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Is Symptom Screening Useful for Identifying COVID-19 Infection in School Settings? Georgia, USA

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Abstract

This study's goal was to characterize the utility of symptom screening in staff and students for COVID-19 identification and control of transmission in a school setting. We conducted a secondary analysis of cross-sectional data for staff, students and associated household members in a Georgia school district exposed to COVID-19 cases who received RT-PCR testing and symptom monitoring. Among positive contacts, 30/49 (61%) of students and 1/6 (17%) of staff reported no symptoms consistent with COVID-19. Symptom sensitivity was 30% in elementary students and 42% in middle/high students. Fifty-three percent (10/19) of symptomatic positive contacts had at least one household member test positive for SARS-CoV-2 compared with 50% (10/20) of asymptomatic positive contacts. The absence of symptoms in children is not indicative of a lack of SARS-CoV-2 infection or reduced risk of infection for associated household members. Testing all close contacts of people with COVID-19 in schools is needed to interrupt transmission networks.

Keywords

COVID-19; symptoms; epidemiology; elementary school students; high school students; transmission; screening testing; school nurses

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Supplemental Material

Supplemental material for this article is available online.

Introduction

Children can acquire and transmit SARS-CoV-2, the virus that causes COVID-19 (Lee & Raszka, 2021; Lipsitch et al., 2020; Ludvigsson, 2020), though evidence is still being gathered to describe how susceptible or infectious children are compared with adults (Assaker et al., 2020; Lessler et al., 2021; Zimmermann & Curtis, 2020a). Children with SARS-CoV-2 infection generally experience milder symptoms and less severe disease compared with adults (Dong et al., 2020; Laws et al., 2021), and an estimated 13–42% of children with SARS-CoV-2 infections are asymptomatic (Assaker et al., 2020; Dong et al., 2020; Han et al., 2021; Viner et al., 2020; Zimmermann & Curtis, 2020b). Symptom profiles of children with SARS-CoV-2 infection are non-specific; fever, cough, headache, sore throat, and rhinorrhea were most common, although this may vary by age (Assaker et al., 2020; Han et al., 2021; Laws et al., 2021; Team, 2020; Viner et al., 2020; Zimmermann & Curtis, 2020b). Children also appear to be less likely than adults to report symptoms predictive of COVID-19, like loss of taste or smell (Dawson et al., 2021; Viner et al., 2020).

Comprehensive testing strategies are critical to the rapid identification of persons with COVID-19 for timely implementation of control measures (e.g., isolation of cases, quarantine of associated contacts, targeting future prevention measures) (CDC, 2021b). People with symptomatic SARS-CoV-2 infections may be more likely to transmit to household members (Lessler et al., 2021; Madewell et al., 2020), but asymptomatic infections also play a significant role in transmission (Furukawa et al., 2020). Asymptomatic transmission among school-aged children may be more common than currently recognized as asymptomatic children shed virus and could possibly transmit (Cai et al., 2020) similarly to symptomatic children (Heald-Sargent et al., 2020). Therefore, understanding how symptoms present in children and transmissibility from children is critical to COVID-19 prevention strategies particularly in school settings. Research on SARS-CoV-2 infection in children will help guide prevention strategies for school nurses and other staff as more children resume in-person activities, including attending schools for in-person learning (Honein et al., 2021; Laws et al., 2021).

To open and keep schools open safely for in-person learning, it is important to understand what testing strategies should be implemented to disrupt transmission and to what extent symptoms can be used to identify SARS-CoV-2 infection among those attending and working in K-12, early care, other education programs, and other child-centric settings. We conducted a secondary analysis of staff and student contacts exposed to COVID-19 cases in a Georgia public school district to characterize the utility of symptom screening in contacts of SARS-CoV-2 positive cases for COVID-19 control in schools.

Methods

Setting

The Centers for Disease Control and Prevention (CDC) collaborated with Cobb and Douglas Public Health, the Georgia Department of Public Health, and a public school district in the Atlanta metropolitan area to assess in-school transmission of SARS-CoV-2 during December 1, 2020–January 22, 2021. The school district serves approximately 8,500

students and employs approximately 1,400 staff across one early learning center, eight elementary schools, two middle schools, and one high school. Parents and guardians could elect in-person or virtual learning for their child; in person education occurred Monday to Thursday with a virtual day Friday. At the time of data collection, educational staff and children were not eligible for vaccination in Georgia. During the investigation period, the COVID-19 seven-day county incidence peaked with a high of 705 cases per 100,000 on January 13, 2021 (Gettings et al., 2021).

Study design

Methods and findings from the full transmission investigation were previously published (Gettings et al., 2021; Gold et al., 2021). In brief, SARS-CoV-2 positive students and staff were identified as index cases by the local public health department in collaboration with the school district. Close contacts of the index cases were identified by district staff and shared with CDC investigators who invited them to participate in the school transmission investigation. Staff or student contacts were defined as those exposed (within six feet for longer than 15 min cumulatively over a 24-h period) in schools to a person with lab-confirmed COVID-19 during the case's infectious period (beginning 48 h prior to a case's positive test if asymptomatic, or 48-h prior to symptom onset (CDC, 2021b)). The investigation identified 14 clusters of 3 or more cases among COVID-19-positive contacts to school associated index cases (Gettings et al., 2021; Gold et al., 2021).

This analysis was restricted to staff or student school-based contacts who reported COVID-19 symptom status data and received a SARS-CoV-2 test and their associated household members if applicable. Contact exposure location was provided by the school, and in instances of concurrent exposures to multiple index cases, the first reported, or chronologically first, exposure was used for analyses. Contacts were included in the analysis if they had a SARS-CoV-2 reverse transcription polymerase chain reaction (RT-PCR) test result and reported symptom status during the monitoring period. Presence of symptoms, date of onset, and specific symptoms were collected in three ways during this investigation: at time of enrollment using a survey (Epi Info, version 7.2.3.1), at time of testing, and via 14-day automated text message monitoring (Text Illness Monitoring System (TIMS)). Investigators received verbal consent from contacts or parents and guardians (for any contacts aged <18 years) before administering the survey. If during the TIMS monitoring period (14-days following in-school exposure) a participant responded 'yes' to the daily text-message asking if they developed symptoms, an investigator called the contact to ascertain symptom(s) and onset date.

All contacts were offered free SARS-CoV-2 drive-through testing at a location within the district using anterior nasal swabs which were processed by the Georgia Public Health Laboratory. SARS-CoV-2 RT-PCR testing was conducted using the PerkinElmer New Coronavirus Nucleic Acid Detection Kit (PerkinElmer, Waltham, MA) with viral nucleic material extracted using PerkinElmer Chemagic 360 (Applied Biosystems, Foster City, CA). Contacts that tested positive were offered free testing for household members. The SARS-CoV-2 test results of household members were linked to their school-based contact

at the time of testing. All consenting household members with a COVID-19 test result and associated with a COVID-19-positive school contact were included in the analysis.

Variable definitions

Contacts were considered symptomatic if they reported having symptoms at any point during the 14-day monitoring period after their COVID-19 exposure or considered asymptomatic if they reported not having symptoms during that time.

Reported symptoms were categorized as 1) any symptom, and 2) meeting the Council of State and Territorial Epidemiologists (CSTE) case definition. CSTE provides two options for meeting the clinical criteria for the COVID-19 case definition: one of five *specific* symptoms (cough, shortness of breath, difficulty breathing, loss of smell, loss of taste), or two of ten *generalized* symptoms (measured or subjective fever, chills, rigors, myalgia, headache, sore throat, nausea or vomiting, diarrhea, fatigue, congestion or runny nose). Meeting either of these classifications fulfills the CSTE clinical case definition for COVID-19 (CSTE 1 of 5 specific or CSTE 2 of 10 generalized symptoms) (CSTE, 2020). Those having symptoms in both the specific (1 of 5) and generalized (2 of 10) symptom categories were prioritized as having specific symptoms. Symptoms were also categorized by body system including constitutional (fever, chills, fatigue, myalgia), lower respiratory (cough, shortness of breath, and difficulty breathing), upper respiratory (sore throat, congestion/runny nose), neurologic (headache, loss of taste, loss of smell), and gastrointestinal (nausea, vomiting, diarrhea, abdominal pain). All school district employees were categorized as staff. Exposures were classified into location categories (classroom, sports, school bus, and office).

Analytic methods

Descriptive statistics of reported symptom status, symptom categories and demographics are presented by contact role (staff, student); by school level (elementary, middle/high school); and by SARS-CoV-2 test result. A Kaplan-Meier analysis of time from COVID-19 exposure to symptom onset, stratified by contact role, was conducted. We evaluated differences between groups using the log-rank chi-square statistic. Censoring occurred on last date of symptom monitoring.

Associations between symptoms and SARS-CoV-2 test result were assessed for student contacts using chi-square or Fisher's exact tests. Associations were tested for different symptom categories and demographic characteristics.

Using the RT-PCR results as the gold standard comparison, the sensitivity (Se), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV) with associated confidence intervals were calculated by age group for having any symptoms in the 14-day monitoring period and meeting either CSTE case definition.

The percent of contacts with COVID-19-positive household members was calculated and stratified by symptomatic status. The median number of household members with a COVID-19 positive test by symptom status was calculated and significance testing for the presence of positive household members was performed using the chi-square statistic.

Analyses were conducted in SAS (version 9.4; SAS Institute, Cary, North Carolina) and R statistical software (version 3.6.1; The R Foundation). In all analyses, a p-value of <0.05 was considered statistically significant. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy*.

Results

Study Population

Of the 1,116 enrolled contacts with a valid test result, 669 (60%), reported any COVID-19 symptom status data during the monitoring period and were included in this analysis (Figure 1). Almost half of the 587 students included in the analysis (48.2%, 283) identified as Hispanic/Latino, of the 72 staff, 8 (11%) identified as Hispanic/Latino with 44 (61%) identifying as non-Hispanic White. The median age of students was 10 years (range 5–20) and the median age of staff was 38 years (range 20–69). Among 69 staff, 24 (35%) reported an existing underlying condition, and 119 of 570 (20.9%) students reported an existing underlying condition. The most common exposure location for staff (59%) and students (74.2%) was in the classroom (Table 1). Of 101 contacts reporting at least one symptom, 24 (24%) tested positive for SARS-CoV-2, while 31 of 568 (5.5%) asymptomatic contacts tested positive ($P = < 0.0001$) (Figure 1).

Symptom Characteristics

Among 49 student and 6 staff SARS-CoV-2 positive contacts, 19 (39%) students and 5 (83%) staff reported experiencing at least one symptom during the monitoring period. Among the 547 student and 67 staff negative contacts, 58 (11%) students and 19 (28%) staff reported experiencing at least one symptom. Of the 30 elementary and 19 middle/high school student SARS-CoV-2 positive contacts, more than half had an asymptomatic infection (elementary: 63%; middle/high school: 58%). Of SARS-CoV-2 positive contacts, 3 (50%) staff and 17 (35%) students reported symptoms meeting the CSTE clinical case definition for COVID-19. All 3 staff reported CSTE symptoms meeting the more specific CSTE 1 of 5 case definition; 12 of 17 (71%) positive students reporting CSTE symptoms met the CSTE 1 of 5 definition and 5 (29%) met the CSTE 2 of 10 symptoms definition. Among positive symptomatic students, 11/19 (58%) reported upper respiratory symptoms and 11/19 (58%) reported neurologic symptoms, with the most common symptom reported being congestion/runny nose 9/19 (47%). Among negative symptomatic students, 34/58 (59%) reported upper respiratory symptoms and 17/58 (29%) reported neurologic symptoms, and the most common symptom reported similarly was congestion/runny nose 24/58 (41%) (Table 2).

Median days from school exposure to symptom onset for all positive contacts was 4.5 days (IQR 3–6) compared to 6 days (IQR 3–7) ($P = 0.42$) for all negative contacts (Table 2). Time from school exposure to reported symptom onset among positive and negative contacts are presented in Kaplan-Meier curves (Figure 2). Time from school exposure to symptom onset is significantly different between SARS-CoV-2 positive staff and student contacts ($P = 0.02$). The last date for symptom onset for SARS-CoV-2 positive staff was day 7 after school exposure, and day 9 for positive students. Through day 5, 22% (11/49) of SARS-CoV-2

positive students reported any symptoms compared to 4.7% (26/547) of negative students. Similarly, 50% (3/6) of SARS-CoV-2 positive staff reported any symptoms through day 5 and 16% (11/67) of negative staff reported any symptoms. Reported symptoms meeting the CSTE symptom definition through day 5 were lower for negative students (2.7%, 15/547) and staff (13%, 9/67) (Figure 2).

Symptom Associations

Symptomatic students had 5 times greater odds (Odds Ratio [OR] = 5.3, 95% confidence interval [CI] = 2.8–10.1, $P < 0.0001$) of testing positive than asymptomatic students. In students 5–7 years old, reporting any symptoms was not significantly associated with a positive RT-PCR test result. However, the odds of testing positive among symptomatic students compared to asymptomatic students increased as student age increased (8–12 years: OR = 5.5, CI = 1.9–15.6, $P = 0.0004$; 13–20 years: OR = 10.8, CI = 3.5–33.1, $p < 0.0001$) (Supplemental Table 1A). Students reporting symptoms meeting the CSTE clinical case definition had eight times greater odds (OR = 8.8, CI = 4.4–17.6, $P < 0.0001$) of having a positive RT-PCR result than those who did not meet the case definition (Supplemental Table 1B).

Sensitivity, Specificity, and Predictive Value of Symptoms to Identify SARS-CoV-2 Infection

Across student and staff groups, there was low Se, moderate Sp, and low PPV for both symptom definitions (Figure 3). Staff had the highest Se values, with 83% (CI = 36%–100%) of SARS-CoV-2 positive contacts reporting symptoms and 50% (CI = 12%–88%) meeting the CSTE clinical case definition. Only 37% (CI = 20%–56%) of positive elementary school students and 42% (CI = 20%–67%) of positive middle/high school students reported symptoms, declining to 30% (CI = 15%–49%) who met the CSTE definition among elementary school students (Supplemental Table 2).

The PPVs for reporting any symptoms were low across all groups, with only 21% (CI = 7%–42%), 20% (CI = 11%–34%), and 35% (CI = 16%–57%) of symptomatic staff, elementary school students, and middle/high school students testing positive, respectively. Limiting analysis to only contacts who met the CSTE clinical case definition did not change the PPV for staff but improved PPV to 26% (CI = 13%–44%) and 57% (CI = 29%–82%) in elementary and middle/high school students, respectively (Supplemental Table 2).

Household Cases Associated with School Exposed Contacts

Of the 55 positive contacts, 39 had at least one household member tested for SARS-CoV-2. Of the reported 174 household members of positive contacts, 114 were tested and 31 (27.2%) were found to be positive for SARS-CoV-2. The rates of having at least one household member test positive were similar for symptomatic (52.6%, 10/19) and asymptomatic positive school contacts (50.0%, 10/20) ($P = 0.6$). These rates were similar for positive contacts regardless of meeting the CSTE clinical case definition for symptomatic (52.9%, 9/17) and asymptomatic (50.0%, 11/22) status (Supplemental Table 3). Asymptomatic positive contacts had a mean of 0.7 (range 0–3) positive household members compared to 0.94 (range 0–5) for symptomatic positive contacts ($P = 0.5$).

Discussion

This analysis provided an in-depth examination of the reported presence or absence of symptoms in staff and students who were exposed to COVID-19 in a Georgia school district during a time of high community transmission (Gettings et al., 2021). The data presented here demonstrate the importance of testing asymptomatic persons in a child-centric setting consistent with CDC guidance (CDC, 2021a); testing recommendations (CDC, 2021d) based solely on symptomatic status would have missed 56% of contacts positive for SARS-CoV-2. Missing positive contacts in school settings may allow for additional transmission at school and spread from positive school contacts to household members (Dawson et al., 2021). Similar to previous studies among children (Dong et al., 2020; Laws et al., 2021; Poline et al., 2020; Viner et al., 2020; Zimmermann & Curtis, 2020b), we found high proportions of asymptomatic infection among students positive for SARS-CoV-2 (62% elementary school students and 58% of middle/high school students). Even fewer elementary school students (30%) reported symptoms that would meet the CSTE clinical case definition for COVID-19. Moreover, SARS-CoV-2 negative students also reported symptoms (elementary 13%, middle/high 7%), though at lower rates than positive students, indicating symptoms in general are neither sensitive nor specific as predictors for SARS-CoV-2 test results for students. Symptom reports in students testing negative may have been due to other influenza-like illnesses circulating during cold and flu season, cognitive biases related to having a known exposure, or possible false negative test results.

Similar to other studies, during this investigation we found congestion/runny nose, fever, sore throat and headache to be the most commonly reported symptoms in school aged children who tested positive for SARS-CoV-2, and COVID-19 defining symptoms such as loss of taste or smell were rare (Dawson et al., 2021; Laws et al., 2021; Viner et al., 2020; Zimmermann & Curtis, 2020b). By day nine, 39% of positive students reported symptoms; however, only 22% of positive students had reported any symptoms through day 5, indicating that a large proportion of students would not have reported symptoms during the recommended testing window (CDC, 2021d). We found symptom Se, Sp, PPV, and NPV were also low for staff and students for both any symptom and the COVID-19 CSTE clinical case definition. The low PPV and NPV illustrate the importance of testing all school contacts to identify transmission, but also shows that using a symptom screening approach for exposed students to determine school attendance during the COVID-19 pandemic is not likely to be an effective strategy due to the high proportion of asymptomatic cases among children and the non-specific nature of symptoms. Though symptoms alone were not a good indicator for testing eligibility, they were strongly associated with SARS-CoV-2 positivity (Supplemental Table 1A). Therefore school nurses and other staff should be aware that if a child develops symptoms they should be tested and kept home from school for the recommended isolation period (CDC, 2021c).

Breaking transmission networks is a critical component of COVID-19 disease control. To do this, health officials identify individuals who might transmit COVID-19 to others and implement prevention measures to limit spread. With the increased testing of all school-exposed contacts, and a subset of family members of positive contacts, we were able to characterize the positivity of household members. We found symptom status of positive

contacts exposed in a school setting was not associated with rates or the number of positive household members.

There were limitations to this analysis. First, some contacts refused to participate because they were not experiencing any symptoms of COVID-19 ($n = 48$). This may have led to a lower rate of testing acceptance among asymptomatic school-based contacts. Also, due to non-complete testing and response among contacts, these results should not be interpreted as the overall asymptomatic infection rate in the school district. Similarly, all exposed household members of positive contacts did not participate in testing (114/174, 65.5%), likely leading to underestimation of cases among household members. Second, we were unable to definitively determine directionality of COVID-19 transmission between contacts and household members. Third, there was potential for missing COVID-19 symptom data, as contacts may have skipped reporting to TIMS during the 14-day monitoring period. To mitigate this, we built in redundancy for COVID-19 symptom data collection including day of testing, TIMS monitoring, and survey data. Fourth, the survey data may be subject to recall and social desirability bias, though interviewers were trained to probe survey answers to improve response accuracy.

Conclusions

The results of this investigation demonstrate that the absence of symptoms in exposed children is not indicative of an absence of SARS-CoV-2 infection. Due to poor Se and PPV of symptoms, testing only symptomatic children exposed to COVID-19 is likely inadequate to identify all infectious individuals and may lead to underestimation of SARS-CoV-2 incidence. These findings strongly suggest strategies to test asymptomatic persons, such as screening testing, or comprehensive contact tracing with testing should be recommended in any program that aims to assess the incidence and transmission networks of COVID-19 among children. In times of moderate, substantial and high community transmission and in light of the increased severity and transmissibility of the delta variant (Ong et al., 2021; Sheikh et al., 2021) screening testing of students is recommended by CDC as well as the National Association of School Nurses (CDC, 2021c; NASN, 2021). School nurses serve as the front line COVID-19 health care providers in schools and are critical to developing and implementing school screening testing and contact tracing activities. It is also critical to increase awareness among parents and guardians of the importance of testing for asymptomatic and symptomatic unvaccinated and symptomatic vaccinated contacts to ensure all COVID-19 transmission events are identified to keep schools safe and open for in person learning.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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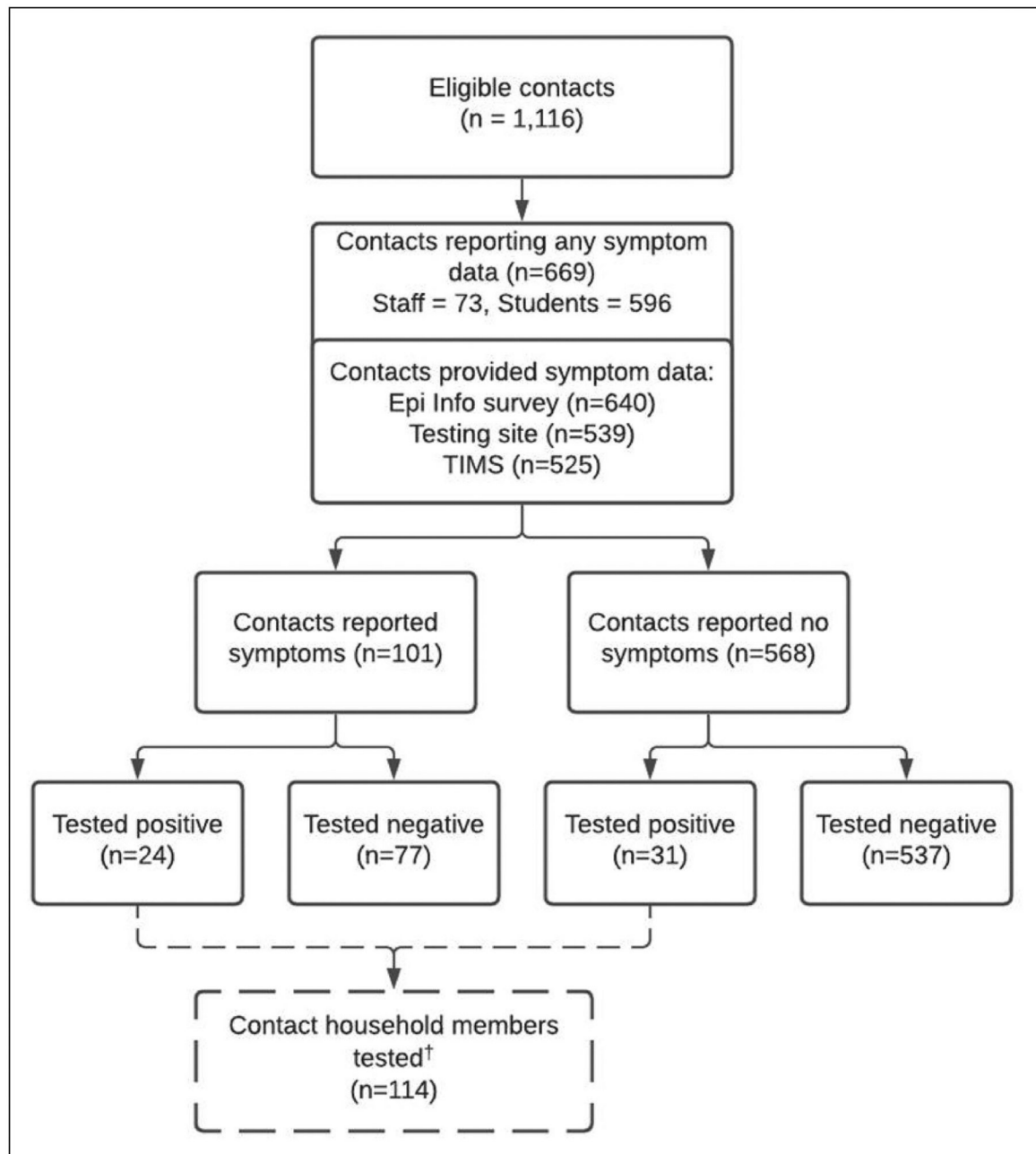


Figure 1. Staff and student contacts for SARS-CoV-2 transmission investigation in a school district—Georgia, United States, December 1, 2020–January 22, 2021, † All household members of positive contacts were offered SARS-CoV-2 testing, in some instances more than one household member was tested per positive person (range 0–8).

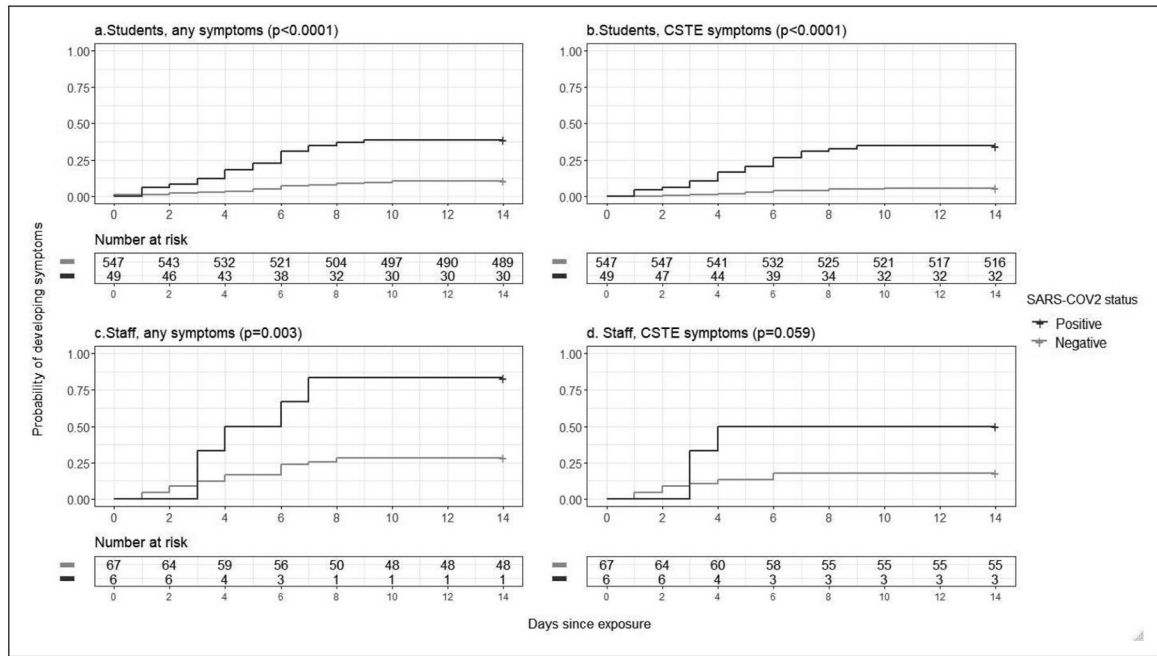


Figure 2. Time from exposure to symptom onset for students and staff testing positive and negative for SARS-CoV-2—Georgia, United States, December 1, 2020–January 22, 2021.

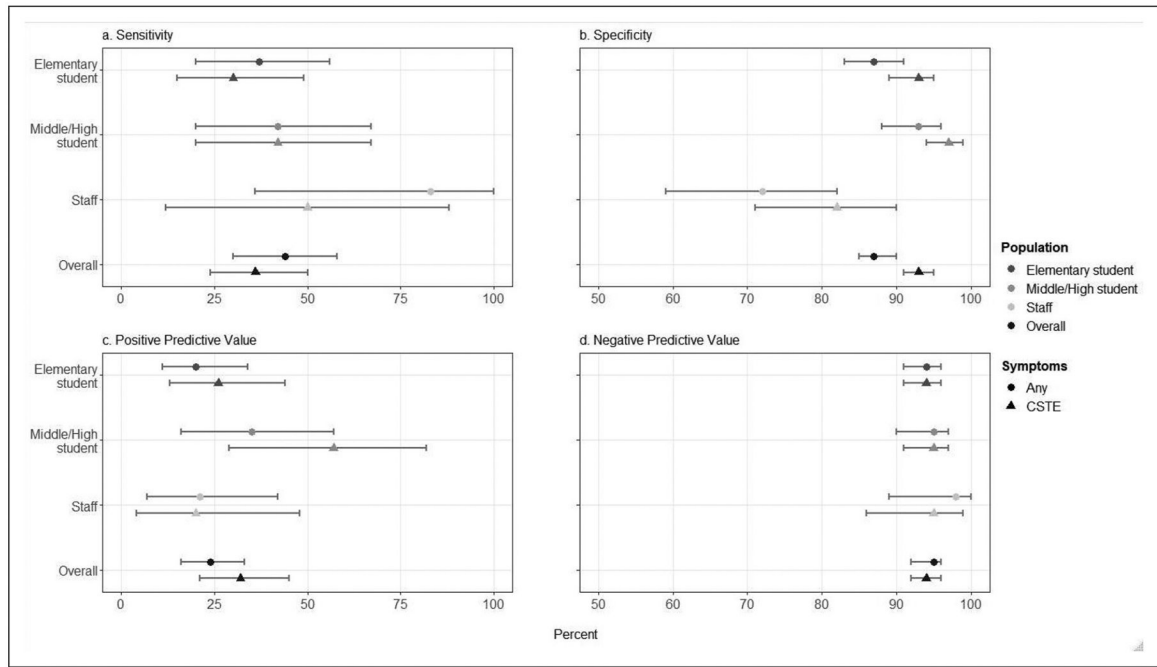


Figure 3. Sensitivity, specificity, positive predictive value, and negative predictive value for SARS-CoV-2 infection by staff and student school level for any symptoms and CSTE case definition symptoms—Georgia, United States, December 1, 2020–January 22, 2021.

Table 1.

Demographics of staff and student contacts exposed to SARS-CoV-2 who participated in an investigation of SARS-CoV-2 transmission in a school district—Georgia, United States, December 1, 2020–January 22, 2021.^a

	Staff No. (%)	Students No. (%)
Gender		
Male	11 (15)	328 (55.0)
Female	62 (85)	266 (44.6)
Transgender or ‘None of these’	0 (0.0)	2 (0.3)
Total	73	596
Race/ethnicity		
Non-Hispanic White	44 (61)	116 (19.8)
Non-Hispanic Black	20 (28)	173 (29.5)
Hispanic/Latino	8 (11)	283 (48.2)
Other^b	0 (0.0)	15 (2.6)
Total	72	587
Age (years)		
Median (range)	38 (20–69)	10 (5–20)
Age categories		
5–7 years	N/A	181 (30.4)
8–12 years	N/A	240 (40.3)
13–19 years	0 (0.0)	174 (29.2)
20 years	73 (100)	1 (0.2)
Total	73	596
Underlying conditions		
Yes	24 (35)	119 (20.9)
No	45 (65)	451 (79.1)
Total	69	570
Most common underlying conditions ^c		
Lung disease (including asthma)	9 (13)	76 (13.3)
Premature birth	0 (0.0)	25 (4.4)
Cardiovascular disease	9 (13.0)	13 (2.3)
Other	6 (9)	5 (0.8)
No	45 (65)	451 (80.2)
Total	69	570
Exposure Location		
Classroom	43 (59)	439 (74.2)
School Bus	1 (1)	94 (15.9)
Sports	6 (8)	59 (10.0)
Office	23 (32)	N/A
Total	73	592

^aIndividual numbers may not add to total denominator if participants declined to respond to a given question.

^bRace/ethnicity other includes: Non-Hispanic American Indian/Alaska Native; Non-Hispanic Asian; respondents of multiple races. Categories are mutually exclusive.

^cNot mutually exclusive.

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Table 2.

Symptom Characteristics of Staff and Student Contacts Participating in an Investigation of SARS-CoV-2 Transmission in a School District by SARS-CoV-2 PCR Testing Results—Georgia, United States, December 1, 2020–January 22, 2021.

Testing status	Staff		Elementary Students				Middle/High Students			Total	
	Positive (n = 6) No. (%)	Negative (n = 67) No. (%)	Positive (n = 30) No. (%)	Negative (n = 342) No. (%)	Positive (n = 19) No. (%)	Negative (n = 205) No. (%)	Positive (n = 55) No. (%)	Negative (n = 614) No. (%)			
Asymptomatic	1 (17%)	48 (72%)	19 (63%)	299 (87.4%)	11 (58%)	190 (92.7%)	31 (56%)	537 (87.5%)			
Any symptom in 14 days after exposure	5 (83%)	19 (28%)	11 (37%)	43 (12.6%)	8 (42%)	15 (7.3%)	24 (44%)	77 (12.5%)			
Median days after exposure (IQR)	4 (3–6)	4 (2–6)	4 (1–6)	6 (3–7)	6.5 (4–7.5)	6 (2–9)	4.5 (3–6)	6 (3–7)			
Symptom on/before day of test	3 (60%)	19 (100%)	10 (91%)	37 (86.0%)	4 (50%)	14 (93.3%)	17 (71%)	70 (90.9%)			
Met CSTE definition ^a	3 (50%)	12 (18%)	9 (30%)	25 (7.3%)	8 (42%)	6 (2.9%)	20 (36%)	43 (7.0%)			
CSTE 1/5 ^b	3 (100%)	6 (50%)	6 (67%)	18 (72.0%)	6 (75%)	1 (16.7%)	15 (75%)	25 (58.1%)			
CSTE 2/1 ^c	0 (0%)	6 (50%)	3 (33%)	7 (28.0%)	2 (25%)	5 (83.3%)	5 (25%)	18 (41.9%)			
Symptoms											
<i>Constitutional</i>	2 (33%)	5 (8%)	4 (13%)	13 (3.8%)	5 (26%)	3 (1.5%)	11 (20%)	21 (3.4%)			
Fever	1 (17%)	1 (2%)	4 (13%)	7 (2.1%)	2 (11%)	0 (0%)	7 (13%)	8 (1.3%)			
Chills	1 (17%)	2 (3%)	0	1 (0.3%)	1 (5%)	0 (0%)	2 (4%)	3 (0.5%)			
Fatigue	0 (0%)	2 (3%)	1 (3%)	8 (2.3%)	2 (11%)	3 (1.5%)	3 (6%)	13 (2.1%)			
Myalgia	1 (17%)	1 (2%)	1 (3%)	1 (0.3%)	3 (16%)	0 (0%)	5 (9%)	2 (0.3%)			
<i>Lower respiratory</i>	2 (33%)	6 (9%)	4 (13%)	15 (4.4%)	4 (21%)	1 (0.5%)	10 (18%)	22 (3.6%)			
Cough	2 (33%)	5 (8%)	3 (10%)	14 (4.1%)	2 (11%)	1 (0.5%)	7 (13%)	20 (3.3%)			
Shortness of breath	0 (0%)	1 (2%)	1 (3%)	1 (0.3%)	3 (16%)	0 (0%)	4 (7%)	2 (0.3%)			
Difficulty breathing	0 (0%)	0 (0%)	0 (0%)	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	1 (0.2%)			
<i>Upper respiratory</i>	2 (33%)	12 (18%)	8 (27%)	25 (7.3%)	3 (16%)	9 (4.4%)	13 (24%)	46 (7.5%)			
Sore throat	0 (0%)	8 (12%)	4 (13%)	11 (3.2%)	2 (11%)	5 (2.4%)	6 (11%)	24 (3.9%)			
Congestion or runny nose	2 (33%)	5 (8%)	7 (23%)	18 (5.3%)	2 (11%)	6 (2.9%)	11 (20%)	29 (4.7%)			
<i>Neurologic</i>	3 (50%)	11 (16%)	6 (20%)	14 (4.1%)	5 (26%)	3 (1.5%)	14 (26%)	28 (4.6%)			
Headache	1 (17%)	11 (16%)	3 (10%)	11 (3.2%)	3 (16%)	3 (1.5%)	7 (13%)	25 (4.1%)			
Loss of taste	1 (17%)	0 (0%)	2 (7%)	2 (0.6%)	0 (0%)	0 (0%)	3 (6%)	2 (0.3%)			

Testing status	Staff		Elementary Students		Middle/High Students		Total	
	Positive (n = 6) No. (%)	Negative (n = 67) No. (%)	Positive (n = 30) No. (%)	Negative (n = 342) No. (%)	Positive (n = 19) No. (%)	Negative (n = 205) No. (%)	Positive (n = 55) No. (%)	Negative (n = 614) No. (%)
Loss of smell	1 (17%)	0 (0%)	2 (7%)	2 (0.6%)	2 (11%)	0 (0%)	5 (9%)	2 (0.3%)
<i>Gastrointestinal</i>	0 (0%)	6 (9%)	1 (3%)	5 (1.5%)	0 (0%)	2 (1.0%)	1 (2%)	13 (2.1%)
Nausea or vomiting	0 (0%)	4 (6%)	0 (0%)	3 (0.9%)	0 (0%)	2 (1.0%)	0 (0%)	9 (1.5%)
Diarrhea	0 (0%)	1 (12%)	1 (3%)	1 (0.3%)	0 (0%)	0 (0%)	1 (2%)	2 (0.3%)
<i>Other symptoms^d</i>	0 (0%)	2 (3%)	0 (0%)	9 (2.6%)	2 (11%)	4 (2.0%)	2 (4%)	15 (2.4%)

^aCouncil of State and Territorial Epidemiologists (CSTE) case definition of symptoms for COVID-19.

^bCSTE1/5: individual reports at least one of cough, shortness of breath, difficulty breathing, loss of smell, and loss of taste.

^cCSTE2/10: individual reports at least two of fever, chills, rigors, myalgia, headache, sore throat, nausea/vomiting, diarrhea, fatigue, congestion/runny nose.

^dOther symptoms includes abdominal pain, ear ache, sneezing, frequent urination, eye pain, "cold" or "flu" symptoms (no specific symptom provided), dizziness, general feeling unwell (no specific symptom provided).