629	39.3	179	41.0	166	39.2	160	38.1	160	38.8
No change	425	26.5	99	22.7	97	22.9	110	26.2	103	25.0
Increase	548	34.2	159	36.4	160	37.8	150	35.7	149	36.2
Library or media center ^p										
No	312	19.5	81	18.5	73	17.3	68	16.2	69	16.7
Yes	1290	80.5	356	81.5	350	82.7	352	83.8	343	83.3
Lunch program ^q										
Below median	807	50.4	228	52.2	215	50.8	221	52.6	210	51.0
Above median	795	49.6	209	47.8	208	49.2	199	47.4	202	49.0

School characteristic	Participating schools									
	Invited schools		Wave 2		Wave 3		Wave 4		Wave 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
Special education ^r										
Below median	638	39.8	171	39.1	176	41.6	179	42.6	172	41.7
Above median	964	60.2	266	60.9	247	58.4	241	57.4	240	58.3

^aThe National Center for Education Statistics (NCES) locale classifications categorize the area where schools are located based on the US Census Bureau’s standard urban and rural designations.

^bUrban status is an alternate categorization of the NCES locale classification, such that “no” includes suburbs and rural locales and “yes” includes city and town locales.

^cCity is an alternate categorization of the NCES locale classification, such that “city” includes city areas and “non-city” includes suburb, town, and rural areas.

^dSmall schools contained <28 students at any grade level and large schools contained ≥28 students at any grade level.

^eThe Affluence Indicator uses a proprietary algorithm developed to rank the socioeconomic status of a school.

^fPoverty level data are sourced from the US Census Bureau’s Small Area Income and Poverty Estimates program.³⁹ Median poverty is determined by a formula (Orshansky Indicator) based on family income and size.

^gThe total dollar amount of instructional material expenditures. The per student data are determined by dividing the whole dollar for all instructional materials expenditures by district enrollment.

^hThe total operating cost for the district per student, including teacher salaries, instruction, support service, and food service. The per student data are determined by dividing the whole dollar current expenditures by district enrollment.

ⁱAdvanced placement (AP) courses offered within schools.

^jTotal computers in a school per enrolled student.

^kTotal number of students per teacher within a school.

^lSchools that provide care to students outside of school hours.

^mThe percentage of 2- or 4-year college bound 12th grade students. Data are applied to all schools within a district.

ⁿSchools within districts providing a broad scope of vocational subjects.

^oThe change in school or district enrollment from the previous year.

^pSchools with a formal library or media center.

^qThe percentage of students that are enrolled in a free or reduced-price lunch program using 2020 MDR data.

^rInstitutions that provide special education classes to children with special needs.

Table 3.

Modeling nonresponse to the National School COVID-19 Prevention Study surveys—2021–2022 school year, United States.

Characteristic	Nonresponse to all 4 NSCPS surveys during 2021–2022 school year ^a	
	No. (%) ^b	aOR (95% CI)
School level		
Elementary	560 (67)	Ref.
Middle	285 (69)	1.23 (0.93–1.62)
High	248 (69)	1.18 (0.88–1.58)
NCES locale		
City	319 (71)	Ref.
Suburb	331 (69)	0.87 (0.64–1.17)
Town	119 (63)	0.69 (0.47–1.00)
Rural	246 (68)	0.78 (0.57–1.08)
Region		
West	267 (67)	Ref.
Midwest	253 (64)	0.92 (0.66–1.26)
Northeast	181 (70)	1.11 (0.77–1.60)
South	392 (71)	1.20 (0.88–1.63)
School poverty level		
Low	181 (67)	Ref.
Mid	544 (67)	1.05 (0.77–1.44)
High	268 (70)	1.12 (0.78–1.61)

Abbreviations: aOR, adjusted odds ratio; NCES National Center for Education Statistics; NSCPS, National School COVID-19 Prevention Study; Ref., referent.

^aA logistic regression model was fit among the NSCPS invited sample of schools ($n = 1602$). The outcome for the model was not responding to any NSCPS survey from waves 2 through 5. The model adjusted for survey wave and 4 school characteristics (school level, NCES locale, region, school poverty). Observations missing data on any covariates ($n = 197$) were not included in the model. Odds ratios and 95% CIs are presented, depicting the association between school characteristics and nonresponse to any NSCPS survey from waves 2 through 5.

^bRepresents the number and percentage of schools among each stratum that did not respond to any NSCPS survey from waves 2 through 5.

Table 4.

Missingness of school-level COVID-19 case, quarantine, and student absenteeism data among K-12 public schools; National School COVID-19 Prevention Study, 2021–2022 school year, United States.

Missingness by wave ^a	School-level COVID-19 case, quarantine, and student absenteeism outcome				
	COVID-19 cases among students, ^b no. (%) ^c	COVID-19 cases among staff, ^d no. (%) ^c	COVID-19 quarantines, ^e no. (%) ^c	All-cause absenteeism, ^f no. (%) ^c	Illness-related absenteeism, ^g no. (%) ^c
Among invited sample					
2	1303 (81.3)	1299 (81.1)	1375 (85.8)	1434 (89.5)	1506 (94.0)
3	1350 (84.3)	1328 (82.9)	1387 (86.6)	1447 (90.3)	1530 (95.5)
4	1422 (88.8)	1402 (87.5)	1463 (91.3)	1476 (92.1)	1535 (95.8)
5	1440 (89.9)	1434 (89.5)	1477 (92.2)	1480 (92.4)	1539 (96.1)
Among participating sample					
2	138 (31.6)	134 (30.7)	210 (48.1)	269 (61.6)	341 (78.0)
3	171 (40.4)	149 (35.2)	208 (49.2)	268 (63.4)	351 (83.0)
4	240 (57.1)	220 (52.4)	281 (66.9)	294 (70.0)	353 (84.0)
5	250 (60.7)	244 (59.2)	287 (69.7)	290 (70.4)	349 (84.7)

^aSchools in the invited sample ($n = 1602$) were invited to complete 4 surveys during the following time frames for the 2021–2022 school year: wave 2 (October 5–November 19, 2021); wave 3 (December 6, 2021–January 23, 2022); wave 4 (February 14–March 27, 2022); wave 5 (April 4–May 27, 2022).

^bFor each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among students in your school (even if acquired elsewhere)?”

^cFor each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among teachers and school staff in your school (even if acquired elsewhere)?”

^dFor each wave, respondents were asked, “how many times have students had to quarantine due to being a close contact of someone with COVID-19 at school?”

^eFor each wave, respondents were asked, “how many absent days were recorded among all enrolled students (count both excused and unexcused absent days)?”

^fFor each wave, respondents were asked to provide the number of recorded absent days were for reasons related to “Illness, injury, health, treatment, or examination (exclude missed days due to quarantining after being a close contact of someone with COVID-19).”

^gFor each outcome, the number and percentage of missingness are reported.

Table 5.

Predictors of missingness for school-level COVID-19 case, quarantine, and student data among full invited sample^a in the National School COVID-19 Prevention Study—2021–2022 school year, United States.

Characteristic	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data				
	COVID-19 cases among students, ^b aOR (95% CI)	COVID-19 cases among staff, ^c aOR (95% CI)	COVID-19 quarantines, ^d aOR (95% CI)	All-cause absenteeism, ^e aOR (95% CI)	Illness-related absenteeism, ^f aOR (95% CI)
School level					
Middle vs elementary	1.61 (1.18–2.19)	1.61 (1.18–2.20)	1.54 (1.10–2.14)	1.85 (1.21–2.81)	1.52 (0.91–2.56)
High vs elementary	1.24 (0.89–1.74)	1.17 (0.84–1.63)	1.02 (0.72–1.45)	1.21 (0.81–1.79)	1.21 (0.70–2.06)
High vs middle	0.77 (0.52–1.14)	0.72 (0.49–1.06)	0.67 (0.44–1.00)	0.65 (0.40–1.07)	0.79 (0.42–1.49)
NCES locale					
Suburb vs city	0.93 (0.67–1.30)	0.91 (0.66–1.27)	0.87 (0.61–1.24)	1.13 (0.74–1.72)	1.32 (0.78–2.22)
Town vs city	0.76 (0.50–1.16)	0.74 (0.49–1.13)	0.86 (0.55–1.36)	0.87 (0.52–1.44)	1.00 (0.52–1.92)
Rural vs city	0.93 (0.64–1.34)	0.92 (0.64–1.33)	0.88 (0.59–1.29)	0.92 (0.59–1.43)	0.93 (0.52–1.66)
Town vs suburb	0.81 (0.54–1.24)	0.81 (0.54–1.22)	0.99 (0.63–1.54)	0.77 (0.46–1.27)	0.76 (0.39–1.48)
Rural vs suburb	0.99 (0.70–1.42)	1.01 (0.71–1.44)	1.01 (0.70–1.44)	0.81 (0.52–1.26)	0.71 (0.40–1.26)
Town vs rural	0.82 (0.53–1.26)	0.80 (0.53–1.22)	0.98 (0.63–1.54)	0.94 (0.56–1.58)	1.07 (0.54–2.12)
Region					
Midwest vs West	0.83 (0.59–1.18)	0.84 (0.60–1.19)	0.78 (0.54–1.12)	0.81 (0.52–1.26)	1.08 (0.62–1.88)
Northeast vs West	1.01 (0.68–1.49)	1.00 (0.68–1.47)	0.95 (0.63–1.44)	0.67 (0.42–1.06)	1.57 (0.83–2.96)
South vs West	1.12 (0.80–1.58)	1.22 (0.87–1.72)	0.95 (0.67–1.36)	0.98 (0.64–1.50)	1.07 (0.64–1.79)
Northeast vs Midwest	1.21 (0.83–1.77)	1.19 (0.82–1.73)	1.22 (0.82–1.82)	0.82 (0.53–1.28)	1.45 (0.77–2.75)
South vs Midwest	1.35 (0.97–1.87)	1.45 (1.04–2.01)	1.22 (0.87–1.72)	1.21 (0.81–1.80)	0.99 (0.59–1.67)
South vs. Northeast	1.12 (0.77–1.62)	1.22 (0.84–1.76)	1.00 (0.68–1.48)	1.47 (0.96–2.25)	0.68 (0.37–1.24)
School poverty level					
Mid vs low	1.02 (0.72–1.44)	1.00 (0.71–1.42)	1.04 (0.72–1.50)	0.87 (0.57–1.35)	0.87 (0.49–1.54)
High vs low	1.14 (0.76–1.70)	1.13 (0.76–1.68)	1.15 (0.75–1.77)	0.92 (0.56–1.51)	0.94 (0.49–1.81)
Mid vs high	0.89 (0.65–1.23)	0.89 (0.65–1.22)	0.91 (0.65–1.28)	0.95 (0.64–1.40)	0.92 (0.55–1.54)
Small school, yes vs no	0.79 (0.61–1.04)	0.79 (0.60–1.02)	0.83 (0.63–1.10)	0.99 (0.71–1.37)	1.48 (0.95–2.31)
Survey wave ^g					
3 vs 2	1.29 (1.15–1.45)	1.16 (1.04–1.30)	1.13 (0.98–1.30)	1.10 (0.95–1.27)	1.40 (1.10–1.78)
4 vs 2	1.82 (1.57–2.11)	1.67 (1.45–1.91)	1.82 (1.52–2.20)	1.36 (1.14–1.63)	1.50 (1.16–1.93)

Characteristic	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data				
	COVID-19 cases among students, ^b aOR (95% CI)	COVID-19 cases among staff, ^c aOR (95% CI)	COVID-19 quarantines, ^d aOR (95% CI)	All-cause absenteeism, ^e aOR (95% CI)	Illness-related absenteeism, ^f aOR (95% CI)
5 vs 2	2.08 (1.77–2.45)	2.02 (1.72–2.36)	2.05 (1.68–2.49)	1.36 (1.13–1.64)	1.50 (1.17–1.92)
4 vs 3	1.41 (1.23–1.62)	1.43 (1.26–1.63)	1.62 (1.36–1.93)	1.24 (1.06–1.45)	1.07 (0.85–1.35)
5 vs 3	1.61 (1.38–1.88)	1.73 (1.49–2.01)	1.82 (1.51–2.18)	1.24 (1.05–1.46)	1.07 (0.84–1.37)
5 vs 4	1.14 (0.99–1.32)	1.21 (1.05–1.39)	1.12 (0.95–1.33)	1.00 (0.87–1.15)	1.00 (0.80–1.24)

Abbreviations: aOR, adjusted odds ratio; NCES, National Center for Education Statistics; NSCPS, National School COVID-19 Prevention Study.

^aFive generalized estimating equation logistic regression models were fit among the NSCPS invited sample of schools ($n = 1602$). The outcome for each model was a binary indicator of missing data for each of the 5 outcomes. Missingness encompasses both survey nonresponse (ie, the school did not respond to the survey) and item nonresponse (ie the school did respond to the survey but was not able to provide outcome data). The models adjusted for survey wave and 5 school characteristics (school level, NCES locale, region, school poverty, and school size) and accounted for repeated observations. Odds ratios and 95% CIs depict the association between school characteristics and survey wave, with missingness for each outcome.

^bFor each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among students in your school (even if acquired elsewhere)?”

^cFor each wave, respondents were asked to provide the number of recorded absent days were for reasons related to “Illness, injury, health, treatment, or examination (exclude missed days due to quarantining after being a close contact of someone with COVID-19).”

^dFor each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among teachers and school staff in your school (even if acquired elsewhere)?”

^eFor each wave, respondents were asked, “how many times have students had to quarantine due to being a close contact of someone with COVID-19 at school?”

^fFor each wave, respondents were asked, “how many absent days were recorded among all enrolled students (count both excused and unexcused absent days)?”

^gSchools in the invited sample ($n = 1602$) were invited to complete 4 surveys during the following time frames for the 2021–2022 school year: wave 2 (October 5–November 19, 2021); wave 3 (December 6, 2021–January 23, 2022); wave 4 (February 14–March 27, 2022); wave 5 (April 4–May 27, 2022).

Table 6.

Predictors of missingness for school-level COVID-19 case, quarantine, and student data among the participating sample^a in the National School COVID-19 Prevention Study—2021–2022 school year, United States.

Characteristic	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data				
	COVID-19 cases among students, ^b aOR (95% CI)	COVID-19 cases among staff, ^c aOR (95% CI)	COVID-19 quarantines, ^d aOR (95% CI)	All-cause absenteeism, ^e aOR (95% CI)	Illness-related absenteeism, ^f aOR (95% CI)
School level					
Middle vs elementary	1.80 (1.25–2.59)	1.75 (1.21–2.53)	1.48 (1.04–2.09)	1.81 (1.15–2.85)	1.33 (0.77–2.31)
High vs elementary	1.03 (0.68–1.55)	0.93 (0.62–1.40)	0.84 (0.58–1.24)	1.14 (0.75–1.73)	1.04 (0.60–1.80)
High vs middle	0.57 (0.36–0.91)	0.53 (0.34–0.85)	0.57 (0.37–0.89)	0.63 (0.37–1.07)	0.78 (0.40–1.53)
NCES locale					
Suburb vs city	0.98 (0.65–1.46)	1.00 (0.67–1.51)	0.92 (0.62–1.36)	1.47 (0.93–2.30)	1.62 (0.95–2.76)
Town vs city	0.78 (0.46–1.32)	0.78 (0.46–1.32)	1.04 (0.63–1.72)	1.17 (0.68–2.00)	1.30 (0.67–2.55)
Rural vs city	1.24 (0.80–1.92)	1.32 (0.85–2.05)	1.12 (0.74–1.69)	1.26 (0.79–2.01)	1.25 (0.71–2.22)
Town vs suburb	0.80 (0.48–1.33)	0.77 (0.47–1.28)	1.13 (0.69–1.83)	0.80 (0.47–1.36)	0.80 (0.40–1.60)
Rural vs suburb	1.27 (0.85–1.91)	1.31 (0.88–1.97)	1.21 (0.82–1.78)	0.86 (0.54–1.36)	0.77 (0.44–1.36)
Town vs rural	0.63 (0.37–1.07)	0.59 (0.34–1.01)	0.93 (0.56–1.55)	0.93 (0.53–1.61)	1.04 (0.51–2.13)
Region					
Midwest vs West	0.78 (0.52–1.19)	0.84 (0.55–1.27)	0.78 (0.52–1.16)	0.83 (0.51–1.35)	1.22 (0.68–2.20)
Northeast vs West	0.92 (0.57–1.48)	0.94 (0.58–1.51)	0.91 (0.57–1.43)	0.45 (0.26–0.77)	1.38 (0.70–2.72)
South vs West	0.76 (0.50–1.15)	0.93 (0.61–1.41)	0.69 (0.47–1.03)	0.79 (0.49–1.26)	0.94 (0.54–1.64)
Northeast vs Midwest	1.17 (0.74–1.87)	1.11 (0.70–1.77)	1.17 (0.74–1.84)	0.54 (0.33–0.90)	1.13 (0.57–2.25)
South vs Midwest	0.97 (0.65–1.45)	1.10 (0.74–1.66)	0.89 (0.61–1.31)	0.95 (0.62–1.47)	0.77 (0.44–1.34)
South vs Northeast	0.83 (0.52–1.32)	0.99 (0.62–1.58)	0.76 (0.49–1.19)	1.76 (1.07–2.89)	0.68 (0.35–1.31)
School poverty					
Middle vs low	1.15 (0.76–1.73)	1.05 (0.69–1.59)	1.10 (0.73–1.67)	0.79 (0.50–1.25)	0.76 (0.42–1.39)
High vs low	1.08 (0.67–1.75)	1.00 (0.61–1.63)	1.08 (0.66–1.75)	0.72 (0.43–1.22)	0.84 (0.43–1.65)
Middle vs high	1.06 (0.73–1.55)	1.05 (0.72–1.54)	1.02 (0.71–1.48)	1.09 (0.72–1.67)	0.91 (0.53–1.54)
Small school, yes vs no	0.72 (0.52–0.99)	0.69 (0.50–0.96)	0.82 (0.60–1.12)	1.04 (0.73–1.49)	1.62 (1.03–2.54)
Survey wave^g					
3 vs 2	1.76 (1.38–2.24)	1.41 (1.10–1.80)	1.23 (0.96–1.58)	1.13 (0.90–1.41)	1.48 (1.09–2.01)
4 vs 2	3.26 (2.50–4.24)	2.75 (2.11–3.58)	2.47 (1.88–3.24)	1.52 (1.19–1.94)	1.58 (1.17–2.13)

Characteristic	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data				
	COVID-19 cases among students, ^b aOR (95% CI)	COVID-19 cases among staff, ^c aOR (95% CI)	COVID-19 quarantines, ^d aOR (95% CI)	All-cause absenteeism, ^e aOR (95% CI)	Illness-related absenteeism, ^f aOR (95% CI)
5 vs 2	4.00 (3.04–5.26)	3.81 (2.92–4.97)	2.92 (2.22–3.86)	1.46 (1.14–1.88)	1.58 (1.17–2.11)
4 vs 3	1.85 (1.45–2.36)	1.95 (1.53–2.49)	2.01 (1.55–2.60)	1.35 (1.08–1.68)	1.06 (0.79–1.42)
5 vs 3	2.27 (1.77–2.92)	2.70 (2.11–3.47)	2.38 (1.83–3.08)	1.30 (1.03–1.63)	1.06 (0.79–1.43)
5 vs 4	1.23 (0.99–1.53)	1.38 (1.12–1.72)	1.18 (0.95–1.48)	0.96 (0.79–1.17)	1.00 (0.77–1.30)

Abbreviations: aOR, adjusted odds ratio; NCES, National Center for Education Statistics; NSCPS National School COVID-19 Prevention Study.

^aFive generalized estimating equation logistic regression models were fit among the NSCPS sample of participating schools. The outcome for each model was a binary indicator of missing data for each of the 5 outcomes. Missingness encompassed only item nonresponse (ie, the school did respond to the survey but was not able to provide outcome data). The models adjusted for survey wave and 5 school characteristics (school level, NCES locale, region, school poverty, school size) and accounted for repeated observations. Odds ratios and 95% CIs depict the association between school characteristics and survey wave with missingness for each outcome.

^bFor each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among students in your school (even if acquired elsewhere)?”

^cFor each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among teachers and school staff in your school (even if acquired elsewhere)?”

^dFor each wave, respondents were asked, “how many times have students had to quarantine due to being a close contact of someone with COVID-19 at school?”

^eFor each wave, respondents were asked, “how many absent days were recorded among all enrolled students (count both excused and unexcused absent days)?”

^fFor each wave, respondents were asked to provide the number of recorded absent days were for reasons related to “Illness, injury, health, treatment, or examination (exclude missed days due to quarantining after being a close contact of someone with COVID-19).”

^gSchools in the invited sample ($n = 1602$) were invited to complete 4 surveys during the following time frames for the 2021–2022 school year: wave 2 (October 5–November 19, 2021); wave 3 (December 6, 2021–January 23, 2022); wave 4 (February 14–March 27, 2022); wave 5 (April 4–May 27, 2022).

Table 7.

Wave-adjusted and fully adjusted associations between school-level protocols and procedures for identifying, monitoring, reporting, and responding to COVID-19 cases, emergency operations plans, and staff shortages with missingness of school-level COVID-19 case, quarantine, and student data among participating sample^a in the National School COVID-19 Prevention Study, 2021–2022 school year, United States.

School-level factor ^g	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data														
	COVID-19 cases among students ^b			COVID-19 cases among staff ^c			COVID-19 quarantines ^d			All-cause absenteeism ^e			Illness-related absenteeism ^f		
	aOR	95% CI		aOR	95% CI		aOR	95% CI		aOR	95% CI		aOR	95% CI	
Quarantine protocols															
Wave adjusted	1.45	0.75, 2.78		1.44	0.75, 2.75		1.40	0.81, 2.42		1.31	0.67, 2.55		1.07	0.46, 2.50	
Fully adjusted	1.61	0.79, 3.29		1.57	0.75, 3.26		1.49	0.81, 2.72		1.47	0.72, 3.01		1.14	0.46, 2.81	
Contact-tracing protocols															
Wave adjusted	0.81	0.57, 1.16		0.88	0.61, 1.27		0.80	0.57, 1.13		0.69	0.46, 1.04		0.60	0.34, 1.06	
Fully adjusted	0.99	0.67, 1.48		1.02	0.68, 1.53		0.93	0.64, 1.35		0.84	0.54, 1.31		0.73	0.40, 1.31	
Tracking vaccination status of students															
Wave adjusted	1.05	0.79, 1.40		1.05	0.79, 1.41		1.07	0.81, 1.41		1.03	0.75, 1.42		1.40	0.94, 2.08	
Fully adjusted	1.07	0.79, 1.46		1.05	0.77, 1.45		1.05	0.78, 1.41		0.93	0.66, 1.31		1.25	0.82, 1.89	
Tracking vaccination status of staff															
Wave adjusted	1.17	0.85, 1.62		1.12	0.81, 1.56		1.09	0.81, 1.47		1.33	0.94, 1.89		1.77	1.17, 2.69	
Fully adjusted	1.29	0.91, 1.84		1.22	0.85, 1.74		1.19	0.85, 1.65		1.24	0.84, 1.83		1.66	1.03, 2.65	
Onsite COVID-19 diagnostic testing for students and staff															
Wave adjusted	1.04	0.78, 1.38		0.99	0.74, 1.32		1.23	0.94, 1.62		1.04	0.76, 1.42		0.99	0.66, 1.46	
Fully adjusted	0.98	0.72, 1.32		0.94	0.69, 1.29		1.20	0.90, 1.61		0.92	0.66, 1.28		0.89	0.58, 1.35	
Onsite COVID-19 screening testing for students and staff															
Wave adjusted	1.10	0.77, 1.58		1.09	0.76, 1.57		1.18	0.83, 1.67		1.28	0.86, 1.91		1.42	0.84, 2.42	
Fully adjusted	1.09	0.74, 1.61		1.10	0.74, 1.63		1.15	0.79, 1.68		1.28	0.83, 1.99		1.37	0.80, 2.35	
System to self-report COVID-19 diagnoses to school															
Wave adjusted	0.66	0.39, 1.10		0.64	0.38, 1.07		0.75	0.45, 1.24		0.87	0.50, 1.49		0.77	0.36, 1.69	
Fully adjusted	0.65	0.37, 1.15		0.57	0.33, 0.99		0.77	0.43, 1.38		0.87	0.49, 1.55		0.75	0.32, 1.76	
System to report child has been exposed to COVID-19															

School-level factor ^g	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data									
	COVID-19 cases among students ^b		COVID-19 cases among staff ^c		COVID-19 quarantines ^d		All-cause absenteeism ^e		Illness-related absenteeism ^f	
	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI
Wave adjusted	0.70	0.48, 1.03	0.64	0.43, 0.93	0.78	0.54, 1.15	0.82	0.54, 1.25	0.71	0.39, 1.30
Fully adjusted	0.70	0.47, 1.06	0.59	0.39, 0.89	0.79	0.52, 1.20	0.79	0.51, 1.24	0.72	0.38, 1.35
System to self-report to school that child is waiting for COVID-19 test results										
Wave adjusted	0.74	0.48, 1.14	0.71	0.46, 1.09	0.91	0.59, 1.40	1.05	0.66, 1.66	0.90	0.49, 1.69
Fully adjusted	0.76	0.47, 1.23	0.68	0.42, 1.09	0.99	0.61, 1.61	1.06	0.65, 1.73	0.97	0.50, 1.89
System reports positive at home COVID-19 tests to school										
Wave adjusted	0.28	0.14, 0.54	0.29	0.14, 0.57	0.32	0.16, 0.64	0.50	0.25, 1.00	0.33	0.08, 1.28
Fully adjusted	0.28	0.14, 0.58	0.26	0.12, 0.54	0.32	0.15, 0.70	0.53	0.26, 1.08	0.35	0.09, 1.41
School reports COVID-19 cases to local or state health department										
Wave adjusted	1.26	0.78, 2.02	1.39	0.85, 2.26	1.30	0.81, 2.07	0.75	0.44, 1.30	0.52	0.24, 1.12
Fully adjusted	1.30	0.79, 2.15	1.42	0.84, 2.41	1.36	0.81, 2.28	0.78	0.45, 1.37	0.52	0.23, 1.16
School reports COVID-19 cases to local or state education agency										
Wave adjusted	0.97	0.69, 1.37	0.96	0.68, 1.35	1.07	0.77, 1.48	0.91	0.62, 1.33	0.96	0.59, 1.56
Fully adjusted	0.98	0.68, 1.42	0.97	0.67, 1.39	1.11	0.79, 1.56	0.94	0.63, 1.40	0.91	0.55, 1.49
Having an emergency operations plan during 2021/2022 school year										
Wave adjusted	1.26	0.89, 1.80	1.36	0.95, 1.94	1.04	0.74, 1.46	1.08	0.72, 1.62	0.91	0.55, 1.52
Fully adjusted	1.29	0.89, 1.88	1.39	0.96, 2.02	1.08	0.76, 1.54	1.16	0.76, 1.78	1.03	0.60, 1.75
Experienced staff shortages for school nurses or health services staff										
Wave adjusted	0.91	0.63, 1.31	0.89	0.62, 1.28	0.95	0.66, 1.36	0.94	0.63, 1.40	1.49	0.86, 2.55
Fully adjusted	1.01	0.69, 1.50	1.02	0.69, 1.50	1.08	0.74, 1.59	0.97	0.63, 1.48	1.46	0.81, 2.62
Experienced staff shortages for teachers										
Wave adjusted	1.43	1.06, 1.93	1.37	1.01, 1.85	1.42	1.06, 1.89	1.73	1.24, 2.41	1.75	1.16, 2.65
Fully adjusted	1.46	1.06, 2.02	1.37	0.98, 1.90	1.43	1.05, 1.95	1.60	1.12, 2.29	1.61	1.04, 2.48
Experienced staff shortages for administrative staff										

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School-level factor ^g	Missingness of school-level COVID-19 case, quarantine, and student absenteeism data														
	COVID-19 cases among students ^b			COVID-19 cases among staff ^c			COVID-19 quarantines ^d			All-cause absenteeism ^e			Illness-related absenteeism ^f		
	aOR	95% CI		aOR	95% CI		aOR	95% CI		aOR	95% CI		aOR	95% CI	
Wave adjusted	1.08	0.69, 1.68		1.41	0.89, 2.23		0.96	0.60, 1.53		0.94	0.58, 1.51		1.94	0.96, 3.94	
Fully adjusted	1.22	0.74, 1.99		1.51	0.89, 2.54		1.07	0.64, 1.77		0.92	0.55, 1.56		2.07	1.00, 4.26	

Abbreviations: aOR, adjusted odds ratio; NCES, National Center for Education Statistics; NSCPS National School COVID-19 Prevention Study.

^a Generalized estimating equation logistic regression models were fit among the NSCPS sample of participating schools. The outcome for each model was a binary indicator of missing data for each of the 5 outcomes. Missingness encompassed only item nonresponse (ie, the school did respond to the survey but was not able to provide outcome data). Wave-adjusted models examined associations between each school-level factor and missingness of each outcome while adjusting for wave. Fully adjusted models further adjusted for school level, NCES locale, and school poverty.

^b For each wave, respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among students in your school (even if acquired elsewhere)?”

^c For each wave respondents were asked, “approximately how many positive COVID-19 cases were reported or identified among teachers and school staff in your school (even if acquired elsewhere)?”

^d For each wave, respondents were asked, “how many times have students had to quarantine due to being a close contact of someone with COVID-19 at school?”

^e For each wave, respondents were asked, “how many absent days were recorded among all enrolled students (count both excused and unexcused absent days)?”

^f For each wave, respondents were asked to provide the number of recorded absent days were for reasons related to “Illness, injury, health, treatment, or examination (exclude missed days due to quarantining after being a close contact of someone with COVID-19).”

^g Schools in the invited sample ($n = 1602$) were invited to complete 4 surveys during the following time frames for the 2021–2022 school year: wave 2 (October 5–November 19, 2021); wave 3 (December 6, 2021–January 23, 2022); wave 4 (February 14–March 27, 2022); wave 5 (April 4–May 27, 2022). For details regarding measurement and operationalization of school-level factors examined, refer to Table 2.

Table 8. Characteristics of school-level COVID-19 case data acquired from local or state health departments (*n* = 28)^a—National School COVID-19 Prevention Study, 2021–2022 school year, United States.

Characteristic	No. (%)
Included at-home COVID-19 tests	
Yes	10 (36)
No	14 (50)
Don't know	
How were school-level COVID-19 case data collected? ^b	4 (14)
Collation of school-level COVID-19 case data that schools obtained through their own reporting systems	11 (39)
Collation of COVID-19 case data that health departments linked to specific schools through case investigation and contact tracing protocols	17 (61)
Other response ^c	12 (43)
Were there any changes to the way school-level COVID-19 case data were reported during the 2021–2022 school year?	
Yes ^d	9 (32)
No	15 (53)
Unsure	4 (14)

^a A total of 27 state health departments and 1 local health department provided school-level COVID-19 case data for 729 of 1602 schools in the NSCPS sample for at least 1 month during the 2021–2022 school year.

^b Options were not mutually exclusive.

^c Other write-in responses included school-level COVID-19 case data were acquired by linking school enrollment data with health department case data; school-based COVID-19 screening testing programs; outbreak investigations; case report forms submitted by medical providers; and state or local COVID-19 reporting systems for schools.

^d Among schools that reported changes to the way school-level COVID-19 case data were reported during the 2021–2022 school year, cited reasons included a general deprioritization of collecting school COVID-19 case data to prioritize settings at higher risk of severe COVID-19 outcomes; no longer mandating schools to report cases to health departments; and transitioning to new case reporting and management systems and protocols.