Evaluation of a COVID-19 Rapid Antigen Testing Program in a Supervised Community Distance Learning Setting for K-8 Students

RYAN C. LEE, B Aa DANIEL W. SOTO, MPHb SOHINI DEVA, MPHc MARISOL Macedo, MPHd KUSH SHANKER, BS6 ANNA RODRIGUEZ, MPHf DANYAH ALHAJRI, MPHg JENNIFER B. UNGER, PhDh

ABSTRACT

BACKGROUND: School-based COVID-19 testing is a potential strategy to limit COVID-19 transmission among youth in congregate settings such as schools, sports programs, and summer camps. The purpose of this study is to evaluate the feasibility and effectiveness of frequent rapid antigen testing at a supervised distance-learning setting for elementary and middle school children while their schools were closed.

METHODS: This evaluation examines participation rates and testing data in addition to qualitative analysis of focus groups from a Los Angeles City-sponsored rapid antigen testing pilot program. In total, 434 children and staff were enrolled in the 13-week pilot program in the spring of 2021.

RESULTS: In this pilot program, 2482 rapid antigen tests were administered, resulting in 3 positive test results, 1 of which was a false positive (confirmed by polymerase chain reaction testing) and 0 outbreaks or community spread.

CONCLUSIONS: Throughout this pilot program, implementing rapid antigen tests allowed for the quick identification and isolation of potentially COVID-19-positive children, improved perceived safety for parents and staff who interact with children, and demonstrated the ability for staff and non-health care professionals in a school-based setting to implement a widespread COVID-19 screening program with minimal training.

Keywords: COVID-19 screening; rapid antigen tests; school-based testing.

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During spring 2020, many kindergarten through grade 12 (K-12) schools closed and transitioned to remote learning to reduce school-associated transmission rates of SARS-CoV-2 (COVID-19). Nationwide closures of K-12 schools have separated nearly 60 million students from vital educational and health resources, disproportionately affecting students from low-income households who rely on schools for physical, nutritional, and mental health services. Before the pandemic, schools serving a large number of children from low-income households already had fewer resources compared to other public schools. As schools closed due to the pandemic, many low-income children faced greater obstacles transitioning to distance learning, thus exacerbating social inequalities in educational achievement. Continuing in-person education for K-12 students is key to addressing the achievement gap and ensuring students have access to educational and health services provided at schools.

As schools resume in-person learning, many school districts across the United States have adopted COVID-19 testing in conjunction with public health safety measures, such as mandatory masking and self-quarantine procedures, among students and staff as
a strategy for safely reopening schools. Testing is a useful surveillance tool in schools to identify and confirm COVID-19 status among students and staff members to ensure that those who test positive will not infect others and minimize outbreaks in schools. Additionally, the Centers for Disease Control and Prevention has recommended screening testing for K-12 schools as an important preventative measure for keeping a safe environment.

While polymerase chain reaction (PCR) tests are considered the “gold standard” for COVID-19 tests, rapid antigen tests are an important tool for COVID-19 testing and may be ideal for screening school-aged children. Rapid antigen tests are affordable, easy to administer, and provide results within 15-20 minutes, allowing for more frequent testing and the immediate identification and surveillance of positive cases. While previous studies have found rapid antigen tests to be effective at identifying COVID-19 in children with viral load levels likely to be infectious, few studies have evaluated the acceptability, feasibility, and effectiveness of rapid antigen tests in school-based settings. Additionally, few studies have evaluated the role of rapid antigen tests in settings where students congregate when schools are closed, including supervised programs where students can do online schoolwork in a group setting. Understanding the barriers and facilitators to implement COVID-19 rapid tests in schools and school-based programs is key to the safety and health of students in this and future pandemics. In this study, we evaluated the feasibility and effectiveness of frequent rapid antigen testing at a supervised community distance learning setting for K-8 students.

METHODS

This study used a mixed-methods approach to evaluate a COVID-19 rapid antigen testing program among school-aged children in Los Angeles, California in the spring of 2021, when public schools were closed due to COVID-19. We evaluated testing participation rates and acceptability of the city-sponsored pilot testing program through qualitative focus groups with staff. This study was coordinated by the City of Los Angeles and the University of Southern California. The Los Angeles County Institutional Review Board approved the study.

Pilot Program Setting

In response to the continuation of distance learning, the City of Los Angeles Department of Recreation and Parks (RAP) launched the “Safer at Parks” program to provide elementary and middle school students with internet access and a secure, supervised environment to facilitate distance learning. The Safer at Parks program took place at Alternative Learning Centers (ALCs) at 60 Recreation Centers across the City of Los Angeles. Each ALC maintained a capacity of 24 students to ensure physical distancing. The ALCs implemented safety measures such as temperature checks, face coverings, frequent handwashing, and rotation to outdoor spaces. The city-sponsored rapid antigen testing pilot program randomized the 60 ALCs into 3 groups: once/week testing, twice/week testing, and no testing. The pilot testing program lasted 13 weeks between the months of February to May 2021.

Participants

Children participating in the testing pilot program were recruited from the enrolled children at the 40 ALCs participating in testing. Parents at these sites were notified of the testing program via email and by staff as parents dropped off and picked up their children. Parents signed an online or paper consent form for their child to be tested. Participants were also allowed to enroll into the testing program at any point during the duration of the Safer at Parks program. Children with parental consent were tested on Mondays at the once/week sites and Mondays and Thursdays at the twice/week sites.

Rapid Antigen Tests Administration Procedure

Abbott BinaxNOW rapid antigen tests were administered by the program staff at the ALC. BinaxNOW COVID-19 Ag Card is a diagnostic lateral flow...
immunoassay that does not require any instrumentation to test a specimen for COVID-19 and instead determines a COVID-19 negative or positive result using a test card. The BinaxNOW COVID-19 Ag Card detects nucleocapsid protein antigens from SARS-CoV-2 in direct anterior nasal swabs. This testing program operated under the CLIA Certificate of Waiver from a private laboratory, Harmony Health.

The testing staff attended training sessions to ensure understanding of the protocol requirements and testing procedures for administering the BinaxNOW COVID-19 Ag Card. Each staff member designated to administer testing was required to administer 2 supervised rapid antigen tests before testing study participants.

On testing days, staff sanitized the ALC, gathered testing materials and personal protective equipment (PPE), and performed temperature checks, health screenings, and rapid antigen tests on children whose parents provided consent. Once the nasal swab was taken, the students were directed to a supervised, outdoor waiting area for 15 minutes. Students were asked to maintain physical distancing until their test results were ready. Once the rapid antigen test indicated a negative result, the student was allowed to join the cohort inside. In the case of a positive test result, students were placed into a quarantine area until the parent/guardian was contacted and the child picked up. Children who tested positive were also offered a confirmatory PCR test or asked to go get a PCR test elsewhere. The children in the cohort with the positive test result were asked to quarantine at home for 10 days, according to the Los Angeles County Department of Public Health guidelines at the time. In the case that the confirmatory PCR test came back negative, cohorts were allowed to come back to the ALC as soon as the negative test result was confirmed. All test results were entered into a secure online database provided by Harmony Health. Harmony Health also reported all positive cases to the Los Angeles County Department of Public Health.

Qualitative Focus Group Participants and Data Collection Procedures

After the end of the 13-week pilot, we collected qualitative data from the testing staff who administered the testing. We conducted 4 focus groups (total N = 41) via Zoom in April 2021. Participants signed an electronic informed consent via REDCap prior to the focus group. Focus groups lasted approximately 45-60 minutes. Participants received a $20 online gift card after the Zoom session. Focus group facilitators received qualitative focus group training from a qualitative methods expert. The interviews and focus groups were conducted with a structured interview guide (Appendix 1).

Data Analysis

The focus groups and key informant interviews were recorded in Zoom, which automatically produces a transcript. The facilitator and notetaker reviewed the transcripts to correct transcription errors. We then analyzed the transcripts qualitatively using a grounded theory approach, in which common themes emerge organically from the data rather than imposing an a priori theoretical framework on the data. Trained coders reviewed the transcripts and identified recurring themes. The team of coders and investigators reviewed and condensed the initial set of themes into a final list of themes that was then used by all coders. Two different staff members coded each statement in the transcripts into 1 or more themes. These themes were then described qualitatively, including representative quotes to illustrate the themes.

RESULTS

Rapid Antigen Testing Allowed for Quick Detection and Isolation of Potentially Infectious Individuals

Over the 13-week pilot project, a total of 434 participants (45% of the total Safer at Parks Program capacity) were enrolled in the testing program across the 40 testing ALCs and 2482 rapid antigen tests were administered. Participant demographics are shown in Table 1. Of the 2482 rapid antigen tests administered, we detected 3 positive test results. The first positive rapid antigen test result was confirmed with a PCR test and the parent/guardian was notified to keep their child home for 14 days. The second positive test result was confirmed to be a false positive by 2 subsequent negative PCR tests and the child was allowed to return to the “Safer at Parks” program before the mandatory 14-day quarantine was up. The third positive test result was not confirmed by a PCR test result, but the child was quarantined at home for 14 days before returning to the program. Despite 3 positive rapid antigen test results, there were no outbreaks or instances of transmission of COVID-19 at any of the participating sites during the duration of the pilot program.

Table 1. Participant Demographics

| Race/Ethnicity | Total (n = 434) | Percentage |
|----------------|----------------|------------|
| Asian          | 9              | 2          |
| Black          | 65             | 15         |
| Hispanic       | 282            | 65         |
| Other          | 35             | 7          |
| White          | 43             | 10         |

Sex

| Gender     | Total (n = 434) | Percentage |
|------------|----------------|------------|
| Male       | 260            | 60         |
| Female     | 169            | 39         |
| Other      | 5              | 1          |

Table 1. Participant Demographics

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Rapid Antigen Testing Had Low Participation Rates

During this pilot program, testing rate steadily decreased across sites. In the first week of testing, of the 434 participants enrolled 65% \((n = 282)\) were tested. By the last week of testing, only 15% \((n = 65)\) of participants enrolled were tested (Figure 1). This decline in participation may be partially attributed to a decline in interest by parents because infection rates decreased after the winter surge. In week 5, there was a significant decrease in testing because the testing day occurred on Cesar Chavez Day, during which all sites were closed. Some sites decided to test later in the week while other sites did not, resulting in a low-testing rate during week 5.

Rapid Antigen Testing Improved Perceived Safety

In addition to implementing a COVID-19 rapid antigen testing program at the “Safer at Parks” program, we also administered focus groups with the testing staff to qualitatively evaluate the perceived efficacy of testing as well as better understand the facilitators and barriers to screening children for COVID-19. In general, staff members administering the test reported rapid antigen testing improved their perceived safety for being around and interacting with the students.

In general I liked the testing because it allowed us to know the COVID status quickly.

For me, I do think it’s useful because it gives us a bit more sense of security when having the kids come in versus not doing anything at all.

I think it’s a pretty good system to open up schools for both parents and students, so that they can feel more comfortable.

It was a very good thing for the students, parents, and staff because we would know the results within 15 minutes.

Rapid Antigen COVID-19 Tests Are Easy, Safe, and Convenient to Administer

In this pilot program, testing staff were able to quickly complete trainings and launch a successful COVID-19 rapid antigen testing screening program in a field setting. Testing staff completed an online, hands-on training to learn how to administer rapid antigen tests and practiced administering the tests under the supervision of the trainer. Additionally, the rapid antigen testing pilot program was seamlessly added to the ALCs existing safety check-in protocols. The testing staff reported that administering the rapid antigen tests on site was quick and convenient.

I was always surprised at how fast it was and how quick and effective it was to get the test and then wait for 15 minutes. It was really cool knowing that this could be a step into the right direction of getting everything back to normal.

I think the testing was very convenient. I personally had no issues with the testing. Really straightforward in terms of instructions and would only take about a minute or so.

The antigen testing is pretty smooth, it’s pretty quick like they said, and it was pretty easy.
Most staff members felt generally safe when administering rapid antigen tests. The staff believed that the precautions they followed, including putting on PPE, practicing physical distancing, and being vaccinated, all helped them feel sufficiently protected while administering tests.

It felt pretty safe with the PPE that we have, and also being vaccinated.

I felt completely safe. I had the shield, mask, and gloves.

I felt safe and fully covered up with all the PPE.

Parent Hesitancy and Concern over Low Participation

According to staff members, the lack of knowledge and misconceptions about rapid antigen testing among parents were some of the barriers to high participation rates. They claimed that the parents were overprotective and unwilling to allow their kids to take the test.

I feel a big part of why some parents are hesitant is because they do not know enough. They just see people sticking things into their kids’ noses.

One hiccup I had was some of the parents were very protective and worried. It may have been the “deep” nasal swab. So I had to tell them it wasn’t the deep one. After experiencing the test for the first time it was fine.

A lot of parents are more hesitant signing off on their kids for testing because they think [it is] the one where they go all the way (the deep nasal testing), when in reality it’s just the shallow nasal. Still a lot of people don’t have a clear idea of how it’s done.

Due to low participation rates, some staff questioned the efficacy and need for a testing program because students who were not tested could still transmit COVID-19. They believed that implementing testing in schools could be challenging unless it becomes mandatory because all effort and other tests will be wasted if untested students were positive.

In terms of implementing this into schools, it is kind of pointless unless you make it mandatory. If one kid doesn’t do the test and is positive, it defeats the purpose.

I feel the best way to get the most out of the rapid antigen testing would be to make it mandatory.

They’re pretty effective but, as mentioned before, I think it’s only effective if everyone does it.

Rapid Antigen Testing May Be Difficult to Scale up

While this rapid antigen testing pilot program was successful in the training of staff, implementation of tests, and rapid detection and isolation of children with COVID-19, some staff felt it may be difficult to scale up and implement a testing screening program for all students at schools. Some staff felt overwhelmed by the check-in/testing process when many children arrived at the same time.

We had very few kids at my site so it was fine and went well, but if we had lots of kids, I can see it being overwhelming.

I agree, I am by myself doing the tests. So it can be overwhelming when multiple kids showed up and I had impatient parents.

Testing can get crazy when there are a lot of kids at one time. I sometimes struggled to match the timer of the test.

There was a time when I had six of them (children) come and that’s when I felt a little overwhelmed.

DISCUSSION

In this study, we evaluated a COVID-19 rapid antigen testing screening program at the Los Angeles Department of RAP ALCs. In total, 434 school children were tested over a 13-week-long period from February to May 2021. We examined the feasibility and acceptability of this testing pilot program through testing data and participation rates as well as qualitative focus groups with the testing staff.

During the duration of the evaluation period, we detected 3 positive test results (1 of which was a false positive). Despite these positive cases, there were no outbreaks or instances of transmission at any participating site. While the number of detected positive cases was low, the lack of COVID-19 outbreaks at the ALCs is still notable. These findings highlight that rapid antigen testing screening for COVID-19 in school-based settings can help quickly identify positive cases and isolate individuals to limit the spread of COVID-19 among school-aged children while safely continuing to resume in-person learning. Additionally, the detection of 1 false-positive affirms the importance of confirmatory PCR tests when there is a positive rapid antigen test result during large-scale screening.

As part of our evaluation, we conducted qualitative focus groups with the testing staff to better understand the perceived efficacy and acceptability of rapid antigen testing for school-aged children. We found widespread support for rapid antigen testing as a means to improve perceived safety for both parents and the adult staff who interact with the students. Logistically, setting up widespread COVID-19 screening at schools is not easy. Therefore, community “buy-in” is important. As such, making sure parents and staff feel an improved sense of safety through testing may be a facilitator to the success of future testing programs.
Despite schools already reopening for the 2021-2022 school year, the rise of cases due to the Delta and Omicron variants has led to a renewed interest in COVID-19 testing for students. Our evaluation of the rapid antigen testing pilot demonstrated a streamlined approach to training staff with no prior experience in COVID-19 testing. In focus groups, the testing staff reported the ease and safety in which rapid antigen tests can be learned and administered to school-aged children. Additionally, staff reported little to no difficulties with administering these shallow nasal swabs, despite the common perception that nasal swabs would be difficult for school children.

One challenge with implementing widespread COVID-19 screening is the logistics and difficulty to scale up and test large quantities of students. This is important to note because most schools have more children than the testing sites in this pilot program. Staff noted feeling overwhelmed when multiple students arrived for testing at the same time when they were testing by themselves. One approach that may help mitigate this challenge when testing more students in a school setting is to train more staff and teachers on how to administer rapid antigen tests, especially given the ease in which non-medical professionals can be trained to administer these tests.

Another challenge we encountered during the pilot program was low participation rates and parent “buy-in.” Since testing at our program was elective, the city could not mandate testing for all children at the ALCs. In the first week of testing, 65% of participants were tested. By the last week of testing, only 15% of participants enrolled in this study were tested. This decline in participation may be partially attributed to a decline in interest by parents because infection rates decreased after the winter surge. Additionally, some schools did reopen in Los Angeles County toward the end of the evaluation period, leading to decreased attendance at “Safer at Parks” program. The low participation rates for testing also may be addressed in schools through a school or district-wide testing mandate for in-person learning.

Limitations

It is important to take the findings of this paper within the context of the state of COVID-19 in Los Angeles at the time of the study. At the onset of testing (February 23), the prevalence of COVID-19 in the City of Los Angeles was approximately 16.5 new positive cases in 100,000 people.9 Prevalence of COVID-19 in Los Angeles at the end of the study (May 25) was 1.8 new positive cases in 100,000 people.10 During this time, COVID-19 cases decreased significantly, leading to low community prevalence.

Conclusions

This study evaluated the feasibility and effectiveness of frequent rapid antigen testing at a supervised community distance learning setting for K-8 students. While there are certain limitations with rapid antigen testing in school-based settings, such as logistical barriers and community “buy-in,” this study highlights some of the key benefits of these tests to maintain the safety of children during in-person learning. In this pilot program, rapid antigen tests allowed for the quick identification and isolation of potentially COVID-19-positive children, improved perceived safety for parents and staff who interact with children daily, and demonstrated the ability for staff and non-health care professionals in a school-based setting to implement a widespread COVID-19 screening program with minimal training. Further study is needed to test and evaluate a larger scale COVID-19 screening program with rapid antigen tests at an in-person school to better understand the efficacy and acceptability, as well as facilitators and barriers to scaling up testing at a school setting to keep schools and children safe.

IMPLICATIONS FOR SCHOOL HEALTH

This paper expands on the understanding of the feasibility and efficacy of implementing a COVID-19 rapid antigen testing screening program at a school-based setting. Our findings demonstrate that rapid antigen tests can quickly identify and isolate COVID-19-positive children, and that staff can implement a COVID-19 rapid antigen testing screening program with minimal training. As new COVID-19 variants such as Delta and Omicron arise, continuing in-person education for K-12 students is key to youth development and addressing academic inequalities caused by remote learning. As such, it is critical that schools have an in-depth knowledge of the feasibility and efficacy of implementing a COVID-19 rapid antigen testing screening program to ensure the safety of students, staff, administration, and families.

Human Subjects Approval Statement

The Los Angeles County Public Health, Ambulatory Care Network, and Health Services Administration Institutional Review Board approved the study (IRB Project No. 2020-10-903).

Conflict of Interest

The authors declare no conflict of interest.

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**Appendix. Focus Group Guide Questions**

- How convenient was administering the rapid antigen tests? How could we make it more convenient?
- How safe did you feel? Did you feel comfortable testing kids? Why or why not? Did you want more PPE? What kind? What would make you feel safer?
- Did testing cause you any problems?
- Did you feel you got enough training? (If no, what other training would you want?)
- How much did this interfere with your other duties?
- Would you administer rapid antigen tests in the future? Or do you want someone else to do it in the future?
- What did not you like about the process? What would you change?
- After doing this, do you feel that rapid antigen tests are a useful tool to reopen schools? Or do you feel it is not worth it?