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BRIEF REPORT

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Coronavirus disease 2019 prevalence rates in reopened private schools in New York City: Impact of diagnostic methods

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Schools in New York City (NYC) closed in March 2020 to minimise the Coronavirus disease 2019 (COVID-19) outbreak; however, the role of children in disease transmission in the community is unclear. In the present study, the COVID-19 prevalence rates in nine private schools in NYC (Brooklyn and Queens) during the re-opening school phase (Fall 2020, Winter 2021) were determined. The results were analysed in relation to the COVID-19 diagnostic methods used.

New York City public schools reopened 1 October 2020; the rate of infection in the community was 0.28%.[1] The public schools were then closed again on 18 November 2020 when the seven-day rolling average test positivity rate in the community increased to 3%.[1] On 7 December 2020, NYC public elementary schools began a phased re-opening of in-person learning and mandatory random weekly tested was instituted; the positivity rate in the community was 5.48%.[2] By 25 February 2021, NYC public middle schools reopened in-person school learning according to the Centers for Disease Control and Prevention (CDC) operational strategy (K-12 schools) through phased mitigation.[3]

The testing initiative was organised by the NYC Health and Hospitals Corporation, the NYC Department of Health and Mental Hygiene (DOHMH), and the NYC Test & Trace Corps.[4] However, no specific recommendations or guidance about type of test that should be used was provided by the NYC DOHMH or New York State Department of Health.[4] There are two types of commercially available diagnostic tests that are used to detect COVID-19: RT-PCR that detects the virus's genetic material and antigen tests that detect specific viral proteins. RT-PCR is considered the gold-standard diagnostic method detection for SARS-CoV-2 in upper and lower respiratory specimens[5]; antigen tests are less sensitive and specific than RT-PCR assays.[5]

However, because of the low prevalence of infection in these settings, even more sensitive tests like the RT-PCR may have false-positive results due to low positive predictive values (PPV).[6] Although testing has been mandated,[4] the type of test to be used has not, leading to heterogeneity of methods making the comparison of results from different schools difficult. Clinical data on the performance of these tests are limited; most of the approvals have been based on analytical, not clinical, evaluations.[6]

COVID-19 testing data were collected from nine private schools that reopened in red, orange and yellow microcluster zones.[7] Data were collected from either school principals/administrators using deidentified data or from the COVID-19 Report Card website https://schoolcovidreportcard.health.ny.gov/#/home. Neighbourhoods where the schools were located included Brooklyn: Yellow Zone: Gravesend/Sheepshead Bay, Brooklyn Heights; Orange Zone: Kensington, Borough Park; Red Zone: Homecrest and Queens, Yellow Zone: Fresh Meadows.[7] After obtaining signed parental consent, tests for COVID-19 were administered during October, November, December 2020, January, and February 2021. Nasopharyngeal (NP) samples were collected from subjects. Samples were transferred to five different commercial laboratories in viral transport medium as recommended. Testing for SARS-CoV-2 was conducted using RT-PCR or antigen tests (Table 1). Test results were provided via text message within 48–72 hours. A COVID-19 case was defined as a positive SARS-CoV-2 RT-PCR or antigen test result.

The average prevalence rate of nine schools was 0.83%. Total number of RT-PCR tests performed was 7816 with 30 (0.38%) positive test results. Total number of antigen tests performed was 2478 with 9 (0.36%) positive results. In a generalised linear model, adjusted test positivity rates (controlling for within-school gender distribution, community prevalence [red/orange/yellow zone] and size of school) were estimated at PCR: 0.361% (95% CI [0.187, 0.699]) and antigen tests: 0.123% (95% CI [0.031, 0.492]). A likelihood ratio test difference between these rates was not significant ($p = 0.119$).

TABLE 1 COVID-19 prevalence rates and detection assays in private schools in New York City

School Number/Zone Colour/ Months tested	Gender/Ages (years)	Number of COVID-19 tests administered	Number of positive COVID-19 tests	Prevalence (%)	Assay
1/Red Oct, Nov, Dec 2020, Jan, Feb 2021	Female 6–18	2757	4	0.14	iAMP Real-Time PCR (Atila Bio Systems)
2/Orange Oct, Nov 2020	Female 6–18	800	8	1.0	Abbott Real-Time PCR (Abbott Molecular Inc.)
3/Yellow Nov 2020	Female 5–18	434	6	1.3	Sophia 2 SARS Antigen FIA (Quidel)
4/Orange Oct, Nov 2020	Male 5–18	258	12	4.6	Cobas SARS-CoV-2 Real-Time RT-PCR (Roche Diagnostics)
5/Orange Nov 2020	Male 5–14	1405	3	0.21	CareStart COVID19 Antigen Rapid POC Test (AccessBio)
6/Yellow Oct, Nov 2020	Male 5–14	639	0	0	Sophia 2 SARS Antigen FIA (Quidel)
7/Orange Nov 2020	Male 5–14	36	0	0	CDC 2019 n-CoV Real-Time RT PCR (CDC)
8/Yellow Sept 2020, Dec 2020, February 2021	Females and Males 5–14	2204	3	0.13	SARS-CoV-2 real-time RT PCR (Perkin Elmer)
9/Orange Oct, Nov 2020	Males 6–14	1761	3	0.17	(1) CDC 2019 n-CoV Real-Time RT PCR (CDC) or (2) SARS-CoV-2 real-time RT PCR (Perkin Elmer)

Percent positive community case rates in the corresponding microcluster areas (21–27 February 2021) (molecular testing) were as following: Brooklyn: 11.79% (Red Zone, Homecrest), 6.19% (Orange Zone, Kensington), 10.8% (Orange Zone, Borough Park) and 4.2% (Yellow Zone, Brooklyn Heights), and in Queens: 6.9% (Yellow Zone, Fresh Meadows).[4] The positivity rates in the community were higher than the rates reported in the schools located in the corresponding community.

The results of this study demonstrated that COVID-19 infection rates in these selected private schools were low compared with community rates, suggesting that children might have a limited role in virus transmission in these communities. However, the heterogeneity of tests used made it difficult to compare data from different schools. To maintain a safe environment and prevent the spread of infection in schools, guidance should include consistent and specific instructions on which tests should be used for COVID-19 screening. Tests should be selected based on affordability and reliable evidence including the performance in school settings.

Lower positive prevalence rates were observed in schools that used antigen tests compared with schools that used RT-PCR for screening. The NYC DOHMH has not specified one uniform test for COVID-19 screening in schools.[4] To meet the diagnostic needs, the US Food and Drug Administration (FDA) granted Emergency Use Authorizations (EUA) to 32 commercial SARS-CoV-2 tests based on analytical validations in the absence of clinical data.

Mostafa, et al[8] compared the analytical sensitivity of seven commonly used commercial SARS-CoV-2 automated molecular assays, the Abbott, Roche and Cepheid Xpert Xpress assays were found to be most sensitive.[8] Sensitivities may also differ depending on the stage of infection. Small differences in test sensitivity may not be apparent when SARS-CoV-2 RNA levels are high, during the early stages of infection. Timing of collection, time after symptom onset, and different populations (hospital versus outpatient) are all important factors to consider for optimal diagnostic sensitivity. There is a need for development of more sensitive and specific tests to minimise false-negative results.

The Centers for Disease Control and Prevention (CDC),[5] the American Academy of Pediatrics (AAP) and state health departments[4] have given schools little guidance regarding in-school testing. The CDC did not initially recommend COVID-19 screening test in schools due to constraints on testing capacity and no 'real-world' studies that demonstrated effectiveness of testing. The new CDC guidelines recommend that schools may offer voluntary testing and should be guided by what is feasible, practical and acceptable.[9] However, COVID-19 testing in schools may also present challenges including disparities in access, lag time in receiving test results and implementing recommended responses to positive COVID-19 test results (ie, arranging quarantines and setting up remote learning), while schools redefine their opening plans. As new variants of SARS-CoV-2 are identified, it is possible that mutations can suppress diagnostic detection and compromise accurate disease tracking; diagnostic COVID-19 tests used for screening in schools and communities should be reconfigured on a regular basis.

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

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