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Test-to-Stay in Kindergarten through 12th Grade Schools after Household Exposure to Severe Acute Respiratory Syndrome Coronavirus 2

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Abstract

BACKGROUND: Test-to-stay (TTS) is a strategy to limit school exclusion following an exposure to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). We evaluated the use of TTS within universally masked kindergarten through 12th grade (K–12) school settings following household SARS-CoV-2 exposure.

METHODS: 322 participants were enrolled. Serial rapid antigen testing was performed up to 15 days post-exposure. Analysis-eligible participants completed the 15-day testing protocol, tested positive any time during the testing window, or received a negative test on or after day 9. Primary outcomes included within-school tertiary attack rate (test positivity among close contacts of positive TTS participants), and school days saved among TTS participants.

RESULTS: 73 of 265 analysis-eligible participants tested positive for SARS-CoV-2 (secondary attack rate of 28% [95% CI: 16–63%]). Among 77 within-school close contacts, 2 were positive (tertiary attack rate = 3% [95% CI: 1–5%]). Participant absences were limited to 338 days, resulting in 82% of 1849 school days saved.

IMPLICATIONS FOR SCHOOL HEALTH POLICY, PRACTICE, AND EQUITY: TTS facilitates continued in-person learning and can greatly reduce the number of missed school days.

CONCLUSIONS: Within universally masked K–12 schools, TTS is a safe alternative to school exclusion following household SARS-CoV-2 exposure.

Keywords

SARS-CoV-2; COVID-19; rapid antigen test; test-to-stay; K–12 school communities

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Since the onset of the coronavirus disease 2019 (COVID-19) pandemic, school exclusion following exposure to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has resulted in millions of missed school days for students and staff across the United States. Given the logistical difficulties of isolating from those within a shared household setting[1] and the high risk of viral transmission between household members,[2] current United States Centers for Disease Control and Prevention (CDC) guidance recommends a longer quarantine following a household SARS-CoV-2 exposure,[3] resulting in an increased length of school exclusion in comparison to those who have had a non-household SARS-CoV-2 exposure. Consequently, those living in crowded, shared, or multigenerational households are disproportionately impacted by prolonged school exclusion following household SARS-CoV-2 exposures.[4] Furthermore, longer periods of school exclusion may exacerbate pre-existing educational disparities by limiting student access to in-person instruction and closing school buildings, due to insufficient numbers of on-campus school staff.

Given the substantial impact of household exposures on missed school days for students and staff, it is critical to identify targeted methods that minimize disruption to in-person education. Test-to-stay (TTS) programs, which offer an alternative to school exclusion by employing serial testing of close contacts over a specified duration of time, have demonstrated effectiveness and safety for those with non-household SARS-CoV-2 exposures in kindergarten through 12th grade (K–12) school communities.[5] Nevertheless, these strategies have not been evaluated in students and staff following household SARS-CoV-2 exposures, which is believed to be a higher risk environment for viral transmission when compared to the non-household setting.[2] The use of TTS following household exposures may offer a targeted, cost- and resource-effective testing method that could allow students and staff to safely remain in school in-person while minimizing the risk of transmission. In this manuscript, we describe the utility of a targeted TTS strategy in minimizing missed school days for K–12 students and staff with household exposures. Our study took place in 4 school districts and 1 charter school in North Carolina (NC), all of which employed universal masking.

METHODS

Study Design and Population

Previously, the ABC Science Collaborative (ABCs) demonstrated that TTS following non-household, within-school exposure to SARS-CoV-2 results in reduced school exclusion and minimized within-school spread of SARS-CoV-2 in the universally-masked K–12 school environment.[5] In January 2022, the ABCs expanded the prospective cohort study in the universally masked setting to include enrollment of household close contacts who would otherwise have to quarantine for a minimum of 10 days following SARS-CoV-2 household exposure.[3] Schools and school districts could opt into this TTS program if they had a universal masking policy in place on January 3, 2022 and received Board of Education and local health department approval. Some districts and schools elected to offer TTS to all eligible household close contacts, while others elected to focus on staff and students who were children of staff as a mechanism to maintain staffing during circulation of the highly transmissible omicron variant.

Individuals from participating schools and districts were eligible for inclusion if they had a household SARS-CoV-2 exposure, were asymptomatic at the time of enrollment, consented to participate in the TTS research protocol via a Research Electronic Data Capture (REDCap)[6,7] e-consent form, and did not meet specific criteria for exemption from quarantine, based on CDC guidance.[8]

Testing Program and Data Collection

Following electronic informed consent and assent, available in English and Spanish, participants were assigned a unique identifier. The protocol required that participants undergo SARS-CoV-2 rapid antigen testing on the day of exposure notification and every other day, up to 15 days after known exposure (e.g., days 0 or 1, and days 3, 5, 7, 9, 11, 13, and 15 following exposure); Figure 1. For household re-exposures, the testing timeline was restarted. Tests scheduled for a weekend were performed the Friday before or Monday after. For simplicity, schools tested on the day of notification and then followed a Monday, Wednesday, Friday testing pattern until 15 days elapsed from the time the household member tested positive. Tests were supplied by the study team (Quidel QuickVue SARS Antigen[9] and Quidel QuickVue At-Home COVID-19 Test[10] [Quidel Corporation, San Diego, CA]) and the state health department (BinaxNOW™ Ag Card [Abbott Diagnostics Scarborough, Inc., Scarborough, ME][11]). Testing occurred in the local school building in all enrolling districts or schools. In instances where the school was informed that testing occurred outside of school, test type was not confirmed and was not documented.

Close contacts were identified via contact tracing programs offered by the NC Department of Health and Human Services (NC DHHS), or by self-report. If enrolled, these participants were tested following an every other day testing pattern for up to 15 days following known exposure. If not enrolled, then these close contacts were required to quarantine following NC DHHS guidelines. Only participants who tested positive or had a negative test on or after day 9 were included in the analysis eligible population. Individuals who had a positive test were required to have a second antigen or PCR test.

A positive SARS-CoV-2 test or the development of symptoms on any day after exposure required isolation according to state public health guidelines. We collected basic demographic information, daily presence or absence of symptoms for 15 days after the last household exposure, test results, school absences, and transmission to other close contacts. We also collected data about school-level mitigation practices using AirTable, a cloud-based database, allowing schools and districts to transfer anonymized data in real time to the Duke Clinical Research Institute (Durham, NC) for analysis. We obtained district-level demographics from the NC Department of Public Instruction[12] database.

Outcome Measures

The primary safety outcome for this study was tertiary attack rate (TAR), defined as the rate of test positivity among within-school close contacts of positive TTS participants. The secondary safety outcome was secondary attack rate (SAR), defined as rate of test positivity among TTS participants. The primary efficacy outcome was days of in-school work and education saved, defined as the number of days a participant could attend in-person work or learning after being notified of a household member who tested positive for SARS-CoV-2.

Definitions

We categorized participant SARS-CoV-2 status as test-positive, presumed-positive, negative, or unknown. Test-positive participants had a positive SARS-CoV-2 test result within 15 days of a known household exposure. Presumed-positive participants were defined as those who developed symptoms and did not report a negative test after development of symptoms. Negative participants were those who did not test positive and had a negative test on or after 9 days following known exposure. Unknown participants did not have a documented test on or after day 9 following their most recent exposure or were lost to follow-up; therefore, unknown participants were excluded from analysis. The day 9 negative test criterion was used because day 9 was the last scheduled testing day that fell within the 10-day quarantine period recommended by the CDC for those with household exposures to SARS-CoV-2.[3]

The analysis-eligible population included those who completed the 15-day testing protocol, test-positive participants, and those who received a negative test on or after day 9. For repeat exposures, each subsequent exposure event was categorized as either: 1) a unique event if the participant's subsequent exposure occurred after completion of the 15-day testing period; or 2) a single, prolonged exposure-event if the repeat exposure occurred within the 15-day testing window. Within-school close contacts were defined as those individuals who spent greater than 15 minutes with a positive TTS participant during which either party was unmasked (positive TTS participant or the contact). We defined school days saved as the number of days a participant was allowed to attend in-person work or education after having a household exposure that would have otherwise been missed due to a required 10 calendar-day quarantine (holidays and weekends were excluded from this count) in the absence of TTS. We calculated missed school days that would have occurred in the absence of TTS according to the number of required days of school exclusion after exposure to a primary case within each participating district.

Statistical Analysis

We used counts and proportions to characterize demographics of the study population, symptom reporting, and cumulative positivity by day. We summarized the proportion of test-positive participants (secondary attack rate) and the proportion of positive in-school close contacts of positive TTS participants (tertiary attack rate). We characterized proportions overall, by student or staff, by school district, and by school level (elementary, middle, high, administration, unknown/multiple levels). To account for the within-school correlation of outcomes, we estimated the 95% confidence interval (CI) for the proportion using a generalized linear mixed model with districts as a random effect. We described school absences due to symptom development versus test positivity using counts and proportions and used proportions to compare the total number of observed absences to those that would have occurred without the TTS protocol. Lastly, we conducted a sub-group analysis to characterize secondary transmission among participants with repeat exposure events. To analyze participants with household re-exposures, we categorized each re-exposure as occurring within the follow-up period or outside of the study follow-up period. We then used descriptive statistics to provide context. We used SAS software, version 9.4 to conduct all statistical analyses (SAS Institute, Inc. Cary, NC).

RESULTS

Study Population

From January 3, 2022 to February 18, 2022, household close contacts from 4 school districts and 1 charter school in NC were eligible for participation. The first test was administered on January 13, 2022, following exposure notification and subsequent consent, and the last test was administered on February 18, 2022. In total, 322 participants were enrolled. The study population was 68% female, 83% White, and 59% students (Table 1). Notably, 16% of enrolled TTS participants reported partial vaccination (Table 1), which is substantially lower than county-level partial vaccination rates for participating districts (range: 63–85%) reported by the CDC during the first week of enrollment (Table 2).[13] The majority of participants (71%) were enrolled from the largest school district that chose to offer enrollment to staff and students who were children of staff to address COVID-related staffing shortages. Demographics of consenting students enrolled in TTS were not representative of students enrolled within each participating district (Supplemental Table 1). Of the 322 participants, 2 participants did not receive testing after enrollment; a total of 1221 tests were performed on 320 TTS participants. A median of 3 (interquartile range [IQR]: 2–5) tests out of the 8 proposed tests were administered per participant. Of the 320 participants who received testing, 265 participants met the criteria for the analysis-eligible population.

Among the 45 analysis-eligible participants who reported symptoms, 24 (53%) tested positive, 14 (31%) tested negative, and 7 (16%) did not receive follow-up testing after developing symptoms (therefore, these 7 were categorized as presumed-positive). Among those who tested positive, the three most reported symptoms were congestion or a runny nose (21%), cough (10%), and/or headache (10%) (Supplemental Table 2).

Tertiary Transmission and Positive Tests among Participants

Two of 77 within-school close contacts of test-positive participants were positive for SARS-CoV-2, resulting in a tertiary attack rate of 3% (95% confidence interval [CI]: 1–5%). Of the 265 analysis-eligible participants, 73 were test-positive, resulting in a secondary attack rate of 28% (CI: 16–63%); Table 3. By day 9, more than 90% of test-positive participants (68/73, 93%) were identified through serial rapid antigen testing (see Supplemental Table 3 for percent positivity by testing day). The median number of days to a positive test was 5 days (IQR: 2–8) after exposure.

In-Person Learning Days Saved

Of the 1849 days that could have been missed, due to school exclusion in the absence of TTS, 1511 (82%) in-person work and school days were saved through enrollment in the TTS study (Table 4). Among the test-positive participants, the median number of work and school days missed was 4 days (range: 0–9; IQR: 3–5). The median number of days missed among those who developed symptoms was 3 days (range: 0–9; IQR: 0–4).

Repeat Exposures Events: Secondary Attack Rate and Time-to-Positivity

There were 23 participants who reported repeat exposures; 13 participants reported second exposure events within the 15-day follow-up period from their initial exposure, and 10 participants reported second exposure events outside of the initial follow-up period. For participants re-exposed within the follow-up period, the secondary attack rate was 15% (2/13); participants tested positive on days 8 and 9 following the initial exposure. For participants re-exposed outside the initial follow-up period, the secondary attack rate was 50% (5/10) with a median of 4 days to positivity (minimum 2, maximum 8).

DISCUSSION

In a universally masked K–12 school setting, a TTS approach following household exposure to SARS-CoV-2 greatly reduced the number of missed school days that would have otherwise been lost to school exclusion. Additionally, among students and staff permitted to remain in school following household exposures, the risk of within-school transmission of SARS-CoV-2 was low, supporting use of a TTS strategy targeting those with household exposures to safely permit ongoing in-person work and learning in universally masked environments. Keeping students and staff safely in school is paramount to ensuring that schools remain staffed, school buildings stay open, and students continue learning.[14]

Given that household exposures to SARS-CoV-2 pose a higher risk for viral transmission than non-household exposures,[1,2] it is unsurprising that that the secondary attack rate among participants within this study was greater than that previously reported among TTS participants following non-household exposures in universally masked settings (28% vs. 1.7%, respectively).[5] The greater observed secondary attack rate in this study could also reflect the transmission dynamics and increased transmissibility of the omicron variant as compared to the delta variant; omicron was the predominant strain during this study.[5] Overall, the secondary attack rate seen here among household close contacts falls on the lower end of the range of reported estimates for the omicron variant (25%[15] to 53%[16]) and is higher than estimates of household secondary attack rate for the delta variant (19%),[17] but our CI estimates (SAR=28%; CI: 16–63%) are compatible with estimates reported in the literature. Three possible explanations for the lower secondary attack rate reported in TTS are: 1) decreased sensitivity of rapid antigen tests in detecting the omicron variant; 2) less shared household time with the index case because participants in TTS were eligible to attend school and work provided they wore a mask, remained asymptomatic, and continued to test negative; and 3) high positive serology during the study period because of high prevalence of omicron in the community, resulting in increased immunity and protection during the study period for those who had household exposures. According to NC COVID-19 infection-induced antibody seroprevalence reported by the CDC before and after the study period, infection-induced seroprevalence increased by nearly 20% between December 21, 2021 (34.5%, 95% CI: 32.1–37.2%) and February 22, 2022 (52%, 95% CI: 48.9–55.2%).[18] When accounting for infection- and vaccination-induced antibody seroprevalence measured through blood samples taken from individuals 16+ years of age and older in central and western NC, a 94.3% seroprevalence was estimated (95% CI: 93.4–95.1%)[19]; data after December 2021 are not yet available. Given these reports[18,19] of high rates of seroprevalence during the study period, it is plausible that the secondary attack rate within this study was likely impacted by elevated rates of prior infection.

Implications for School Health Policy, Practice, and Equity

In this study, we demonstrated that the TTS approach is a suitable alternative to school exclusion for those with household exposures. For students who disproportionately reside in crowded households where quarantine from other household members may be difficult and school exclusions are consequently prolonged, a TTS approach will promote access to in-person education and associated health, learning, nutritional, and social emotional needs.

In addition to promoting access to education, TTS is a more targeted approach than other types of testing, such as screening testing, and enables more efficient use of testing resources. A schedule that limits the number of required tests in TTS after household exposures further promotes feasibility, improves equity, and is supported by our data; 93% of positive household contacts were identified by day 9, suggesting this cut-point as appropriate for future implementation in universally-masked schools (Supplemental Table 3).

School-based testing programs require extensive resources, and school districts with more limited resources could be at a disadvantage. Nevertheless, by demonstrating the benefits of TTS, statewide or nationwide policy change could be enabled, resulting in more accessible and equally distributed resources across school districts in NC. Previously, mask-to-stay became a policy in NC, following data that demonstrated how masking of close contacts was effective in limiting transmission.[20]

Limitations

Our study has several limitations. First, rapid antigen tests have demonstrated reduced sensitivity to the omicron variant[21]; therefore, positivity rates may be under-reported. Despite this limitation, we believe that serial testing helped minimize unidentified positive cases. Second, the true secondary attack rate and tertiary attack rate could be higher than our report if participants who were lost to follow-up developed symptoms, but failed to report them, or if close contacts of positive participants (tertiary contacts) did not enroll in TTS. Third, while our cohort allowed us to evaluate the logistics of a TTS approach following household exposures in varying real-world settings (i.e., different school districts), the demographic breakdown within our study was determined by district guidelines for participant eligibility and participant consent. As a result, our cohort is not representative of the participating districts' populations (Supplemental Table 1). Most likely because of a longstanding history of research misconduct among minorities and persons of color (e.g., Henrietta Lacks, Tuskegee Syphilis Trials, etc.), many populations that have been historically minoritized are hesitant to participate in research studies. We are not surprised by this underrepresentation of minorities and persons of color. By eliciting policy change where TTS is offered as the gold standard and accessible to everyone, we are hopeful that participation will increase, regardless of race or ethnicity. Fourth, not all participants who developed symptoms had a subsequent test; therefore, those presumed positive may be an overestimate of those with symptoms who were truly positive. Finally, while we believe that TTS is a beneficial alternative to quarantine, based on our investigation during the predominance of the omicron variant, the safety of TTS should be reassessed when evaluating variants or pathogens with more severe health effects, higher mortality, or increased transmissibility.

CONCLUSIONS

TTS is a compelling alternative to school exclusion following household exposure to SARS-CoV-2. In this 9-week evaluation of TTS following household exposures in universally masked K–12 school settings, the tertiary attack rate was low and akin to the tertiary attack rate reported when using TTS following non-household exposures in similar (e.g., universally masked) school settings. In total, more than 80% of potentially lost in-person school days were saved using a TTS strategy. Given these promising results, potential next steps could include adopting the TTS strategy following household exposures at the district, state, or national policy level. Such a policy could ensure that all students and staff are able to benefit from this protocol and, in turn, experience the advantages associated with receiving in-person education.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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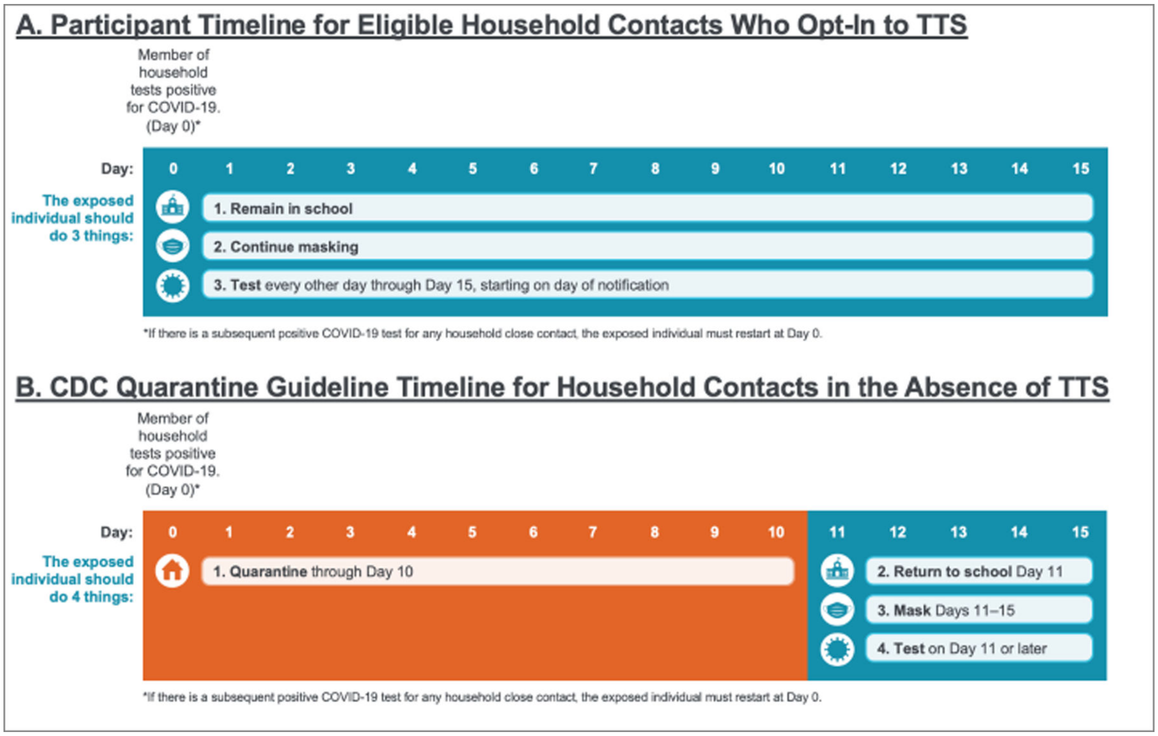

Figure 1. Testing and Masking Timeline

Testing and masking timeline for: A) participants in TTS; compared to B) January 2022 CDC quarantine guidelines in the absence of TTS.

CDC, Centers for Disease Control and Prevention; TTS, test-to-stay

Table 1.

District Size and Participant Demographics

	District Size	Study Population		Students		Male		White		Black		Hispanic, Latino, or Spanish Origin		Vaccinated[c]	
		Enrolled	Analysis Eligible[a]	Enrolled[a]	Analysis eligible[b]	Enrolled[a]	Analysis Eligible[b]	Enrolled[a]	Analysis Eligible[b]	Enrolled[a]	Analysis Eligible[b]	Enrolled[a]	Analysis Eligible[b]	Enrolled[a]	Analysis Eligible[b]
All districts	57143	322	265 (82%)	191 (59%)	159 (60%)	103 (32%)	91 (34%)	267 (83%)	225 (85%)	19 (6%)	13 (5%)	23 (7%)	17 (6%)	51 (16%)	39 (15%)
District A	<10,000	4	4 (100%)	4 (100%)	4 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
District B	30,000–40,000	229	193 (84%)	105 (46%)	93 (48%)	72 (31%)	66 (34%)	191 (83%)	163 (84%)	16 (7%)	13 (7%)	13 (6%)	12 (6%)	49 (21%)	39 (20%)
District C	<10,000	7	1 (14%)	7 (100%)	1 (100%)	1 (14%)	0 (0%)	4 (57%)	1 (100%)	3 (43%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
District D	<10,000	77	65 (84%)	70 (91%)	59 (91%)	29 (38%)	25 (38%)	67 (87%)	59 (91%)	0 (0%)	0 (0%)	10 (13%)	5 (8%)	2 (3%)	0 (0%)
District E	10,000–20,000	5	2 (40%)	5 (100%)	2 (100%)	1 (20%)	0 (0%)	5 (100%)	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Elementary school	-	183	155 (85%)	119 (65%)	104 (67%)	55 (30%)	50 (32%)	144 (79%)	124 (80%)	15 (8%)	11 (7%)	12 (7%)	11 (7%)	26 (14%)	22 (14%)
Middle school	-	74	57 (77%)	49 (66%)	38 (67%)	24 (32%)	21 (37%)	64 (86%)	54 (95%)	3 (4%)	1 (2%)	9 (12%)	5 (9%)	14 (19%)	10 (18%)
High school	-	37	31 (84%)	23 (62%)	17 (55%)	16 (43%)	13 (42%)	32 (86%)	26 (84%)	1 (3%)	1 (3%)	1 (3%)	0 (0%)	3 (8%)	3 (10%)
Administration	-	11	8 (73%)	0 (0%)	0 (0%)	5 (45%)	4 (50%)	10 (91%)	7 (88%)	0 (0%)	0 (0%)	1 (9%)	1 (13%)	3 (27%)	1 (13%)
Unknown/ multiple levels	-	17	14 (82%)	0 (0%)	0 (0%)	3 (18%)	3 (21%)	17 (100%)	14 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (29%)	3 (21%)

[a]Percentages are calculated based on the number of participants enrolled.

[b]Percentages are calculated based on the number of analysis eligible participants.

[c]While the study team collected vaccination rates, the number of doses or "completion of series" was not collected; however, per state guidance, individuals who were "up-to-date" on vaccination, defined by NCDHHS as, "Status of a person who has received all recommended doses of a COVID-19 vaccines, including additional doses and boosters" were not required to quarantine following known exposure. For this reason, we believe our reported vaccination rates are low.

Table 2.

North Carolina District-Level COVID-19 Vaccination Rates Reported by the CDC at the Time of Study Enrollment[a]

District	Percent of Population Receiving 1 Dose (%)	Percent of Population Completing Vaccination Series[b] (%)	Percent of Population (Ages 5+ Years) Completing Vaccination Series[b] (%)	Percent of Population (Ages 12+ Years) Completing Vaccination Series[b] (%)	Percent of Population (Ages 18+ Years) Completing Vaccination Series[b] (%)
District A	85.3	60.1	64.3	69	70.1
District B	66.4	49.9	53.2	58.3	60.6
District C	63	48.8	51.3	54.8	56.4
District D	69.6	53.4	55.3	56.7	57.3
District E	72.4	52.9	56	60.5	62.5

CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus 2019

[a]First participant was consented on January 13, 2022; data here reflect vaccination rates from the CDC database at this time

[b]Per CDC data dictionary,[13] “Series complete” is defined as the “percent of people who are fully vaccinated (have second dose of a two-dose vaccine or one dose of a single-dose vaccine) based on the jurisdiction and county where recipient lives.”

Table 3.

Secondary and Tertiary Transmission among Household Close Contacts

	Total Exposure Events	Secondary Transmission			Tertiary Transmission			
	Analysis Eligible*	Total Participants with Positive COVID-19 Test following Household Exposure[a]	Total Participants Considered Positive[b] following Household Exposure	Days to test positivity following household exposure[a], Median (Q1, Q3)	Total Participants with Positive COVID-19 Test following Household Exposure who Reported Close Contacts[a]	Total Participants with Positive COVID-19 Test following Household Exposure who Reported Close Contacts = 0[a]	Total Number of Close Contacts who were Positive/Total Number of Close Contacts (%)	Total Number of Close Contacts who were Positive in TTS/ Total Number of Close Contacts in TTS (%)
All districts, N (%) 95% CI	265	73/265 (28%) (16%−63%)	80/265 (30%) (19%−58%)	5 (2, 8)	71/73 (97%)	52/71 (73%)	2/77 (3%) (1%−5%)	0/7 (0%)
District A	4	3/4 (75%)	3/4 (75%)	6 (5, 6)	3/3 (100%)	3/3 (100%)	0/0 (0%)	0/0 (0%)
District B	193	47/193 (24%)	52/193 (27%)	5 (2, 7)	47/47 (100%)	43/47 (91%)	0/4 (0%)	0/4 (0%)
District C	1	1/1 (100%)	1/1 (100%)	0 (0, 0)	1/1 (100%)	0/1 (0%)	0/15 (0%)	0/0 (0%)
District D	65	21/65 (32%)	23/65 (35%)	4 (2, 9)	20/21 (95%)	6/20 (30%)	2/58 (3%)	0/3 (0%)
District E	2	1/2 (50%)	1/2 (50%)	2 (2, 2)	0/1 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)
Elementary school	155	47/155 (30%)	51/155 (33%)	5 (2, 8)	46/47 (98%)	34/46 (74%)	1/48 (2%)	0/5 (0%)
Middle school	57	14/57 (25%)	16/57 (28%)	4 (2, 7)	14/14 (100%)	8/14 (57%)	1/27 (4%)	0/2 (0%)
High school	31	5/31 (16%)	6/31 (19%)	7 (7, 8)	4/5 (80%)	4/4 (100%)	0/0 (0%)	0/0 (0%)
Administration	8	3/8 (38%)	3/8 (38%)	7 (1, 8)	3/3 (100%)	3/3 (100%)	0/0 (0%)	0/0 (0%)
Unknown/multiple levels	14	4/14 (29%)	4/14 (29%)	3 (2, 6)	4/4 (100%)	3/4 (75%)	0/2 (0%)	0/0 (0%)

Table 4.

In-Person School Days Saved among Enrolled Household Close Contacts

	Total Participants with Positive COVID-19 Test or Symptoms following Household Exposure	Total Participants with Positive COVID-19 Test following Household Exposure	Number of School/ Work Days Missed Due to Positive COVID-19 Test after Household Exposure, N[a], median (min, Q1, Q3, max)	Total Participants with Symptoms following Household Exposure	Number of School/ Work Days Missed due to Symptoms after Household Exposure, N[a], median (min, Q1, Q3, max)	Total Number of Participants Who were Considered Positive[b] following Household Exposure	Total School Days Saved/ Total School Days Potentially Missed per Household Quarantine Policy	Total Work Days Saved/ Total Work Days Potentially Missed per Household Quarantine Policy
All districts, N (%) 95% CI	108	73/320 (23%) (15.7%−34.4%)	73, 4 (0, 3, 5, 9)	59/320 (18%) (12.2%−28.1%)	59, 3 (0, 0, 4, 9)	93/320 (29%) (22.5%−36.6%)	918/1125 (82%)	593/724 (82%)
District A	3	3/4 (75%)	3, 4 (4, 4, 4, 4)	2/4 (50%)	2, 4 (4, 4, 4, 4)	3/4 (75%)	5/17 (29%)	0/0(0%)
District B	72	47/227 (21%)	47, 4 (1, 3, 5, 5)	38/227 (17%)	38, 2 (0, 0, 4, 5)	63/227 (28%)	568/660 (86%)	556/673 (83%)
District C	2	1/7 (14%)	1, 5 (5, 5, 5, 5)	1/7 (14%)	1, 8 (8, 8, 8, 8)	1/7 (14%)	38/51 (75%)	0/0(0%)
District D	30	21/77 (27%)	21, 4 (0, 2, 4, 9)	18/77 (23%)	18, 3 (0, 1, 4, 9)	25/77 (32%)	283/368 (77%)	37/51 (73%)
District E	1	1/5 (20%)	1, 5 (5, 5, 5, 5)	0/5(0%)		1/5 (20%)	24/29 (83%)	0/0(0%)
Elementary school	70	47/182 (26%)	47, 4 (0, 3, 5, 5)	38/182 (21%)	38, 3 (0, 0, 4, 8)	58/182 (32%)	500/659 (76%)	309/369 (84%)
Middle school	21	14/73 (19%)	14, 4 (0, 4, 5, 5)	13/73 (18%)	13, 2 (0, 0, 3, 5)	19/73 (26%)	279/312 (89%)	100/127 (79%)
High school	6	5/37 (14%)	5, 4 (3, 4, 5, 8)	3/37 (8%)	3, 4 (0, 0, 8, 8)	6/37 (16%)	139/154 (90%)	72/81 (89%)
Administration	6	3/11 (27%)	3, 3 (2, 2, 4, 4)	3/11 (27%)	3, 1 (0, 0, 4, 4)	5/11 (45%)	0/0(0%)	34/48 (71%)
Unknown/multiple levels	5	4/17 (24%)	4, 3 (2, 2, 6, 9)	2/17 (12%)	2, 7 (5, 5, 9, 9)	5/17 (29%)	0/0(0%)	78/99 (79%)

CI, confidence interval; COVID-19, coronavirus 2019; Q1, quarter 1; Q3, quarter 3

[a]N = number of participants who reported missed days

[b]Total participants considered positive is the sum of the number of participants who received test confirmation of COVID-19 infection and the number of participants presumed positive (developed symptoms but did not received/report a negative test after development of symptoms)