Risk Assessment and Testing Protocols for Reducing SARS-CoV-2 Transmission in K-12 Schools

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Authors

Caitlin Rivers, PhD, MPH
Senior Scholar, Johns Hopkins Center for Health Security

Christina Silcox, PhD
Managing Associate, Duke-Margolis Center for Health Policy

Christina Potter, MSPH
Analyst, Johns Hopkins Center for Health Security

Michelle Franklin, PhD, MSN, FNP-BC, PMHNP-BC, CNS
Postdoctoral Research Associate, Duke-Margolis Center for Health Policy

Rebecca Ray
Senior Research Assistant, Duke-Margolis Center for Health Policy

Mira Gill
Research Assistant, Duke-Margolis Center for Health Policy

Mark McClellan MD, PhD
Director, Duke-Margolis Center for Health Policy

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Objective

The purposes of this document are to 1) help school administrators to assess the risk of SARS-CoV-2 (the virus that causes Covid-19[1]) in their schools, and 2) identify key considerations in developing a screening program to regularly test students and staff for the virus to support schools to open in-person more safely.

Introduction

For many children in the United States, the 2020 school year is beginning online, presenting a difficult set of challenges to keep kids learning. The **importance** of schools goes far beyond the academic benefits of in-person instruction. Schools provide meals, access to health services, and a **safe space** for students to develop social and emotional skills. Prolonged school closures can jeopardize access to these resources, particularly for the most vulnerable students. School closures also affect parents and guardians. More than **41 million** adults were a care provider for a child under the age of 18 in the United States in 2018. During the Covid-19 pandemic, the care of children for many of these adults has collided with work. A **survey** of working parents in May and June by Northeastern University reported that 13% of the 2,557 participants had to reduce their working hours or leave work entirely to compensate for the loss of childcare availability due to school and childcare closures. Those still working reported an average of eight working hours of the week lost to childcare needs.

While schools provide many important benefits, they also are at risk for outbreaks. **Recent studies** have **found** that **infected children** are able to **transmit** SARS-CoV-2 to other children and adults. It has also become clear that infected children are often asymptomatic (e.g., 57% of students involved in an **Israel** school outbreak were asymptomatic, and 41% of students from a retrospective analysis of primary school outbreaks in **France** were asymptomatic), making symptom screening or temperature checks **insufficient** to identify potentially infectious children. The concern is that schools that reopen for in-person learning, particularly those in high-prevalence[2] communities, will face cases and outbreaks of Covid-19. Without mitigation measures in place, schools are considered a **high-risk environment** for transmission due to close and prolonged contact among large numbers of people in a poorly ventilated, indoor environment with many high-touch surfaces.

Unmitigated or uncontrolled school-related outbreaks can have substantial impacts on students, household members, teachers and the wider community. While infected children are **less likely** than adults to require hospitalization, it is **possible** for children to become severely ill. The **American Academy of Pediatrics and the Children's Hospital Association** note that 0.2% - 7.9% of all child Covid-19 cases resulted in hospitalization, constituting 0.7% - 3.6% of total hospitalizations. Children represent **less than 1%** of deaths

1 Covid-19: The name of the disease caused by the novel coronavirus, SARS-CoV-2.

2 Community prevalence: The number of people currently infected with SARS-CoV-2 infection in the community (e.g., city, county).

due to Covid-19 in the United States, and the **case fatality rate** among children has been consistently under 1%. However, the risks of severe illness are **disproportionately** high in children of color; 78% of Covid-19 deaths in children under the age of 21 reported from mid-February to July 2020 were Hispanic, non-Hispanic Black, and non-Hispanic American Indian/Alaska Native children. Furthermore, it is not only children who are at risk of outbreaks in school buildings. Outbreaks in a school in **Israel** and a summer camp in the state of **Georgia** led to infections in 16.6% and 56% of staff, respectively. School outbreaks also can easily spill into the greater community, such as what occurred in **Israel** when 87 close contacts[3] of school community members became infected.

In order to facilitate the safe reopening of schools, measures to prevent SARS-CoV-2 transmission must be at the forefront. This document aims to aid discussion around whether and how to reopen by 1) helping school administrators to assess the risk of SARS-CoV-2 in their schools and 2) identifying key considerations in developing a screening program to regularly test students and staff for the virus to support schools to open in-person more safely. Because the evidence on how to open is limited, school administrators should expect guidance to evolve, as schools develop more experience and evidence.

3 Close contact: According to CDC, a close contact is defined as any individual who was within 6 feet of an infected person for at least 15 minutes starting from 2 days before illness onset (or, for asymptomatic patients, 2 days prior to positive specimen collection) until the time the patient is isolated.

Risk Assessment

This risk assessment is composed of three parts: the likelihood of an introduction of SARS-CoV-2 into the school building, the likelihood that a single case spreads in the building and becomes an outbreak, and the consequences of an outbreak for students, staff, and families. Schools should assess each of the three parts for their own communities, based on local data and observations about their specific circumstances.

Likelihood of introduction of a Covid-19 case into the school building

The likelihood of SARS-CoV-2 being introduced into a school is a direct function of the overall prevalence of the virus in the school's community. In September 2020, the U.S. Centers for Disease Control and Prevention (CDC) issued guidelines describing a variety of indicators that could inform decisions about school reopening, including community incidence[4], test positivity, hospital capacity, and ability of the school to implement mitigation measures (Table 1).

Table 1: Modified from "CDC indicators and thresholds for risk of introduction and transmission of COVID-19 in schools" (published September 2020).

Indicators	Lowest risk of transmission in schools	Lower risk of transmission in schools	Moderate risk of transmission in schools	Higher risk of transmission in schools	Highest risk of transmission in schools
Core Indicators					
Number of new county-level cases per 100,000 persons within the last 14 days	<5	5 to <20	20 to <50	50 to ≤ 200	>200
Percentage of county-level RT-PCR tests that are positive during the last 14 days	<3%	3% to <5%	5% to <8%	8% to ≤ 10%	>10%
Ability of the school to implement 5 key mitigation strategies: • Consistent and correct use of masks • Social distancing to the largest extent possible • Hand hygiene and respiratory etiquette • Cleaning and disinfection • Contact tracing in collaboration with local health department	Implemented **all 5** strategies correctly and consistently	Implemented **all 5** strategies correctly but inconsitently	Implemented **3-4** strategies correctly and consistently	Implemented **1-2** strategies correctly and consistently	Implemented **no** strategies

These are the core indicators CDC issued to inform risk assessment decisions for school reopening. Secondary indicators included hospital and ICU load and local indicators of outbreaks.

4 Community incidence: The number of new cases of SARS-CoV-2 infection in the community (e.g., city, county).

According to the CDC thresholds, schools with "lower" or "lowest" risk of transmission will have had fewer than 20 new cases per 100,000 people within the last 14 days within the community (e.g., local city or county), under 5% test positivity, and the ability to implement consistent proper mask usage, social distancing to the best extent possible, appropriate hand hygiene and respiratory etiquette, good cleaning and disinfection practices as well as the ability to execute contact tracing activities in partnership with the local health department. The CDC thresholds and indicators also suggest that the local community should have had at least a 5% decrease in weekly incidence, less than 80% of ICU and inpatient beds occupied in local hospitals, less than 10% of beds in local hospitals used by Covid-19 patients, and no local Covid-19 outbreaks occurring.

Schools with over 50 new cases per 100,000 people in the last 14 days, over 8% test positivity, and the ability to implement only two of the necessary mitigation measures described above are considered to have "higher" or "highest" risk of transmission. "Higher" or "highest" risk of transmission is also indicated by communities with stagnant or increasing weekly incidence, over 90% occupancy of ICU and inpatient beds in local hospitals, over 15% bed occupancy in local hospitals by Covid-19 patients, or the presence of a localized Covid-19 outbreak.

Other academic groups have also created metrics for the reopening of schools based on local virus activity, with a variety of indicators considered. **Harvard University's Safra Center** has an upper bound of 25 cases per 100,000 people per day as a threshold to consider limited reopening of in-person learning, while **University of Nebraska Medical Center** proposes 5 per 100,000 people per day. Most state and local public health departments have dashboards on their website with data on incidence rates and test positivity. The **New York Times** and **Johns Hopkins University** also have data available.

Other considerations for the likelihood that a case will be introduced into the school building relate to school operations. Schools with many visitors in and out of the buildings (for example, classroom volunteers), may be at higher risk of introduction due to the extra contacts. Similarly, the presence of substitute teachers, particularly those who work at multiple schools, may put schools at higher risk of introduction. Schools who have many parents who serve in essential roles, for example healthcare workers, may also be at higher risk. These additional considerations should factor into a school's risk assessment.

Likelihood of onward transmission

Here we consider whether a single case in a school building could become an outbreak. If there are one or more cases of Covid-19 introduced into the school building, the probability that the single case becomes an outbreak is dependent on mitigation measures. Although we are not yet able to quantify the incremental value of each mitigation measure, guidance by the CDC, the National Academies of Sciences, Engineering, and Medicine and others propose a number of measures that, taken together, can reduce the risk of transmission in a classroom setting.

Although early in the pandemic there was speculation that children were not able to transmit the virus, there is now **evidence** that children are capable of **transmitting**, and may do so as efficiently as adults. Current scientific understanding of how the virus is transmitted suggests that priority mitigation measures for limiting outbreaks include reducing the number of contacts by implementing cohorts ("pods"), ensuring

physical distancing, hand hygiene and regular cleaning, minimizing use of shared objects, consistent mask usage, and improving ventilation. Schools or other similar indoor group settings where these mitigation measures are not consistently applied have shown a higher likelihood of onward transmission. This is evident in the different experiences of **Georgia** and **Maine** summer camps, one of which had a large outbreak following lapses in mitigation measures. The other camp followed stringent protocols and was able to maintain operations without any outbreaks. Risk should be determined based on the planned mitigation measures, but with a realistic assessment of how well those measures will be followed.

When assessing risk, school administrators may wish to consider whether there are personnel, activities, or settings at higher risk where robust interventions may be especially important. High-risk groups may include people who have a higher number of contacts (e.g., contact with multiple classrooms) as well as people who spend time in spaces where distancing, ventilation, or other mitigation measures are inadequate. Groups that are unlikely or unable to adhere to mitigation measures, such as younger children and some children with disabilities, may also warrant additional consideration. Furthermore, there is **some indication** that older children and adolescents may be more susceptible to SARS-CoV-2 infection than younger children, potentially making high schools higher risk than younger grades.

Consequences of transmission

Here we consider consequences of onward transmission to children, teachers and staff, and families at home. We recognize that there are other consequences to equity, educational attainment, and family well-being through access to school services related to school reopening, but those are out of scope for this document, which focuses specifically on preventing transmission. We urge school administrators to consider those other dimensions in their deliberations, in consultation with relevant stakeholders.

In the setting of K-12 schools, the consequences of transmission are primarily a function of the age and underlying health of the population at risk. Children are at lower risk of severe illness than adults, but that **risk** is not zero. Young infants and children with serious **underlying health conditions** are at higher risk of severe illness than children with no pre-existing conditions. Older children may be at higher risk of severe illness than younger children, so although the absolute risk is low, the relative consequences of transmission in middle and high schools are higher than in elementary schools. Consequences of transmission may also be higher in schools that serve a high proportion of children with underlying health conditions or medical vulnerabilities. Some children may need to continue with remote learning due to these vulnerabilities, regardless of reopening plans.

In adults, the risk of severe illness increases with age, with the highest risk in the elderly. Adults with underlying health conditions like cancer, chronic kidney disease, COPD, immunocompromised state, obesity, serious heart conditions, sickle cell disease, and type 2 diabetes are also at **increased risk** of severe illness. Because adults are at higher risk of severe illness than children, consequences of transmission will be highest among teachers, staff, and adult household members. School administrators should be aware that the best way to protect the most vulnerable members of the school community is by preventing transmission within the entire network. There are additional strategies that can further protect vulnerable school members, such as restructuring work duties and providing high quality personal protective equipment.

Testing Approaches

School administrators should be aware that most tests available now have not been evaluated specifically for performance in children or people who do not have symptoms. It is possible that some tests are not as accurate at detecting infection in school-age populations and in asymptomatic individuals. Administrators should work with their local health departments to continue to incorporate the latest guidance and evidence into school testing programs, as it becomes available.

Testing protocols should be customized for individual school districts based on the risk assessment described above and community priorities, as well as test availability and budget.

The first priority of a testing protocol is to ensure that there is accessible diagnostic testing[5] for any school community member showing symptoms of Covid-19. If feasible, districts should also consider making diagnostic testing available for any student or staff member with a recent history of close contact (within 6 feet for at least 15 minutes) with a confirmed case. If it is not possible to conduct testing

5 Diagnostic testing: According to CDC, diagnostic testing for SARS-CoV-2 is intended to identify occurrence at the individual level and is performed when there is a reason to suspect that an individual may be infected, such as having symptoms or suspected recent exposure, or to determine resolution of infection.

Table 2: Testing types, purposes, and characteristics.

Testing Type	Purpose	Priority Characteristics	Required Sensitivity[6] and Specificity[7]
Diagnostic Testing	Diagnosing symptomatic individuals and close contacts of those infected for clinical and public health decision-making.	Highly accurate results with a short enough time to result for appropriate clinical treatment (if required) and effective isolation and contact tracing.	> 95% Sensitive > 99% Specific
Screening Testing	Routine testing of individuals without symptoms or any history of exposure. The objective of screening is to reduce transmission by isolating potentially infected individuals faster to protect public health. Screening tests can also be used less frequently or on random subsets of a population to determine prevalence.	For regular routine screening, frequency of retesting and time to results are more important than highly accurate tests; confirmatory tests may be needed for individual clinical decision-making.	> 70% Sensitive > 90% Specific (higher specificity is required if used in low prevalence settings)
Surveillance Testing	Understanding prevalence in a community to inform workplace, local, or regional policies; individual results are not returned.	Frequency and time to results should be appropriate to allow timely decision-making and course adjustment.	Because these tests are not used for individual decision-making, less accurate tests can be used if highly validated to allow for appropriate statistical adjustments.

Table 2 describes the purpose and characteristics of diagnostic, screening, and surveillance testing types. In general, diagnostic tests are needed for people who have symptoms or a history of close contact, and require the highest level of sensitivity and specificity. Screening tests, used for asymptomatic individuals with no known history of exposure, may have lower test sensitivity and specificity. Screening tests tend to prioritize test frequency and result return time, and should be implemented in conjunction with other measures to mitigate risk of spread. Surveillance testing is used at a population level and results are not returned to individuals, allowing for the greatest flexibility in test characteristics. These general characteristics may change depending on the specific clinical and/or public health setting. (Source: A National Decision Point: Effective Testing and Screening for Covid-19)

through the school district itself, an information sheet with local testing sites should be provided to those individuals. This information should also be supplied to family members or guardians of students or staff who test positive. Because many testing sites are **not able to test children**, school districts should identify local testing sites that are able to accommodate kids.

6 Sensitivity: The proportion of infected individuals tested that are correctly identified as such (i.e., true positives). For more on sensitivity, see FDA guidance.

7 Specificity: The proportion of non-infected individuals tested that are correctly identified as such (i.e., true negatives). For more on specificity, see FDA guidance.

People with symptoms should be isolated away from others as soon as symptoms appear. Those who test positive should remain in isolation until they have met the **criteria** for release. The current CDC criteria are: 10 days have passed since symptom onset; at least 24 hours have passed since resolution of fever without medication; and other symptoms have improved. CDC does not recommend that people be tested again before leaving isolation because people who have recovered can test positive for several weeks without being infectious. If an individual with symptoms tests negative, they should still stay home until their symptoms resolve to avoid spreading any infection - coronavirus or otherwise. Some schools may also decide to require a definitive alternate diagnosis rather than just resolution of symptoms (e.g., positive flu test).

Regardless of the test result, individuals with a known exposure should be quarantined away from others for 14 days. Diagnostic testing during the quarantine period can enable another round of contact tracing on that person's contacts and can guide medical care where needed. School administrators should be aware that the local health department likely has resources for supporting families through the isolation and quarantine period.

Finally, regular screening tests performed on people without symptoms and with no known history of exposure can help to identify cases early, before they become large outbreaks. These screening programs are particularly valuable in higher-prevalence areas. Districts considering implementing screening programs should design protocols that allow schools to move seamlessly between different testing strategies as community prevalence (and therefore risk assessment) changes. At the highest risk levels, schools should consider returning to remote learning. As risk decreases but the likelihood of multiple infected individuals at the school remains high, frequent routine screening tests can be deployed to help identify and contain outbreaks. And as the risk decreases further, a transition to less frequent testing, for example through a surveillance program, may be appropriate. Considerations for designing a testing program are detailed in the next section.

Considerations for designing a testing protocol

After conducting a risk assessment, schools should consider whether and how a testing program may contribute to a safe reopening strategy. Table 3 below shows examples of school testing strategies based on qualitative risk levels. To reduce transmission within schools, testing frequency and quick turnaround time for test results (in addition to reasonable test accuracy) are more important than a highly accurate test alone, as shown in recent modeling work by **Larremore et al**. Based on a modified version of the model described in the Larremore et al. paper, Figure 1 highlights that different combinations of testing strategies can be used to meet the same infection transmission reduction goals.[8] However, school administrators should be aware that testing should not be the only approach to reducing risk in school buildings. Mitigation measures like limiting contacts, masks, physical distancing, and improved ventilation will continue to be important for all schools; testing can augment their effectiveness.

Districts with a lower assessed risk may choose to focus on facilitating access to diagnostic testing for people with symptoms and their close contacts. Some districts have implemented programs to test teachers once or twice per month, as a proxy indicator for SARS-CoV-2 incidence within the school

8 For more information on the modeling used for this figure, see A National Decision Point: Effective Testing and Screening for Covid-19.

community. Although this approach cannot be relied upon to meaningfully reduce the risk of outbreaks in schools, it could inform decision-making about ramping up or down mitigation measures.

Districts that determine their risk to be moderate or high would benefit from a regular screening program to prevent infections from spreading within the school, if they choose to reopen. Achieving substantial reduction in transmission requires more frequent testing and shorter lags between test administration and reporting of results, which may not be possible for every school district. However, when combined with other mitigation measures, such as mask use, ventilation, and physical distancing, testing protocols may not need to reduce transmission by 90% or more in order to effectively limit outbreaks. Because there is flexibility in these combinations, individual school districts can assess test availability, logistics, and available budget to identify a strategy that fits local conditions; there are multiple combinations that can reduce risk of transmission. As a resource, **Arizona State University's Testing Commons** has a curated database describing testing technologies that are on the market or in development. The database can be filtered by desired characteristics such as testing sensitivity and specificity.

Table 3: Example screening and surveillance strategy for a K-5 school that is using a "pod" strategy, with limited mixing between cohorts.

Covid-19 risk level, as determined through the risk assessment	Example goals of testing	Testing strategy
Very low	Identify or rule out SARS-CoV-2 infection in students and staff with Covid-19-like symptoms or recent history of contact with a confirmed case using diagnostic testing.	Continued mitigation measures in school. Students and staff are offered diagnostic testing as needed. If a confirmed positive case is found, all individuals in that pod and any other close contacts are quarantined and tested.
Low	Monitor for an increase in infection rates using surveillance testing. Monitor individuals at higher risk of transmitting the virus using routine screening. Continue to offer accessible and actionable diagnostic testing.	Routine surveillance testing, for example through pooled testing,[9] of school "pods" every week. If a pool is found positive, all individuals in the pool remain in quarantine until individual testing identifies who is infected. Routine screening for staff in close contact with a significant number of other people throughout the day. Students and staff are offered diagnostic testing as needed. If a confirmed positive case is found, all individuals in the affected pod and any other close contacts are quarantined and tested.
Moderate	Reduce the probability of transmission within the school using routine screening. Continue to offer accessible and actionable diagnostic testing.	A routine screening program that carefully balances test frequency, accuracy, and time to results is implemented for all students and staff to significantly reduce infection transmission. Students and staff are offered diagnostic testing as needed. If a confirmed positive case is found, all individuals in that pod are quarantined and tested.
High	Monitor for an increase in infection rate if teachers and staff are on-site using surveillance testing. Continue to offer accessible and actionable diagnostic testing.	No in-person learning for students. Staff come to school for remote teaching, using strict mitigation measures, and testing every two weeks. Staff at high risk of severe illness work off-site. Students and staff are offered diagnostic testing as needed.

9 Pooled testing: According to CDC, pooling—sometimes referred to as *pool testing*, *pooled testing*, or *batch testing*—means combining respiratory samples from several people and conducting one laboratory test on the combined pool of samples to detect SARS-CoV-2.

Figure 1: Simulated results of testing strategies to reduce SARS-CoV-2 transmission.

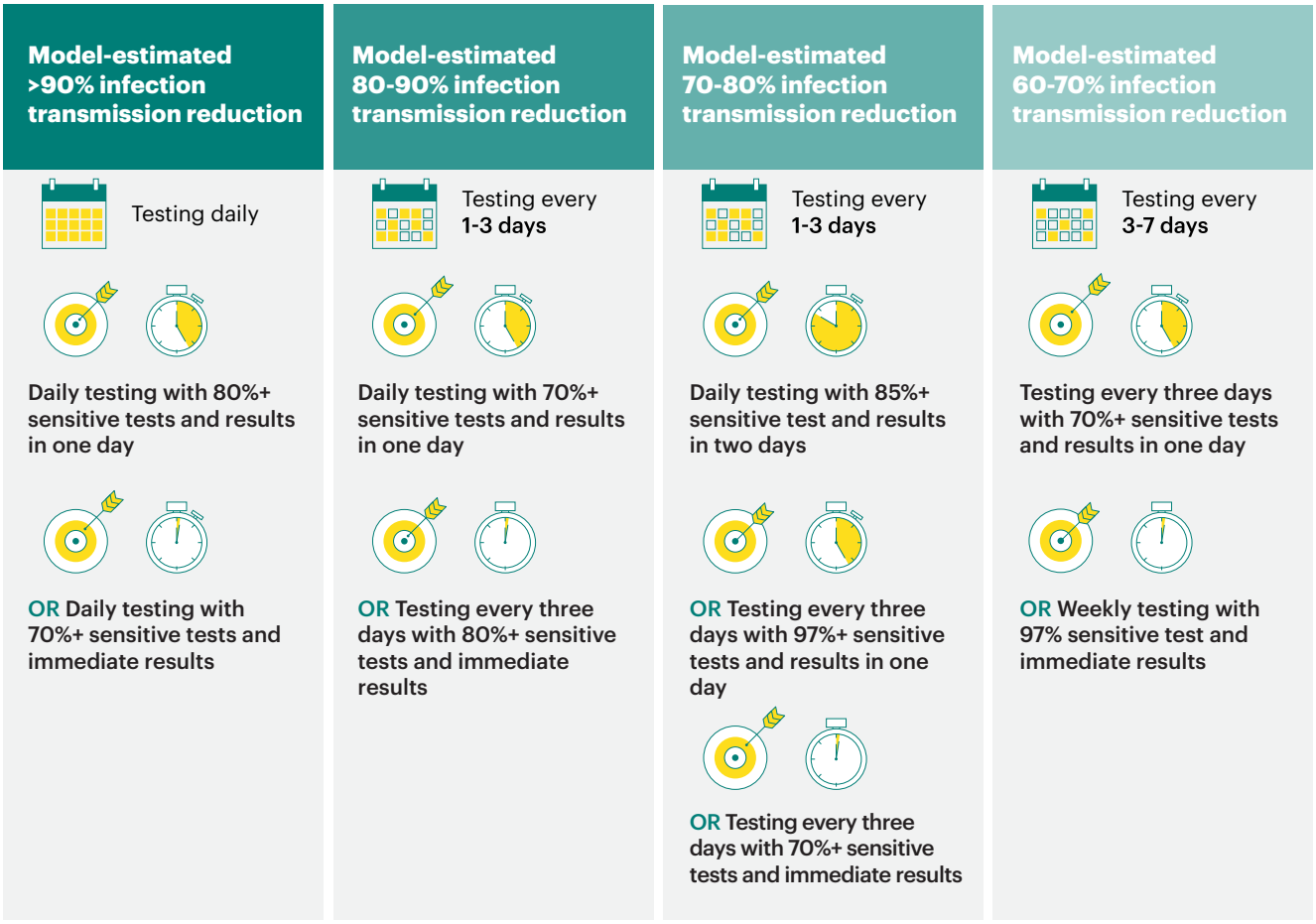
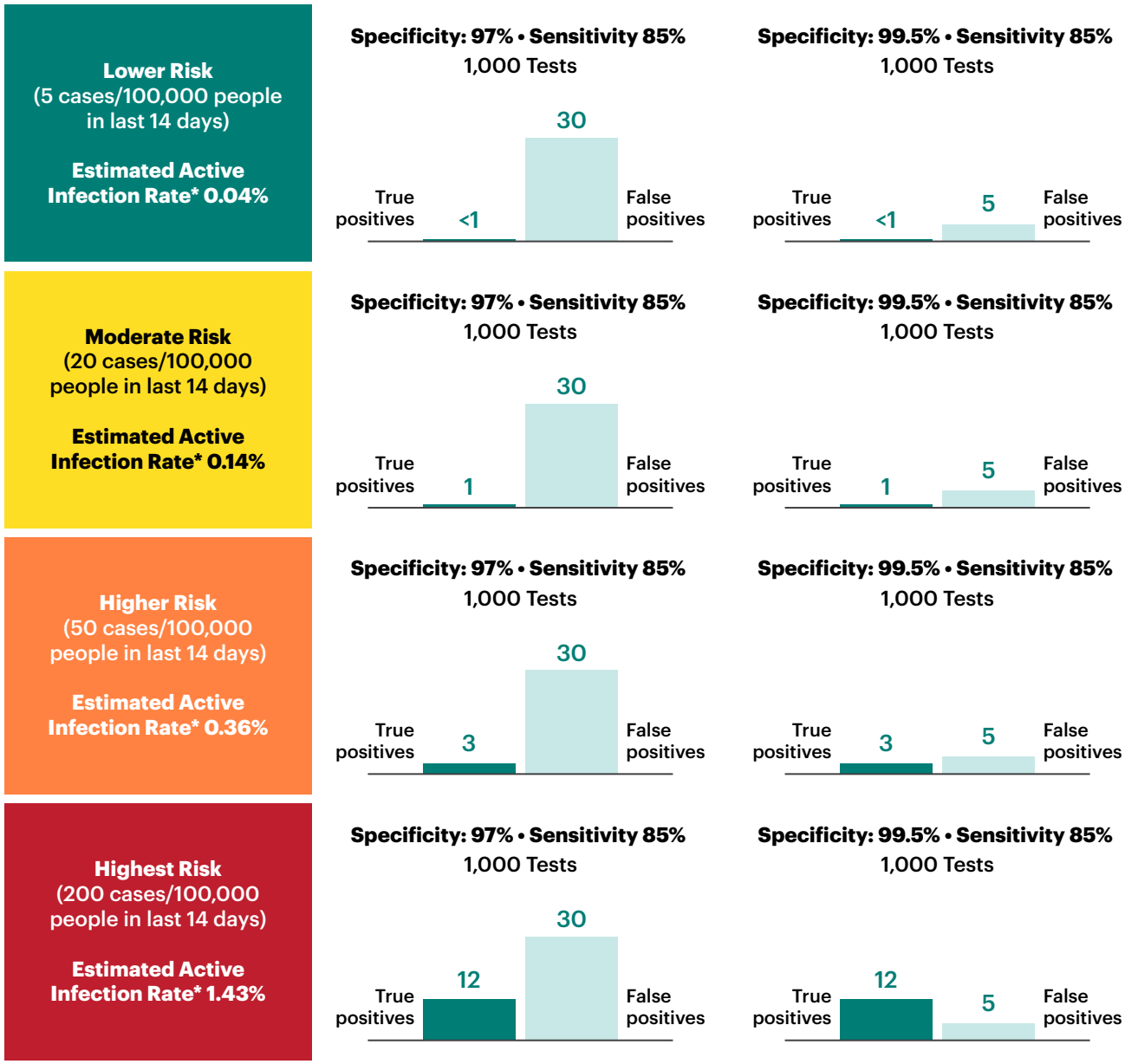


Figure 1 illustrates how several alternative testing strategies may achieve similar predicted reductions in SARS-CoV-2 transmission. Components of the simulated testing strategies include test frequency (from daily to every 7 days), test sensitivity, and time to result return. Test frequency and time to result return were most influential on projected transmission reduction. These results are based on a simulation model and assume perfect isolation and no further transmission from detected cases. This is a modified figure from "A National Decision Point: Effective Testing and Screening for Covid-19."

When designing a testing strategy, schools should also consider that no test is perfectly accurate, and so some incorrect test results are expected. The probability of **false positives** depends on the performance characteristics of the test, and community prevalence. Figure 2 shows the number of true and false positives that might be expected in communities with different active infection rates if tests similar to those available today were used to screen 1,000 people. Schools should expect a higher proportion of false positives when the active infection rate is low. In these cases, schools may consider either relying on surveillance testing that doesn't return individual results or by using tests with very high specificity. Schools should have communication and response plans in place that acknowledge that some false positive results are expected. **False negative** results, in which someone is infected but receives a negative test result, can also occur. The possibility of false negatives is why other mitigation measures (e.g., masks, distancing) are important to maintain. Additional considerations on how to incorporate incorrect test results into school response plans are discussed below.

Figure 2: How estimated active infection rate and test specificity affect the ratio of true and false positive test results.



*Estimated active infection rate was calculated using the CDC threshold boundaries, converting 14 to 10 days to represent CDC advice on duration of the Covid-19 infectious period. This 10-day cumulative case load was multiplied by 10 to correct for under-reporting due to ascertainment bias. Note that this is likely to be an overestimation in areas with a low test positivity ratio, meaning that the share of false positives may be higher in these areas.

Swift action on testing results

Each school district should work with the local health department to develop clear procedures for how to handle positive test results from diagnostic, screening, and surveillance tests, as well as negative test results for people who are symptomatic. These plans should clearly describe expectations around testing and isolation for both the individual who tested positive, their close contacts, and other contacts in the school's community and clearly identify the plans for allowing the teacher, staff, or student to return to school.

For example, a response to a positive test result should include isolation of the infected individual, and quarantine for people who were in close contact with that individual. These situations should be managed in partnership with the local health department. Districts will need to define who will be included as a "close contact". Although the CDC definition of a close contact is within 6 feet of an infected individual for at least 15 minutes, schools may also want to consider quarantine of other contacts, such as members of "pods" who are spending long periods of time in the same indoor classroom, particularly if masks are removed for eating and drinking. Schools will also want to consider whether other students or staff had close contact with the infected person outside of the classroom, for example during transportation to and from school or during extracurricular activities.

For schools using rapid tests as part of their screening program, confirmatory testing may be recommended for positive results, due to the possibility of a false positive. For example, a positive result on an antigen test in someone who has no symptoms and where community prevalence is low should be considered a "presumed positive," meaning they should be isolated but should also receive confirmatory PCR testing. The school district should help these individuals access confirmatory testing, which could include connecting them to testing through the local public health or healthcare systems. More information on interpreting antigen test results is available on the **CDC website**, and the local health department should also be notified and consulted in response to any positive results.

For schools using pooled testing, a positive result for the pool should result in all individuals in the pool being quarantined until individual test results can be determined. If the pooled specimens come only from members of a single "pod," and one of the individual test results comes back as positive, the entire pod may need to quarantine, as they are all close contacts. If the pools consist of individuals who are not in close contact with each other, people from each of the samples in the pool can stop quarantining after individual testing confirms they are not infected. Because of the complexities of acting on a positive result, pooled testing is best used in situations where the number of positives is expected to be very low, for example in areas with low community prevalence.

In all of these situations, there may be time between when a case is suspected and when the test results are confirmed. Schools should plan ahead for when and how they will notify the close contacts of those individuals. Some communities may wish to be notified as soon as there is a possibility of infection in order to allow potential contacts to take additional precautions, especially if test results may be delayed.

Schools should also expect that some students and staff may refuse to take a test or may not be transparent about their test results, especially if they are asymptomatic. Schools should have plans in place for this scenario by anticipating and understanding the refusal and potentially addressing those underlying reasons. For example, the school district could work with the local health department to connect families in isolation or quarantine with housing and nutrition support if there is a concern that a positive test could lead to food or housing insecurity.

Clear Communication

A successful testing program will require leadership and community support. Clear communication about the purpose and limitations of the program should be developed, including stressing that testing is one part of a combination of mitigation measures that must be used in concert for maximum effectiveness. These plans should clearly explain that false negatives and false positives are expected, and describe plans for how to manage those results. The plans discussed above for responding to presumed or confirmed infections should be clearly laid out and communicated before the testing program begins.

Schools should also clearly communicate how they will determine if the school needs to close in-person learning to contain an outbreak. This will primarily depend on **assessment** by school officials in partnership with the local health department. Scenarios that may warrant the closure of in-person learning include in-school transmission, indicating that current mitigation measures are not working, or increasing incidence in the community. Schools should also draft a communication plan, including templates for communication to families, that will be disseminated if there is an exposure, case, or outbreak. Plans for continuing learning, for example through remote instruction, should also be prepared in advance and shared in case a closure is needed.

Effective communication must be tailored to the school and community. By removing barriers to testing and being responsive to community-specific needs, such as advertising testing options in multiple languages and working with the local health department to provide wrap-around services to support families in isolation and quarantine, community trust in the testing program will likely increase. Schools should reassure staff and students that these protocols are consistent with recommendations from CDC or the local health department, but that processes may be modified as more evidence develops.

Incorporating new science

The availability of high quality information and analyses from K-12 school reopenings in the U.S. is currently restricted to independently-created dashboards with data from a **limited number of voluntarily participating schools** or **anonymous submissions by school personnel**, supplemented by a small number of school reopening case studies in the academic literature. This sparse body of evidence should be expanded to support the development of best practices for safe reopening. The findings of these studies should be shared as soon as possible to inform reopening decisions by other school leaders. School administrators, public health departments, and researchers should work together to collect, analyze, and publish data on K-12 school reopening. Data that should be prioritized for collection include aggregate metrics at the school, district, county, state, and national levels on cases and outbreaks in schools, including detailed information on mitigation and response measures (including testing) in place. In addition, real-world evidence on the sensitivity and specificity of diagnostic and screening testing is needed, particularly in both symptomatic and asymptomatic children and asymptomatic adults. Studies to determine the relationship between infectiousness and viral load are also needed. School leaders and researchers should comply with relevant privacy and human subjects research requirements when undertaking this research.

Finally, pilot tests of screening and surveillance protocols should be implemented, both to test the feasibility and impact of such testing, and to build best practice implementation guides to allow rapid scaling if these approaches work. Hospitals and certain universities have used frequent routine testing to contain outbreaks. These testing regimes have generally used laboratory-based diagnostic tests, rather than rapid screening tests. However, the availability of rapid, inexpensive tests that can be performed at the point of care is rising. More evidence is needed to understand how differences in test performance will affect outcomes. One effort to generate this type of evidence, led by the U.S. Department of Health and Human Services (HHS) and The Rockefeller Foundation, involves partnering with select cities and states to establish a pilot testing program to implement some of the approaches proposed in this document. As more evidence grows through these pilots and other studies over the next year, this document will be periodically revised and expanded based on that information.