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ORIGINAL ARTICLE

SARS-CoV-2 Screening Testing Programs for Safe In-person Learning in K–12 Schools

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Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) screening testing is a recommended mitigation strategy for schools, although few descriptions of program implementation are available.

Methods: Kindergarten through 12th grade (K–12) students and staff practicing universal masking during the delta and omicron variant waves from five schools in Durham, North Carolina and eight schools in Kansas City, Missouri participated; Durham's program was structured as a public health initiative facilitated by school staff, and Kansas City's as a research study facilitated by a research team. Tests included school-based rapid antigen or polymerase chain reaction testing, at-home rapid antigen testing, and off-site nucleic acid amplification testing.

Results: We performed nearly 5700 screening tests on more than 1600 K–12 school students and staff members. The total cost for the Durham testing program in 5 public charter K–12 schools, each with 500–1000 students, was $246 587 and approximately 752 h per semester; cost per test was $70 and cost per positive result was $7076. The total cost for the Kansas City program in eight public K–12 schools was $292 591 and required approximately 537 h in personnel time for school-based testing; cost per test was $132 and cost per positive result was $4818. SARS-CoV-2 positivity rates were generally lower (0–16.16%) than rates in the community (2.7–36.47%) throughout all testing weeks.

Conclusions and Relevance: Voluntary screening testing programs in K–12 schools are costly and rarely detect asymptomatic positive persons, particularly in universally masked settings.

Clinical Trial Registration: NCT04831866.

Key words. K–12 school communities; SARS-CoV-2; screening testing.

INTRODUCTION

School-based mitigation measures to reduce severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission have varied during the coronavirus disease 2019 (COVID-19) pandemic. As safety data on in-school learning became available, school leaders shifted from widespread and prolonged building closures to prioritizing masking, ventilation, and vaccination among students and staff. Notably, data from kindergarten through 12th grade (K–12) schools demonstrated that with universal masking, basic hand hygiene, and routine cleaning, rates of secondary transmission remained as low as 1% prior to the omicron variant surge [1–3].

Despite the success of layered COVID-19 mitigation practices, the Centers for Disease Control and Prevention (CDC) guidelines incorporated K–12 screening tests as an additional tool to reduce SARS-CoV-2 transmission during periods of medium to high community case rates [4]. Based on concerns about high rates of asymptomatic infections in the K–12 population, routine testing of asymptomatic individuals to detect infections early and interrupt transmission was presumed to be a useful strategy for outbreak prevention within K–12 schools, although limited data to support their effectiveness are only recently available from modeling studies [5, 6]. In-school universal screening tests were also offered as an option to reduce testing inequities for families disproportionally impacted by COVID-19. Funding for these programs was allocated by federal and state governments, and the cost of these programs has not been described.

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Abbreviations: CDC, Centers for Disease Control and Prevention; CLIA, Clinical Laboratory Improvement Amendments of 1988; COVID-19, coronavirus disease 2019; CMKC, Children's Mercy Kansas City; EUA, emergency use authorization; FDA, Food and Drug Administration; IRB, Institutional Review Board; K-12, Kindergarten—12th grade; MO, Missouri; MIS-C, multisystem inflammatory syndrome in children; NC DHHS, NC Department of Health and Human Services; NPA, negative percentage agreement; NC, North Carolina; PPA, positive percentage agreement; QR, Quick Response; REDCap, Research Electronic Data Capture; School TLC, School Testing, Learning, and Consultation Study; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; U.S., United States.

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Given the limited prior evaluations of voluntary screening testing in the K–12 environment, we evaluated the utilization, test results, resources needed, and costs associated with implementing two unique screening testing programs conducted in publicly-funded K–12 schools that were practicing mandatory masking during periods of varying community case rates and changing national guidance.

METHODS

We conducted two independent SARS-CoV-2 screening testing programs. The Durham, Durham County, North Carolina (NC) program was structured as a public health initiative and included five public charter schools. The Kansas City, Jackson County, Missouri (MO) program was structured as a research study and included eight public schools. In both programs, schools enrolled students and staff, provided weekly SARS-CoV-2 screening tests, and practiced universal masking. Data use agreements and institutional approvals were separately obtained prior to data analysis.

Program Overview

Figure 1 summarizes program setup, consents, enrollment, and testing periods. In Durham, the testing program was developed with the ABC Science Collaborative (ABCs) [7] to encourage school participation in public health efforts to decrease the SARS-CoV-2 burden. Each participating Durham school enrolled participants into an optional testing program from April 23, 2021 to January 31, 2022. For the study analyses, we used data collected from August 15, 2021 when all students received in-person instruction, as compared to hybrid or remote instruction in the prior semester.

In Kansas City, MO, Children's Mercy Kansas City (CMKC) and ICF International Inc. partnered with a large public school district to implement the School Testing, Learning, and Consultation Study (School TLC Study), which operated as a research study from August 25, 2021 to January 31, 2022. For both programs, we estimated that SARS-CoV-2 delta variant dominance lasted until December 11, 2021 and the omicron variant dominated from December 12, 2021 to January 31, 2022.

All schools implemented local and state-wide laws and guidance, which mirrored the CDC's recommendations regarding COVID-19 mitigation in K–12 schools [4, 8]. Participants with positive results were required to complete out-of-school isolation. All schools enforced universal masking indoors, scheduled environmental cleaning, hand hygiene, and conducted contact tracing in collaboration with local health departments. No school reported ventilation overhauls, but there were varying uses of classroom cohorts and outdoor masking during the study period. No participating school had concurrent testing programs (eg, test-to-stay or test-to-play) [9, 10].

Procedures, Platforms, Data Collection, and Sources

Durham Program.

All Durham schools used rapid SARS-CoV-2 testing kits that were Food and Drug Administration (FDA)-authorized under non-prescription emergency use authorization (EUA) for both symptomatic and asymptomatic evaluations of children and adults. Testing platforms and assay specifics are in Supplementary Table 1. Details on test brands and sample collection can be found in the Supplementary Methods. Each week, the study team directly observed self-collected nasal swabs in designated areas after school staff sent a random selection of consented participants to the testing room. Positive antigen results were confirmed with a second antigen test on a new sample obtained on the same day; a third test was performed for discordant results. Positive results from PCR tests were not confirmed; however, participants with positive results were encouraged to seek additional testing outside of school.

Schools reported participation rates and demographics of enrollees to the study team at the beginning of the study and weekly. Study data were collected and managed using REDCap electronic data capture tools hosted at Duke University [11, 12], and reviewed weekly. Data collection and analyses were performed as part of the ABCs testing initiative program under Pro00108049, and approved by the Duke University Health System Institutional Review Board.

Kansas City Program.

COVID-19 Nasal Nucleic Acid Amplification Tests (NAAT) were used during the entire study period. See Supplementary Table 1 for assay details, and Supplementary Methods for test brands and sample collection. Confirmation testing was not recommended for positive results. The school nurse was responsible for notifying the staff and students of positive results. School protocols were followed in the event of a positive COVID-19 test result.

Participant demographics, including age, race, ethnicity, language spoken at home, and gender identity were collected through the study enrollment form. The study team logged the duration of each testing period at each school to calculate labor hours. Data collection and analyses for the School TLC Study were performed under Project 2021-085-ICF, and approved by ICF's Institutional Review Board.

Testing Programs: Durham and Kansas City.

To account for known COVID-19 disparities between racial and ethnic groups, program participants had the option to provide self-reported race and ethnicity data. Publicly available data on school demographics, students, COVID-19 case rates, and school clusters during the study period were collected from the following sources: NC Department of Public Instruction [13] (Durham program), the school district, the CDC COVID-19 Case Surveillance Public Use Data with Geography [14],

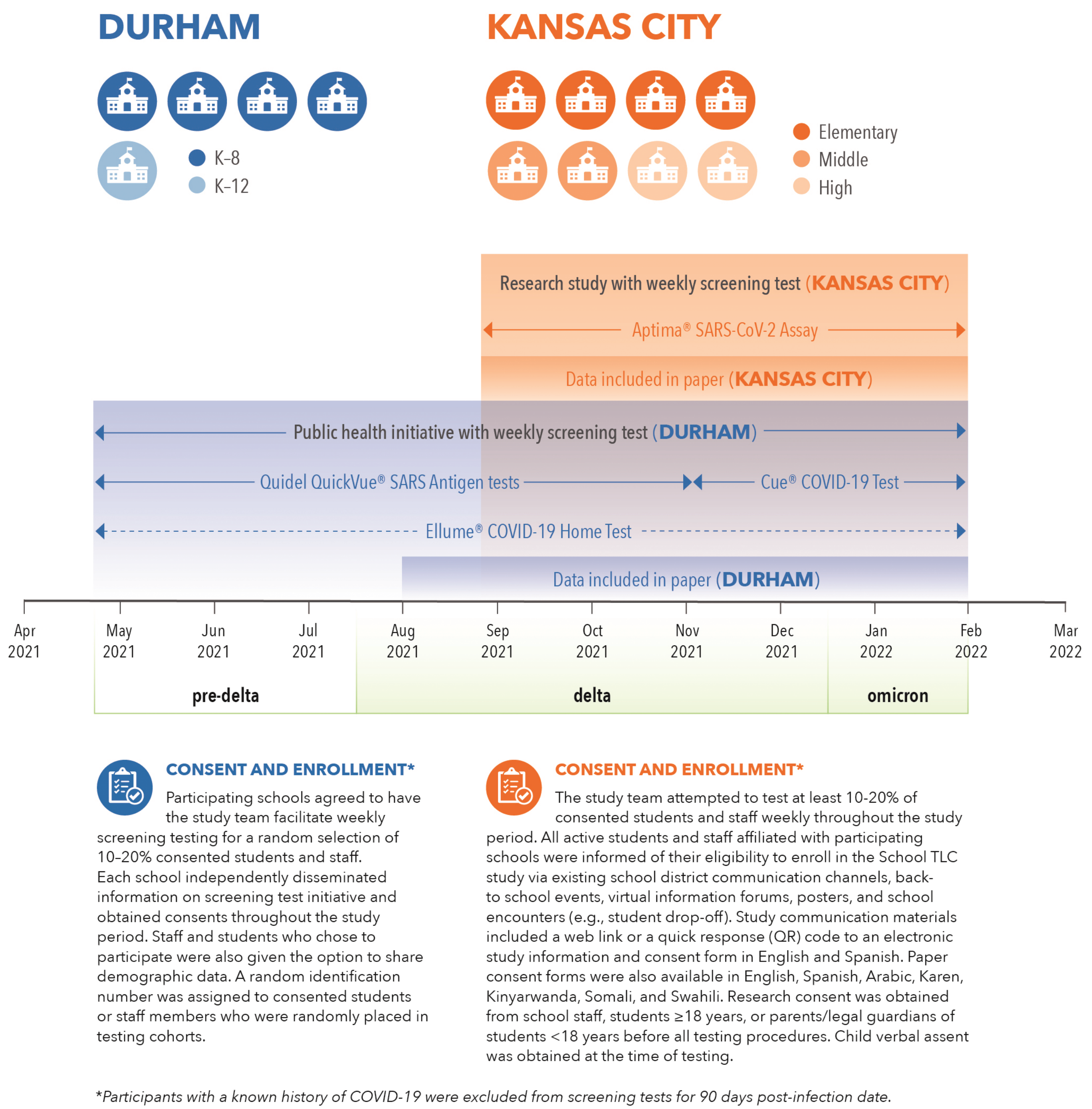

Figure 1. SARS-CoV-2 screening testing programs in two U.S. states—North Carolina and Missouri summary of the screening testing program setup, consents, enrollment, and testing periods. K–8, kindergarten through 8th grade; K–12, kindergarten through 12th grade; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

and the Institute of Education Sciences National Center for Education Statistics [15]. Additional methods for Durham and Kansas City programs can be found in Supplementary Methods.

Cost and Burden Estimation: Durham and Kansas City

The study teams quantified the required resources for school-based screening testing programs, specifically, time, personnel, and monetary costs (in United States [U.S.] dollars), per test administered and participant tested. Time spent per individual per week for each activity in each school for the program duration was used to compute the total time per week, per test assay, and per participant. To calculate the total time required to execute a K–12 school-based testing program, time spent per individual, per week for each test in each school was used for the program duration. Estimated time excluded time for sample processing at an external lab, but included school staff training, test room prep and maintenance, consent gathering from students/parents and staff, participant monitoring at the test location, sample collection assistance, and results distribution. Estimated costs included labor and materials for the entire study period and separately for periods when delta and omicron SARS-CoV-2 variants were dominant in local counties (Supplementary Methods).

Data Analyses: Durham and Kansas City

We used SAS® software version 9.4 to conduct all statistical analyses (SAS Institute, Inc., Cary, NC USA). Analyzed data included costs, screening test results, testing cohort demographics, and school demographics from August 2021–January 2022 for all participating schools. Routine school breaks and closures were excluded.

We performed descriptive analyses of demographics (ie, age, race, ethnicity, sex, grade level, student, and staff) and testing data (ie, enrollment rates and SARS-CoV-2 positivity rates) in participating schools. To assess the participation rate over time, we calculated the proportion of weekly screening tests performed, divided by the total number of participants for each program during the 2021–2022 school year. To assess positive COVID-19 rates over time across all schools, we calculated the proportion of individuals who had positive screening tests divided by the total number of individuals who had screening tests administered in a given week for each school. Finally, we examined the positive COVID-19 rates alongside the CDC's reported positivity rates for each testing program's county for each week of the testing period. To calculate our program rates, the number of individuals with a positive test result for each school and each week was divided by the total number of individuals tested, and then multiplied by 100 000. For individuals who received multiple tests in a week, only one case count contributed to the numerator and denominator. The percent positive rates per week and by county reported in the CDC COVID Data Tracker [16] database were multiplied by 1000 to calculate the county rate per 100 000 individuals.

RESULTS

School-based Testing Programs

The Durham program consented 962 participants; of these, 947 were tested with 675 (71.3%) participants noted as students. Of 947 tested participants, 3504 screening tests were performed within five public charter schools from August 2021 to January 2022, incorporating delta and early omicron SARS-CoV-2 variant surges. During the same period, the Kansas City testing program collected 2127 screening tests from 712 consented participants with 485 (68.1%) noted as students, while the rest were staff members in eight public schools. Across both programs, the median number of tests per week for the entire program was 251, and the median number of participants per week across all schools was 250 (interquartile range [IQR]: 140, 336). During the analysis period, of the 962 consented participants in the Durham program, the weekly number of tested participants ranged from 41 to 257 (4.3–26.7%); among 712 consented participants in Kansas City, the weekly number of tested participants ranged from 9 to 160 (1.3–22.5%). Supplementary Table 2 shows weekly testing rates for students only within each program. Public annual reports for participating schools in Durham estimate an annual enrollment of 2967 students. In Durham, the weekly proportion of enrolled school students voluntarily participating in the screening testing program was no more than 6%. For Kansas City, the estimated annual student enrollment is 4623; the proportion of enrolled students participating in the testing program was no more than 2.4% per week (Supplementary Table 2).

Both testing programs had participants with similar age, race, ethnicity, and gender demographics as shown in Table 1; however, the Durham program (which was set up as a public health initiative) had 48.4% of participants missing race or ethnicity. Demographic characteristics of testing program participants are compared with public data on school demographics (Supplementary Table 3). The median student age in the Durham program was 10 (IQR: 8, 13) years, whereas in Kansas City, the median student age was 14 (IQR: 11, 16).

SARS-CoV-2 Screening Test Positivity Rates

Positivity rates during each testing week are summarized in Supplementary Table 4. Prior to the omicron variant surge (August 2021–December 2021), a positive test result was noted in only 5 of 18 testing weeks for the Durham program with a peak of 3.70% (Supplementary Table 4). In contrast, during omicron dominance, positive results were noted during all testing weeks in January 2022, with weekly positivity rates surging to 16.2%. Similarly, schools in the Kansas City program only reported positive results during 8 of 16 testing weeks prior to January 2022, yet program-level weekly positivity rates reached 15.5% in January 2022 (Supplementary Table 4). Notably, the community COVID-19 rates in each geographical region were consistently higher than positivity rates in the K–12 testing cohorts (Figure 2).

Cost Burden for School-based Testing Programs

The overall total program cost for the 21-week Durham testing program was $246 587, of which $125 689 was attributed to labor and $120 897 to materials (Table 2). The total program cost for the 19-week Kansas City program was $292 591, of which $50 112 was attributed to labor cost and $242 478 to material cost (Table 2). The lower labor cost is directly influenced by the lab-based NAAT (Aptima) tests that limited the need for on-site staff. In the Durham program, 3504 tests were administered to 947 participants from whom 32 total positives were detected; the cost to detect a positive was $7076 and the cost per participant

Table 1. Demographic characteristics of participants in Kindergarten–12th grade school-based SARS-CoV-2 screening testing programs

Demographic characteristics	Durham Program (Durham Co.) *N* = 947	Kansas City Program (Jackson Co.) *N* = 712
Participant classification		
Student	675/947 (71.3%)	485/712 (68.1%)
Staff	197/947 (20.8%)	227/712 (31.9%)
Unknown	75/947 (7.9%)	0/712 (0.0%)
Student age (years)		
N	540	469
Mean (SD)	10.3 (3.23)	13.0 (3.93)
Median (Q1, Q3)	10.0 (8.0, 13.0)	14.0 (11.0, 16.0)
Min, max	4, 18	3, 40
Prefer not to answer	135	16
Staff age (years)		
N	76	217
Mean (SD)	41.5 (11.04)	39.7 (13.16)
Median (Q1, Q3)	40.5 (32.0, 50.5)	37.0 (30.0, 50.0)
Min, max	21, 67	5, 69
Prefer not to answer	121	10
Gender		
Male	317/947 (33.5%)	269/712 (37.8%)
Female	395/947 (41.7%)	427/712 (60.0%)
Non-binary	0/947 (0.0%)	5/712 (0.7%)
None of these describe me	0/947 (0.0%)	1/712 (0.1%)
Prefer not to answer	235/947 (24.8%)	10/712 (1.4%)
Ethnicity		
Hispanic or Latino	51/947 (5.4%)	186/712 (26.1%)
Not Hispanic or Latino	736/947 (77.7%)	467/712 (65.6%)
Prefer not to answer	160/947 (16.9%)	59/712 (8.3%)
Race		
White	232/947 (24.5%)	293/712 (41.2%)
Black or African American	198/947 (20.9%)	218/712 (30.6%)
Asian	21/947 (2.2%)	35/712 (4.9%)
American Indian or Alaska Native	0/947 (0.0%)	7/712 (1.0%)
Native Hawaiian or Other Pacific Islander	0/947 (0.0%)	0/712 (0.0%)
Multiracial	15/947 (1.6%)	21/712 (2.9%)
Other	23/947 (2.4%)	27/712 (3.8%)
Prefer not to answer	458/947 (48.4%)	111/712 (15.6%)

K–12, kindergarten through 12th grade; Q1, quarter 1; Q3, quarter 3; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; SD, standard deviation.

was $260. In the Kansas City program, 2127 tests were administered to 712 participants from whom 57 total positives were detected; the cost to detect a positive result was $4818 and the cost per participant was $411. The Durham program required 752 total hours of effort and Kansas City required 537 h. Hands-on time required per test ranged from 13 to 15 min in each program (Table 2). The estimated time spent to identify a single positive was 23.49 h for Durham, and 9.42 h for Kansas City. The projected time for a dedicated school nurse running similar programs would be 1138 h for Durham and 448 h for Kansas City. The time required to detect a positive test was substantially reduced during omicron circulation compared to delta (Table 2).

Supplementary Table 5 shows the estimated total cost by test type and quantity for a typical K–12 school incorporating an average K–12 nurse's salary and standard materials, while excluding costs routinely incurred by the school or staff (ie, mileage and the wagon transport mechanisms). To derive an estimation, actual material costs for the entire program were used as a baseline (Supplementary Table 6) to project test-related material costs by SARS-CoV-2 test type and quantity (Supplementary Table 7).

DISCUSSION

Our study is a thorough description of the utilization, test results, and cost of two geographically and methodologically distinct real-world K–12 screening testing programs. We found lower SARS-CoV-2 positivity rates among voluntary

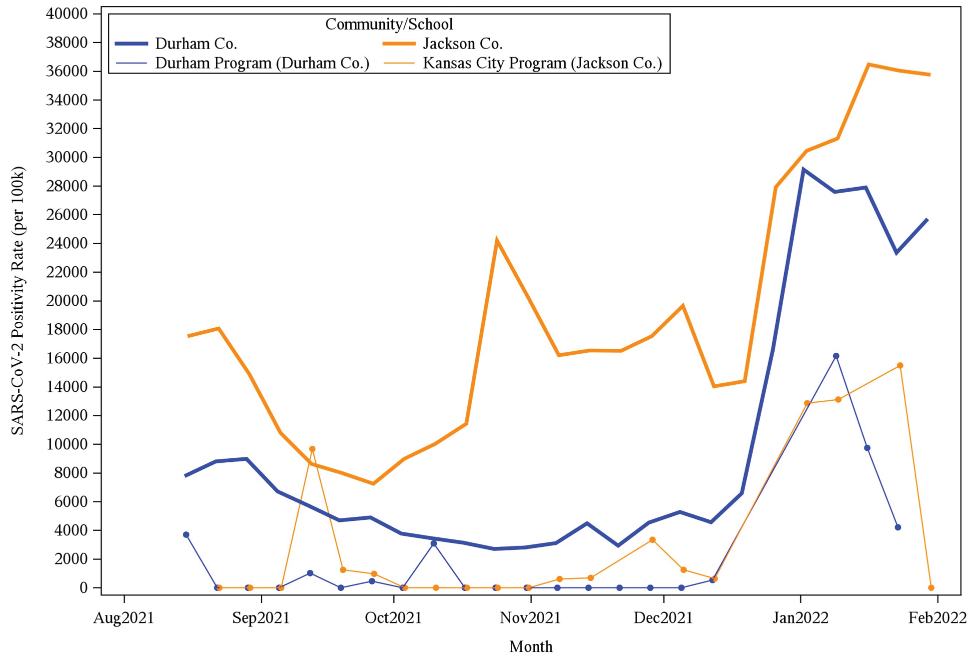

Figure 2. Positive SARS-CoV-2 screening tests and SARS-CoV-2 positivity rates across Durham (Durham County) and Kansas City (Jackson County) screening testing programs and counties. COVID-19, coronavirus 2019; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

participants in K–12 screening testing programs compared to rates in local counties during the delta variant dominance and a limited period of omicron variant dominance in the U.S. Both programs were costly (ie, nearly $4000–$6000), resulting in additional efforts and stress placed on school staff, particularly nurses.

Our data highlight concerns about the utility of a voluntary testing program, particularly in a universally masked setting. Prior to December 2021 [17], children younger than 18 years represented 22% of the U.S. population and proportionally accounted for <20% of cases [16]. By January 2022, during the omicron variant surge, nearly one million children became infected within one week [18], accounting for approximately 25% of the U.S. cases. In both testing programs within universally-masked schools, weekly screening tests only identified 89 positive cases in presumably asymptomatic participants. The case-identification rates within the Durham and Kansas City screening programs aligned with, but did not predict, substantial increases in their respective local communities over a period that encompassed the omicron variant surge; this is consistent with prior findings observed in pre-omicron and pre-vaccination periods [19–21].

Both programs required 9–24 h of active testing time per week and may have required more time if school nurses independently ran similar programs. The minimal difference in estimated time for both programs was likely due to variation in staffing, testing, and general school operations. Both testing initiatives were run by experts experienced in testing logistics and platforms. Nonetheless, school nurses may require more dedicated time to learn testing logistics, communicate with caregivers and the school community, and answer follow-up questions. Additionally, finding a positive case approximately cost $4800–$7000. Even when considering a program that solely administers the lowest cost test (which was the rapid antigen [Quidel] test), the estimated cost per test averages $37, meaning a program that only administers 1000 tests would still spend about $37 658. When scaled to account for lower material costs with bulk purchases, the average cost for a 20 000-test program is approximately $730 743 (Supplementary Table 5). These costs may be prohibitive for many public K–12 schools. Although federal and state funds were made available for COVID-19 testing, these funds did not necessarily include resources needed to run these programs (eg, full-time nurses) or account for sustainability.

Real-world data are not available as to the effectiveness of COVID-19 screening testing programs at limiting transmission in schools. Modeled data [22] assume nearly universal (eg, 100%) voluntary consent for screening tests, as well as consistent access to molecular tests to allow for surveillance testing of 10–20% and follow-up testing of 90%; our real-world data suggest these assumptions are impractical, and modeling may have limited utility in providing real-world estimates. Given the high cost of implementing testing programs, understanding if and to what degree screening testing prevents in-school COVID-19 transmission is crucial to determining the cost-effectiveness. In contrast to screening

Table 2. Quantified effort: time and costs associated with K–12 school-based SARS-CoV-2 screening testing programs

Variable	Program totals[a]		Delta variant[b]		Omicron variant[c]	
	Durham	Kansas City	Durham	Kansas City	Durham	Kansas City
	N = 947	*N* = 712	*N* = 947	*N* = 712	*N* = 947	*N* = 712
Test counts						
Total tests	3504	2127	3094	1648	410	479
Total positives[e]	32	57	8	14	24	43
Time (h)						
Total time	752	537	661	435	90	102
Time per test[f]	0.21	0.25	0.21	0.26	0.22	0.21
Time per positive	23	9	83	31	4	2
Costs ($)						
Total costs	246 587	292 591	206 546	228 776	40 045	63 815
Total labor	125 689	50 112	110 725	40 594	14 965	9519
Total materials	120 897	242 478	95 821	188 182	25 080	54 296
Cost per test	70	132	N/A[d]			
Cost per positive	7706	4818				
Cost per participant	260	411	218	321	42	90
Projected costs ($)[g]						
Total costs	188 995	250 442	N/A			
Total labor	69 807	8391				
Total materials	119 188	242 051				

K–12, kindergarten through 12th grade; N/A, not applicable; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

[a]Durham program used antigen point-of-care, antigen at-home, and rapid polymerase chain reaction tests; Kansas City program exclusively used lab-based nucleic acid amplification testing.

[b]Delta variant dominated.

[c]Omicron variant dominated.

[d]Estimated cost per test and per participant could not be separated due to fixed startup costs.

[e]No outbreaks (locally defined as five cases with an epidemiological link) were reported in any of the schools.

[f]Hands-on time per test for the Durham program with on-site sample collection and processing was approximately 13 min, whereas the Kansas City program, with off-site NAAT sample processing, required approximately 15 min per test.

[g]Assumes the testing program replicates the Durham program (21 weeks in five public schools, where 3504 tests were administered and 32 positives were detected) and the Kansas City program (19 weeks in eight public schools, where 2127 tests were administered and 57 positives were detected). Per the description in Results, the projection replaces labor research/school staff with a dedicated school nurse.

tests, targeted testing and personnel resources allocated for non-pharmaceutical interventions, diagnostic tests, test-to-stay, or test-to-play programs may provide better value [23]. Other studies have highlighted the effectiveness of universal masking and test-to-stay policies in limiting secondary transmission in K–12 schools, even during variant-fueled surges [3, 23–25], yet these studies did not routinely include screening testing as a core component of their COVID-19 mitigation plans. Therefore, in settings with layered mitigation, access to screening testing may improve the perception of safety, but may minimally add, if adding at all, to existing COVID-19 mitigation strategies, given the low prevalence of asymptomatic detection [24, 26].

Universal masking was a core part of layered mitigation strategies in participating K–12 schools. The estimated costs for providing double-layered, disposable, ear loop masks for each student daily are notably lower than estimated testing costs. Assuming a cost of 10 cents per student in the five Durham schools enrolling 2967 students who receive a new mask each weekday for the duration of the testing program (21 weeks), we estimated a total cost of $31 153, reducing costs by more than $200 000. Similarly, when applying these estimates to the 4623 students enrolled in the eight Kansas City testing program schools over a 19-week period, we estimated a total masking cost of $43 918, thereby reducing costs by $248 673. Recently updated CDC guidance for schools now emphasizes vaccinations and masking and removes screening test recommendations [9].

There are many possible reasons for the limited utility of testing programs in K–12 schools. First, weekly testing cadence may miss infections caused by rapidly transmissible variants, but more frequent testing may cause missed class time, burden to personnel, be undesirable, and financially infeasible. Second, participation in voluntary testing programs is limited. Both testing programs separately consented to 1674 participants across all schools, yet tested a small proportion of the schools' eligible students. While estimates [27] of asymptomatic children who test positive for SARS-CoV-2 in a given population may be as high as 21%, screening tests rarely interrupt transmission, due to low participation (<1%). Finally, asymptomatic infections picked up by screening tests may increase isolation and quarantine-associated learning losses, and result in caregivers missing work. Future studies may assess qualitative reasons for low participation in school-based testing programs and testing utility in an era of widespread vaccinations [28].

Limitations

Our study had several limitations. First, the Kansas City program required separate consents for participation, which may have been a deterrent, or may have been selected for participants with a lower risk of SARS-CoV-2 infections. Voluntary participation may have also been selected for risk-averse participants who are more compliant with CDC and state-level guidance. Second, the scarcity of testing supplies sporadically reduced the number of available test kits per week for the Kansas City program and led to changes in testing platforms for Durham; however, all testing modalities reported comparably high sensitivity rates and allowed the study teams to estimate costs by test types. Third, cost descriptions were based on market rates for supplies and institutionally-negotiated rates for effort compensation, which may not directly apply to other K–12 settings. Nevertheless, other testing programs utilize private institutions that require significantly higher costs without clear benefit to K–12 communities [29]. Pooled testing may reduce costs, but in times of high positivity rates, this type of testing creates more burden for staff, since a positive pool result means that each test in the pool needs to be independently re-analyzed to identify the positive person. Consequently, pooled testing rapidly loses value in high viral transmission settings [30]. Fourth, measures of compliance with COVID-19 mitigation policies (specifically masking), within-school transmission, and quarantines were not captured in this study, but have been reported [31–34]. Fifth, school case rates for primary infections were not directly captured, but local community rates provided adequate comparisons since community-based testing was available for symptomatic and asymptomatic individuals during the study period. Lastly, this study was not powered or designed to assess the effect of COVID-19 screening programs on in-school transmission. With no published data on the effectiveness of these programs in preventing COVID-19 transmission, a cost-effectiveness analysis of screening testing compared with other mitigation strategies was unable to be performed.

CONCLUSIONS

Voluntary K–12 screening testing programs are resource-intensive and asymptomatic detection was uncommon. Data support the efficacy of low-cost interventions, such as masking and vaccinations, in reducing COVID-19 incidence, severity, comorbidities, and long-term harm in children [35–37]. K–12 schools should focus on targeted testing of symptomatic individuals and increased vaccine uptake, rather than school-based screening testing programs.

Supplementary Data

Supplementary materials are available at the *Journal of The Pediatric Infectious Diseases Society* online (http://jpids.oxfordjournals.org).

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