

1 **Utility of a Test to Return Strategy to Identify Individuals with COVID-19 in the Pre-Kindergarten through Grade**  
2 **12 School Setting – District of Columbia, January 2022**

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19 **Running title: Utility of “Test to Return” to Identify COVID-19 in Schools**

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1 **Abstract:** The highly transmissible SARS-CoV-2 Omicron variant led to increased hospitalizations, staffing  
2 shortages, and increased school closures. To reduce spread in school-aged children during the Omicron peak, the  
3 District of Columbia implemented a test-to-return strategy in public and public charter schools after a two-week  
4 break from in-person learning.

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6 Key words: K-12 schools, testing, population-based, surveillance, evaluation, District of Columbia

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ACCEPTED MANUSCRIPT

1 **Introduction**

2 Research suggests that prolonged and frequent school closures due to the COVID-19 pandemic may negatively  
3 affect children’s social well-being and learning [1, 2]. Adaptations to COVID-19 protocols can provide innovative  
4 options for families to safely continue sending their children to school for in-person learning, despite the  
5 emergence of new and more infectious variants, to address students’ mental, social, and educational needs [2, 3].  
6 As part of layered prevention strategies including vaccination, physical distancing, and appropriate mask use,  
7 testing approaches can (a) help to reduce community spread of COVID-19, (b) keep schools open and students in  
8 classrooms, and (c) increase confidence within the school community that in-person learning and school-based  
9 activities can continue safely [4].

10 Many school districts across the country, including public and public charter schools in the District of Columbia  
11 (DC), have implemented routine school-based testing to identify pre-symptomatic and asymptomatic cases,  
12 thereby reducing the potential spread of COVID-19 in the school environment [5]. Test-to-Return (TTR) is a related  
13 strategy in which students and staff provide proof of a negative COVID-19 test to safely return to school after a  
14 break in in-person learning. In January 2022, during the peak of the Omicron surge nationwide, DC Health  
15 introduced a TTR strategy whereby at-home or over-the-counter rapid antigen tests (RATs) were made available at  
16 no cost to students and staff prior to returning to school for the start of the 2022 Spring semester [4, 6, 7].  
17 Descriptive data were used to describe the implementation of TTR and its potential benefits in preventing  
18 outbreaks and reducing the spread of COVID-19 in DC public and public charter schools.

19 **Methods**

20 Participation and reporting of TTR was mandatory for pre-kindergarten and K-12 DC public schools (DCPS) and  
21 voluntary for DC public charter schools (DCPCS). DC Health provided more than 50,000 COVID-19 at-home iHealth  
22 RATs to students and staff at their respective schools and at various public locations in DC (e.g., firehouses,  
23 libraries). Student and staff testing data, both reverse transcription-polymerase chain reaction (RT-PCR) or RAT,  
24 were provided to DC Health through DC’s COVID-19 Test Self Reporting Portal or DCPCS’ voluntary reporting form  
25 by families or designated COVID-19 school point of contacts (POC) regardless of who administered the test (e.g.,

1 healthcare professional, school POC, individual, or family member) [8]. Tests and attestation documents (e.g.,  
2 photo or PDF of test result) had to be conducted and uploaded no more than 1 day before the first day of school  
3 (January 6th, 2022). Students were also encouraged to bring the uploaded proof-of-negative test to school.  
4 Individuals who tested positive for COVID-19 were classified as a COVID-19 case and required to isolate.  
5 Testing data were categorized according to grade level and distribution across DC's eight wards (Figure 1). Wards  
6 vary by socioeconomic factors, with the median household income ranging from  $\leq$ \$53K in Ward 8 to  $>$ \$195K in  
7 Ward 3 [9]. Additionally, schools were classified based on percentage of student population deemed economically  
8 disadvantaged [10]. Descriptive analyses and chi-square tests were performed in SAS.

## 9 **Results**

10 A total of 2882 positive cases (2237 students and 645 staff) from all 116 public schools and 1623 positive cases  
11 (1321 students and 302 staff) from 62% of all charter schools (n=76) were identified (Table 1). The majority (>99%)  
12 of students and staff reported using RATs. Tests returned by staff had a higher positivity rate compared to those  
13 returned by students (7.3% vs 6.1%), with an overall positivity rate of 6.3%. Positivity rates were significantly  
14 higher for staff compared to students in Wards 3, 5, and 6 (p-values  $\leq$ 0.01, data not shown). Ward 1 experienced  
15 the highest positivity rate for both students and staff (7.8% and 9.2%, respectively), followed by Ward 4 (6.7% and  
16 7.5%) and Ward 6 (6.3% and 8.0%, respectively). Grade level did not correlate with the risk of students testing  
17 positive for COVID-19 (p-value:  $>$ 0.05, data not shown). Overall, Wards 3 and 1 experienced the lowest and highest  
18 positivity rates (4.2% and 8.0%), respectively. Positivity rates by school ranged between 0-20.2% for DCPCS and  
19 2.3-15.2% for DCPS for students and staff. All schools with student positivity rates above ten percent DCPS (n=7)  
20 and DCPCS (n=12) were categorized as serving economically disadvantaged populations [10]. Vaccination rates  
21 varied across wards but were not associated with overall positivity rates (data not shown).

## 22 **Discussion**

23 This is the first report detailing results of a jurisdiction-wide TTR strategy and the feasibility of incorporating at-  
24 home testing in Pre-K to grade 12 schools. A key factor in the decision to implement TTR was high levels of COVID-  
25 19 community transmission and increased hospitalizations in DC. TTR was implemented at the peak of the Omicron

1 wave when DC's 7-day rolling average number of daily cases was 1,975 with a total case rate of 15,319 per 100,000  
2 people [11]. Positivity rates were higher among staff than students, and among schools that served economically  
3 disadvantaged populations. These findings may support DC's vaccination mandate for staff and the use of testing  
4 strategies to decrease the risk of COVID-19 transmission to prevent school outbreaks and subsequent closures.  
5 Implementation of testing strategies in DC can limit the number of school contacts who must quarantine and miss  
6 additional school days; these strategies may have the greatest benefit to schools with higher COVID-19 caseloads  
7 or student populations deemed economically disadvantaged [10, 12].

8 TTR reduces both the number of positive cases detected at school (vs. at-home) and students exposed to a positive  
9 case, thereby conserving in-person days of learning among potential contacts. In pre-K and low-resourced settings,  
10 entire classes or grade levels may have to quarantine for ten days due to detection of a positive case [12].  
11 Consistent use of TTR could prevent people who test positive from interacting with others in the school setting  
12 through early identification.

13 DC has incorporated weekly TTR for pre-kindergarten students to identify COVID-19 cases through at-home RATs  
14 before entering schools. This measure can enhance confidence in families that school is a safe setting for their  
15 children.

16 Based on analysis of 2021-22 academic year data, DC's TTR strategy likely saved up to 185,016 in-person learning  
17 days for potential contacts assuming a maximum of 8 missed school days for every 10-day quarantine period [12].  
18 This screened out positive students through testing and likely reduced the risk of secondary and tertiary COVID-19  
19 transmission in public and charter schools during DC's record-breaking COVID-19 surge [12]. To support the TTR  
20 policy and general testing protocols, in addition to RATs, DC Health ensured residents could pick up RT-PCR tests at  
21 36 convenient locations that could be dropped off at DC libraries and recreation centers [7]. Additionally, DC  
22 established COVID-19 centers where individuals could access vaccinations, at-home RATs, and walk-up RT-PCR  
23 testing. These various testing measures supported a safe return-to-school, as well as health equity (through broad  
24 testing access) and general community safety. Due to its success, DC schools will continue to distribute RATs to  
25 students and staff prior to vacation breaks for the remainder of the 2021-22 school year to prevent school

1 outbreaks and closures. Proof of a negative test will be mandatory for DCPS and strongly recommended for DCPCS,  
2 to return after the breaks.

3 TTR strategy is one of the multiprong approaches that DC takes, including promoting vaccinations, requiring masks  
4 and physical distancing, and encouraging improved in-school ventilation to prevent the spread of COVID-19.

5 Although as of March 2022 96% of DC residents are partially or fully vaccinated and 44% are up-to-date,  
6 vaccination rates vary by student age (with 36% of 5–11-year-olds partially or fully vaccinated) and by schools (85-  
7 100% among DCPCS staff) [6, 13]. Ensuring schools have equitable access to TTR and other testing strategies (e.g.,  
8 test-to-stay) may increase access to in-person learning primarily among potential close contacts. Schools serving  
9 an economically disadvantaged population may choose to support broader testing strategies to ensure populations  
10 affected most by COVID-19 are not disadvantaged academically, given the ripple effect a positive case can have on  
11 the school community.

12 Several limitations were identified. A single antigen test may result in unidentified cases (“false negatives”) and  
13 asymptomatic individuals were encouraged to perform repeat testing. Data collection was not standardized for  
14 DCPS and DCPCS. Tests do not reflect the total 2020-21 student population because of lower 2021-22 school  
15 enrollment, parents opting to keep students at home after the break, and some families only reported to school (vs.  
16 portal). For operationalization, logistical planning and robust availability of testing resources were required;  
17 implementing TTR can be resource-intensive if proof of a negative test is required, and falsification of results could  
18 occur. Furthermore, some families may not have access to the technology required to upload results. Finally,  
19 schools experiencing staffing shortages and limited resources may not be able to fully operationalize TTR.

20 While schools nationwide considered alternatives to in-person learning due to the Omicron variant, only one DC  
21 public school shifted to situational virtual learning. TTR gave DC education, public health, and political leaders the  
22 data to enact evidence-based policies and promoted continuity of safe in-person learning after a long break  
23 coinciding with peak SARS-CoV-2 transmission.

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1 **Conclusion**

2 In addition to vaccination, schools might consider TTR strategies as an option for allowing students and staff to  
3 safely return to the classroom. As many school districts delayed traditional reopening of schools in the nation after  
4 the holiday break, DC was able to support a safer return to in-person learning with minimal school closures by  
5 testing their students and staff, thereby reducing potential sources of COVID-19 transmission. Screening out  
6 positive students and staff through testing can reduce the number of exposures at school and lost in-person  
7 learning days.

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1 **References:**

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- 3 1. Sanrey, C., et al., *A Two-Sided Lockdown? Social Class Variations in the Implementation of*  
4 *Homeschooling During the COVID-19 Lockdown*. *Front Psychol*, 2021. **12**: p. 670722.
- 5 2. Hawes, M.T., et al., *Increases in depression and anxiety symptoms in adolescents and young*  
6 *adults during the COVID-19 pandemic*. *Psychological medicine*, 2021: p. 1-9.
- 7 3. Rogers, A.A., T. Ha, and S. Ockey, *Adolescents' Perceived Socio-Emotional Impact of COVID-19*  
8 *and Implications for Mental Health: Results From a U.S.-Based Mixed-Methods Study*. *The*  
9 *Journal of adolescent health : official publication of the Society for Adolescent Medicine*, 2021.  
10 **68**(1): p. 43-52.
- 11 4. CDC. *Community, Work, and School*. 2022; Available from: [www.cdc.gov/coronavirus/2019-](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/school-testing.html)  
12 [ncov/community/schools-childcare/school-testing.html](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/school-testing.html).
- 13 5. Asgary, A., et al., *Simulating preventative testing of SARS-CoV-2 in schools: policy implications*.  
14 *BMC Public Health*, 2021. **21**(1): p. 125.
- 15 6. DCPS. *DCPS Rapid Testing Results for January 5, 2022*. 2022; Available from:  
16 [dcpsreopenstrong.com/updates/dcps-rapid-testing-results-for-january-5-2022/](https://dcpsreopenstrong.com/updates/dcps-rapid-testing-results-for-january-5-2022/).
- 17 7. Health, D. *Test Yourself*. 2022; Available from: [coronavirus.dc.gov/testyourself](https://coronavirus.dc.gov/testyourself).
- 18 8. DC\_Health. *COVID-19 Test Self Reporting Portal*. 2022; Available from:  
19 <https://securelink.dc.gov/en-US/sta/>.
- 20 9. DC\_Health. *Ward Demographic Indicators 2022*; Available from:  
21 <https://dcdataviz.dc.gov/page/ward-demographic-indicators>.
- 22 10. DCPS. *School Profiles Home*. 2022; Available from: [profiles.dcps.dc.gov](https://profiles.dcps.dc.gov).
- 23 11. CDC. *COVID Data Tracker*. 2022 [cited 2022 January 6]; Available from: [covid.cdc.gov/covid-](https://covid.cdc.gov/covid-data-tracker/#trends_dailycases_totalcasesper100k)  
24 [data-tracker/#trends\\_dailycases\\_totalcasesper100k](https://covid.cdc.gov/covid-data-tracker/#trends_dailycases_totalcasesper100k).
- 25 12. Nemoto, N., et al., *Evaluation of Test to Stay Strategy on Secondary and Tertiary Transmission of*  
26 *SARS-CoV-2 in K-12 Schools - Lake County, Illinois, August 9-October 29, 2021*. *MMWR Morb*  
27 *Mortal Wkly Rep*, 2021. **70**(5152): p. 1778-1781.
- 28 13. DC\_Health. *COVID-19 Vaccination Data 2022*; Available from:  
29 [coronavirus.dc.gov/data/vaccination](https://coronavirus.dc.gov/data/vaccination).

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1 **Table 1. Breakdown of student and staff identified as positive for COVID-19 during the District of Columbia's**  
 2 **Test-to-Return (TTR) strategy, January 2022**

			Students (n= 58,168)			Staff (n= 12,943)			Overall (n=71,111)		
			Tests returned, n	Positive cases, n	Positivity rate, %	Tests returned, n	Positive cases, n	Positivity rate, %	Tests returned, n	Positive cases, n	Positivity rate, %
<b>All Schools, (n=192 schools)</b>			58168	3558	6.1	12943	947	7.3	71111	4505	6.3
<u>Grade</u>	Pre-Kindergarten	(PK3, PK4)	4440	276	6.2	-	-	NA <sup>c</sup>	-	-	NA
	Elementary	(K - 5)	25707	1588	6.2	6577	561	8.5	36724	2425	6.6
	Middle	(6 - 8)	9036	513	5.7	1460	90	6.2	10496	603	5.7
	High	(9 - 12)	11746	671	5.7	2447	149	6.1	14193	820	5.8
	Other <sup>a</sup>		7239	510	7.0	2459	147	6.0	9698	657	6.8
<u>Ward</u>	No. schools	Vaccination Rate, % <sup>b</sup>									
1	12	59	5734	446	7.8	1266	117	9.2	7000	563	8.0
2	12	56	3769	216	5.7	736	38	5.2	4505	254	5.6
3	9	56	4991	198	4.0	745	44	5.9	5736	242	4.2
4	28	61	11622	777	6.7	2324	174	7.5	13946	951	6.8
5	32	56	8261	482	5.8	1922	145	7.5	10183	627	6.2
6	30	60	8757	549	6.3	1787	143	8.0	10544	692	6.6
7	31	44	6856	419	6.1	1741	125	7.2	8597	544	6.3
8	38	37	8178	471	5.8	2422	161	6.6	10600	632	6.0
<b>Public (DCPS), (n=116 schools)</b>			<b>38895</b>	<b>2237</b>	<b>5.8</b>	<b>8533</b>	<b>645</b>	<b>7.6</b>	<b>47428</b>	<b>2882</b>	<b>6.1</b>
<u>Grade</u>	Pre-Kindergarten	(PK3, PK4)	4440	276	6.2	-	-	NA <sup>c</sup>	-	-	NA
	Elementary	(K - 5)	18132	1075	5.9	4830	406	8.4	27402	1757	6.4
	Middle	(6 - 8)	6791	342	5.0	1056	71	6.7	7847	413	5.3
	High	(9 - 12)	9364	534	5.7	1820	117	6.4	11184	651	5.8
	Other <sup>a</sup>		168	10	6.0	827	51	6.2	995	61	6.1
<u>Ward</u>	No. schools	Vaccination Rate, % <sup>b</sup>									
1	8	59	3901	303	7.8	833	77	9.2	4734	380	8.0
2	9	56	3050	174	5.7	580	34	5.9	3630	208	5.7
3	9	56	4991	198	4.0	745	44	5.9	5736	242	4.2
4	19	61	9000	600	6.7	1725	132	7.7	10725	732	6.8
5	13	56	3617	193	5.3	825	53	6.4	4442	246	5.5
6	20	60	6756	367	5.4	1313	120	9.1	8069	487	6.0
7	18	44	3479	194	5.6	1098	78	7.1	4577	272	5.9
8	20	37	4101	208	5.1	1414	107	7.6	5515	315	5.7
<b>Charter (DCPCS), (n=76 schools)<sup>d</sup></b>			<b>19273</b>	<b>1321</b>	<b>6.9</b>	<b>4410</b>	<b>302</b>	<b>6.8</b>	<b>23683</b>	<b>1623</b>	<b>6.9</b>
<u>Grade</u>											

	Elementary	(K - 5)	7575	513	6.8	1747	155		668	7.2
	Middle	(6 - 8)	2245	171	7.6	404	19	8.9	9322	
	High	(9 - 12)	2382	137	5.8	627	32	4.7	2649	190
	Other <sup>a</sup>		7071	500	7.1	1632	96	5.1	3009	169
Ward	No. schools	Vaccination Rate, % <sup>b</sup>								
1	4	59	1833	143	7.8	433	40	9.2	2266	183
2	3	56	719	42	5.8	156	4	2.6	875	46
3	0	56	-	-	-	-	-	-	-	-
4	9	61	2622	177	6.8	599	42	7.0	3221	219
5	19	56	4644	289	6.2	1097	92	8.4	5741	381
6	10	60	2001	182	9.1	474	23	4.9	2475	205
7	13	44	3377	225	6.7	643	47	7.3	4020	272
8	18	37	4077	263	6.5	1008	54	5.4	5085	317

1 <sup>a</sup> Other includes DC's non-traditional schools (e.g., Education Campuses, opportunity academics, special education, and youth  
2 engagement schools). <sup>b</sup> Coverage (%) of fully vaccinated DC residents by ward (<https://coronavirus.dc.gov/data/vaccination>).

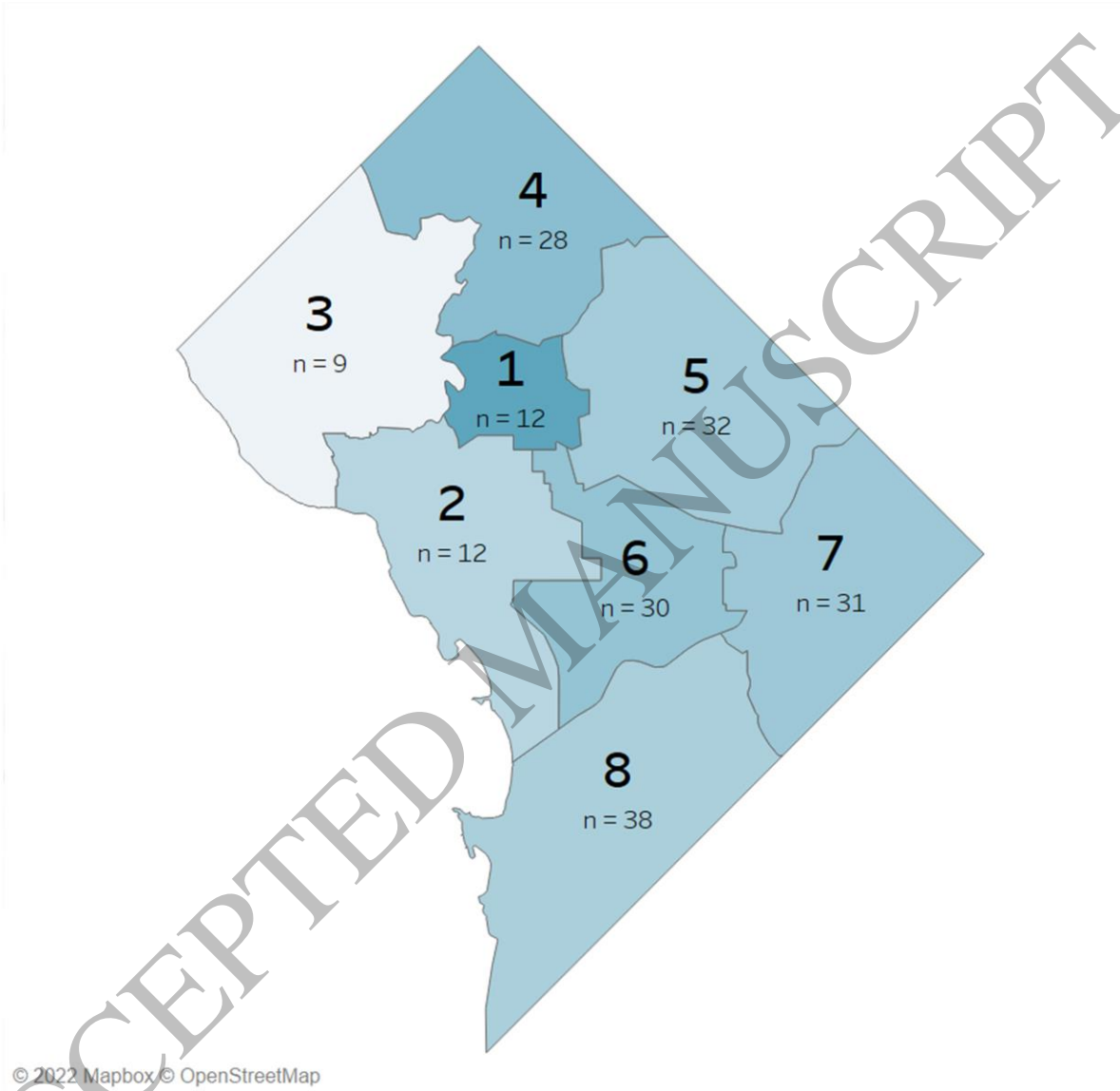
3 <sup>c</sup> Among DCPS schools including Pre-Kindergarten (PK3, PK4) and Elementary (K-5) students, staff testing results were not  
4 stratified. Thus, Staff and Overall DCPS testing results for Pre-Kindergarten and Elementary Schools are combined into  
5 Elementary.

6 <sup>d</sup> There are a total of 123 charter schools in DC. Of those, 76 voluntarily reported TTR results.

7 <sup>e</sup> Based on 2020-21, there were 52,396 students in DCPS and 46,715 in DCPCS.

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1 **Figure 1. Number of schools (n=192) that participated in Test-to-Return (TTR) and test positivity by ward in the**  
2 **District of Columbia, January 2022.**



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