

MINIMIZING DISEASE TRANSMISSION IN SCHOOLS

APRIL 2021

While it is not possible to eliminate the risk of disease transmission in schools, evidence from reopened schools indicates that simple mitigation measures like masking, social distancing, and ventilation are effective in substantially reducing COVID-19 transmission to students and teachers. Given differences by age in susceptibility to and transmission of COVID-19, schools may need to employ different approaches for each level of education. While community transmission remains high, schools can also halt or modify non-instructional activities that contribute to disease transmission. Although universal testing may not be necessary, schools should have protocols for isolating suspected and confirmed cases, tracing their contacts, and quarantining exposed individuals. Given that children are less likely to transmit COVID-19 than adults and that most documented school-based transmission has occurred among staff, schools and the broader education system should promote a culture of adopting mitigation measures inside and outside school.

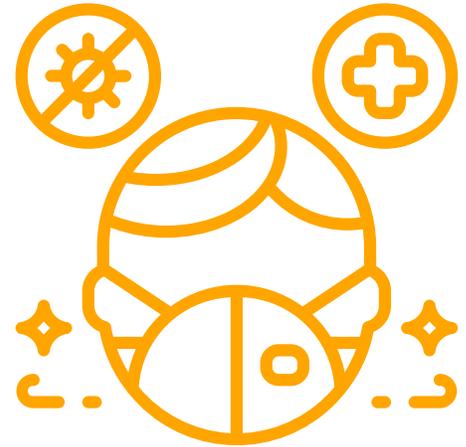


The COVID-19 virus primarily spreads through respiratory droplets exchanged by individuals in close proximity and typically enters the body through the eyes, nose, and mouth. These droplets are emitted when someone coughs, sneezes, sings, talks, or breathes. Some [evidence](#) suggests that the virus can be airborne as well (spreading through aerosols), which means that COVID-19 particles can remain in the air even after an infected person leaves the area ([MacIntyre et al. 2015](#); [Roberge 2016](#); [Chu et al. 2020](#); [Clase et al. 2020](#); [MacIntyre and Chughtai 2020](#); [Mitze et al. 2020](#); [Wang et al. 2020](#)). Documented cases of airborne transmission, however, have occurred in enclosed, poorly ventilated spaces where an infected person was [singing](#). Thus, in a school setting, measures to mitigate transmission should focus on preventing the spread of virus-infected particles and maintaining physical distance between individuals. Evidence from reopened schools suggests that simple and inexpensive measures can be effective in substantially reducing the risk of disease transmission, and experts recommend that these strategies be used in combination. Schools also need to develop protocols for when students or teachers fall sick.

Masks

How masks work

Masks protect the wearer and others by filtering infected particles. They also help prevent people from touching their nose and mouth. Layers of fiber within the mask trap particles carrying the virus through a process called filtration. While masks like the N95 respirator are most effective in filtering these particles, simpler masks made of tightly woven cotton can also work well. The New York Times has created an [animated graphic](#) that demonstrates the process at the microscopic level, and PBS Digital Studios has produced a [video](#) that even younger audiences can follow that presents slow-motion air flow out of the nose and mouth when someone is masked and unmasked.

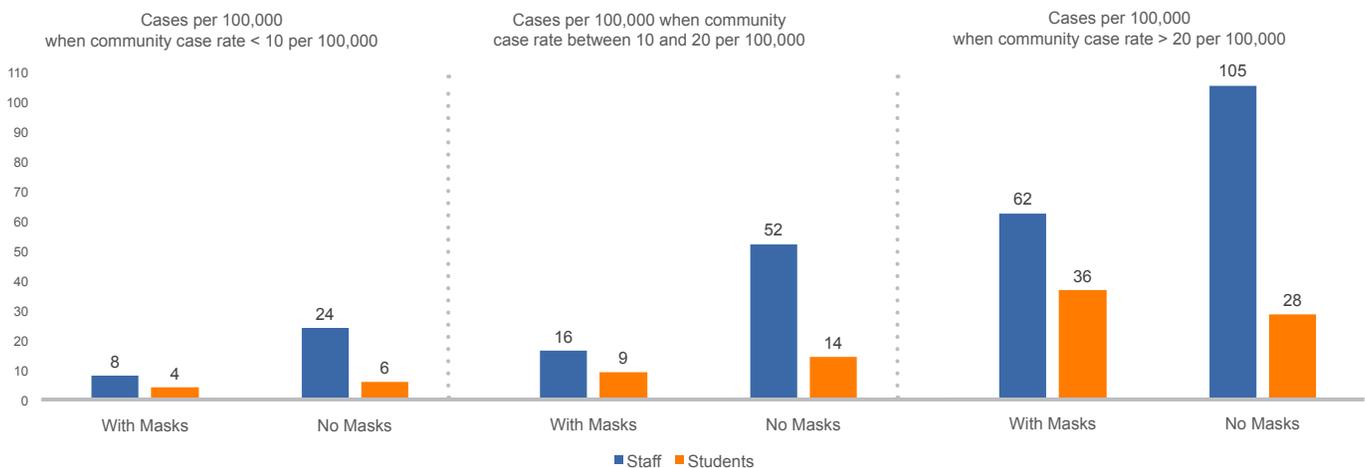


Effectiveness in practice

While it may be clear that masks can prevent the transmission of COVID-19, does prevention occur in practice when there is variation in the materials that people use and in [how they wear their masks](#)?

Evidence from systematic reviews, randomized control trials, and quasi-experimental studies in the peer-reviewed scientific literature suggests that masks are effective in reducing the transmission of COVID-19 in both health care and community settings ([MacIntyre et al. 2015](#); [Roberge 2016](#); [Chu et al. 2020](#); [Clase et al. 2020](#); [MacIntyre and Chughtai 2020](#); [Mitze et al. 2020](#); [Wang et al. 2020](#)). The evidence also suggests that plastic face shields worn without masks underneath are not as effective as masks alone in preventing transmission.

Evidence from reopened schools in the United States from the [National COVID-19 School Response Dashboard](#) is consistent with what appears in the peer-reviewed literature. While the dashboard cannot distinguish between cases acquired in school and cases acquired in the community, the schools that do not require student masking report more cases of COVID-19 among both students and school staff. These data show substantially fewer cases among children, and contact tracing studies indicate a higher likelihood of staff-to-staff transmission than child-to-staff transmission observed in contact tracing studies (see [Is It Safe to Reopen Schools?](#)). Thus, mitigation strategies like masking will disproportionately benefit staff.



Source: National COVID-19 School Response Dashboard (United States), March 5, 2021.

Who should wear masks

In contrast to earlier periods of the pandemic when health authorities offered conflicting advice on who should wear masks, experts now agree that in public settings and at any events or gatherings adults should wear masks when there is community transmission of COVID-19. The WHO recommends that within schools, teachers and support staff

and children over the age of twelve years wear masks when they cannot guarantee at least a one-meter distance from others or if there is widespread transmission in the area.

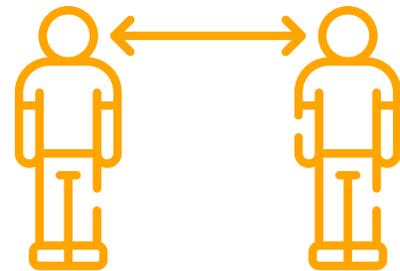
While the Centers for Disease Control and Prevention (CDC) in the United States recommends that only children under the age of two years should not wear a mask, the WHO extends the age cutoff to five years, citing issues related to safety and younger children's ability to use a mask appropriately with minimal assistance. For children ages six to eleven years old, the WHO recommends that masking protocols in schools be based on the rate of community transmission, the ability of the child to use a mask appropriately, access to clean and replacement masks, the presence of adult supervision, and proximity to people who are ill. Students ages twelve and older should, like adults, mask whenever they are in a public setting. Children with developmental disorders, physical disabilities, or severe cognitive or respiratory impairments should not be required to wear masks, and for these children, it is important that other mitigation strategies are used to keep them, their peers, and their teachers safe.

Maintaining Physical Distance

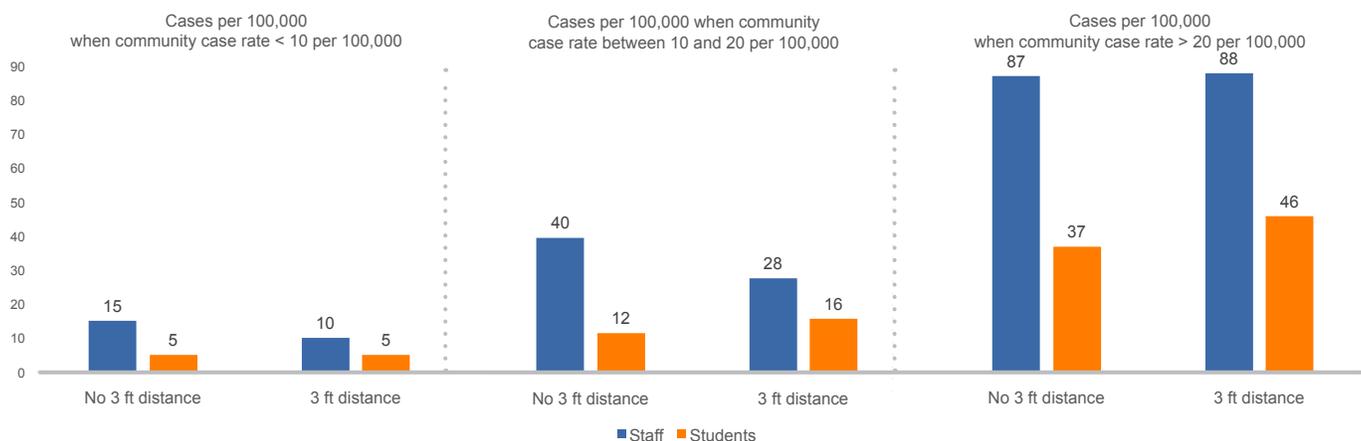
The greater the distance between people, the less likely they will be exposed to each other's respiratory droplets. Ensuring a certain distance between people is the mitigation measure that has the greatest impact on school operations.

Recommended Distance

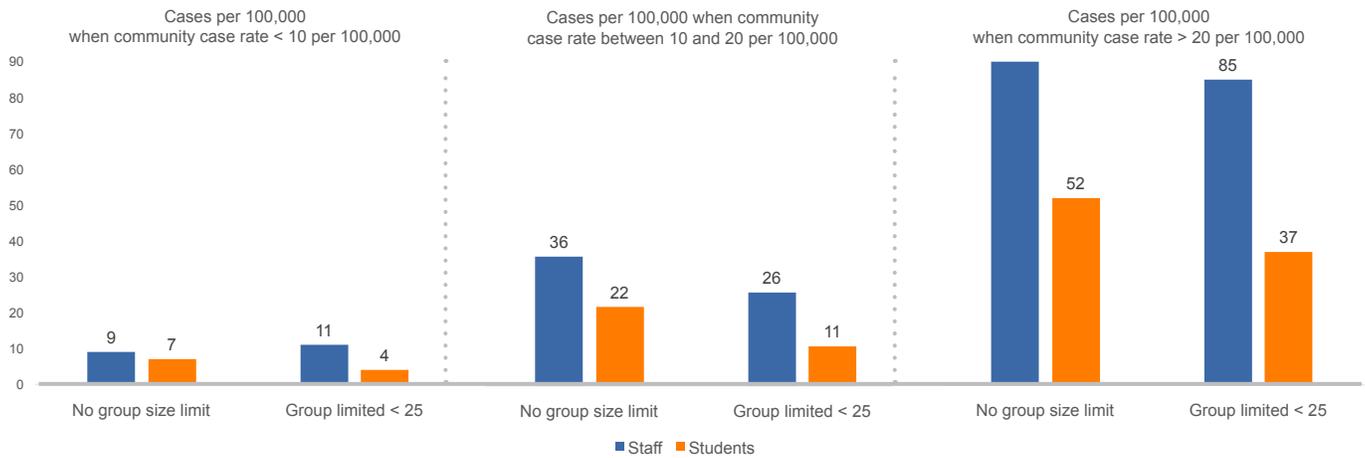
The [WHO recommends](#) that schools maintain at least one meter (three feet) between individuals whenever possible. In the peer-reviewed literature, a systematic review in which most of the included studies were in health care settings, demonstrated "moderate certainty" that policies requiring one meter (three feet) of separation are associated with reduced infection rates compared to situations without these policies ([Chu et al. 2020](#)).



Evidence from reopened schools in the United States from the [National COVID-19 School Response Dashboard](#) is consistent with lower infection rates among teachers when schools have a policy of maintaining one meter (three feet) of separation between students, although in schools in communities with high transmission rates, infection rates appear similar across schools that maintain a distance of three feet and schools that do not follow distancing protocols. Similarly, student infection rates are lower in schools that impose group limits of 25 students. Again, it is important to note that infections observed in this data could have been acquired in either the school, household, or community.



Source: National COVID-19 School Response Dashboard (United States), March 7, 2021.



Source: National COVID-19 School Response Dashboard (United States), March 7, 2021.

Achieving appropriate distancing

Classroom layout

Students' desks or spots on a bench should be separated; they are no longer able to sit together at a table or in a cluster of desks. Teachers should also maintain distance between themselves and their students, including during instruction. Markings on the floor and benches (with paint, tape, or stickers) can help students and teachers recognize the target distance of separation.



Personal supplies

Students should bring their own writing tools, paper, small electronic equipment, and books, as sharing supplies increases the chance of infection. If students cannot provide their own supplies, schools must procure enough materials so they can be adequately disinfected between uses.



Navigation around school

Making certain hallways one way can help students and teachers maintain distance. Similarly, limiting the situations when students must move as a group also limits proximity. Teachers can rotate across classrooms, if necessary, and students can remain in the same classroom for the day. Keeping students in cohorts in this way not only increases the distance between them and students outside of their cohort; it also aids contact tracing when an infected individual attending the school is identified.



Shifting students and hybrid instruction

The size of many schools precludes maintaining a distance of one meter (three feet) between students. In these cases, schools might have to break students into shifts, thus limiting their in-person instructional time. For example, half of the students may come into school for one week, while the other half engages in remote instruction at home. Then the groups switch places of instruction the following week.

A shifting model may also be necessary for older children (students over the age of ten or twelve years) who are more susceptible to COVID-19 and transmit the disease like adults. Older students can also more effectively engage in remote instruction compared to younger learners.



Arrival and dismissal

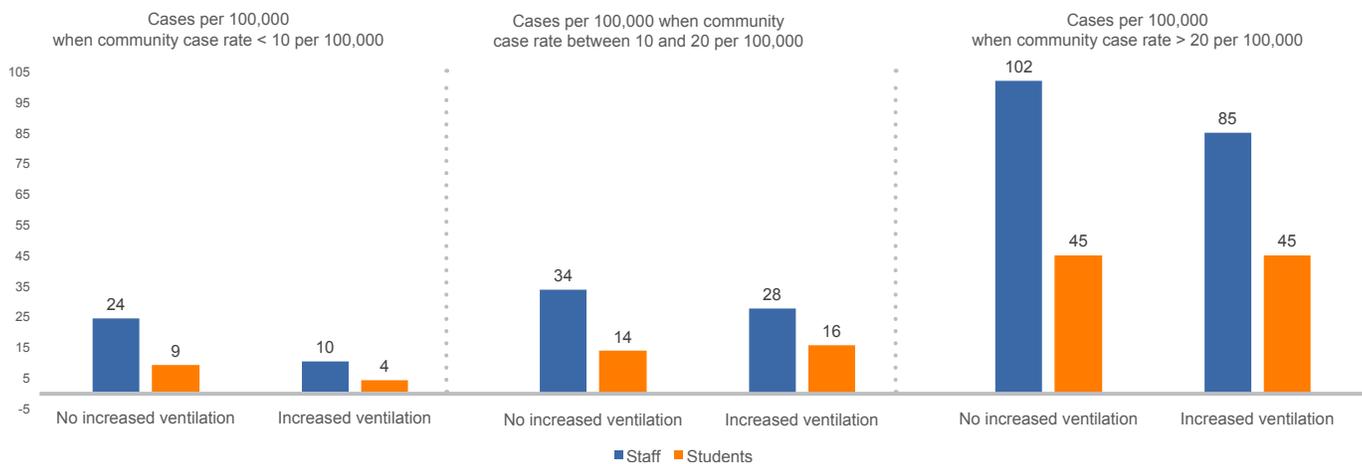
Maintaining an adequate distance is also challenging when parents and students congregate at the entrance of the school when schools open and close for the day. To avoid this situation, schools can stagger the arrival and dismissal times for students or designate grade-specific entrances and exits.



Ventilation

Even though the primary transmission route of COVID-19 is not by air, ventilation does play a role in preventing the spread of any respiratory pathogen. Increasing the circulation of outdoor air delivers clean air and dilutes the concentration of virus particles in the air.

Evidence from reopened schools in the United States from the [National COVID-19 School Response Dashboard](#) suggests lower rates of infection when schools reported taking measures to increase ventilation.



Source: National COVID-19 School Response Dashboard (United States), March 7, 2021.

Options to increase ventilation in schools range from simple, low-cost measures to more expensive capital investments such as installing or upgrading central ventilation systems.

Moving activities outside

If weather conditions, space, and safety permit, instruction can be moved outdoors. Outdoor spaces can also accommodate activities that cannot be done while masked, like eating, or activities that release high amounts of respiratory droplets, like singing, recitation, sports, or exercise.



Opening windows and doors

Opening windows and doors is a simple way to increase the circulation of outdoor air in schools. Windows may require screens, and thermostats may need to be adjusted to avoid other health risks like falling or exposure to very cold or very hot temperatures.



Fans

When windows and doors are open, child-safe fans can also increase the circulation of clean outdoor air.



Heating, ventilation, and air conditioning (HVAC)

Centralized systems or room units can be set to bring in as much outdoor air as possible and to reduce air recirculation. Controls that reduce air supply based on temperature or occupancy can also be disabled. Both the WHO and the CDC recommend running HVAC systems at maximum outside airflow for two hours before and after the school is occupied. It is also important to make sure that the filters used in these systems are appropriately sized, installed, cleaned, and replaced.



Hygiene

Handwashing and sanitizer

While it is important that students continue to use soap and water to wash their hands before eating, after using the bathroom, and when hands are visibly dirty, supplemental hand hygiene using hand sanitizer has been shown to decrease the transmission of influenza and influenza-like illnesses in randomized control trials, with one trial finding hourly use to be more effective than usage every two hours or only before eating ([Stebbins et al. 2011](#)). A study of WHO-recommended formulations for alcohol-based hand rubs found that they were effective in inactivating SARS-COV-2 within 30 seconds ([Kratzel et al. 2020](#)). The United States' CDC recommends hand sanitizers that contain at least 60 percent alcohol (ethanol or ethyl alcohol).

Getting supplies like soap and sanitizer to schools is just the first step, however. Adherence to hand hygiene among both children and adults is a behavioral challenge, and schools can use visual reminders and incorporate frequent slots for hand hygiene into the structure of the school day.



Cleaning and disinfecting

Frequently touched surfaces, such as drinking fountains, light switches, door handles, and sinks, and shared equipment should be cleaned and disinfected regularly. Cleaning with soap and water first removes dirt, and disinfectants kill germs on surfaces. For disinfection, the WHO recommends using sodium hypochlorite (bleach or chlorine) at a concentration of 0.1 percent or 1,000ppm (1 part of 5% strength household bleach to 49 parts of water) or solutions containing 70 to 90 percent alcohol. The United States' CDC recommends making a new diluted bleach solution daily, as bleach solutions may not be as effective in killing the virus after being mixed with water for more than 24 hours.



Protocols for Isolation, Quarantine, and Closure

It is important that schools make it clear that staff and students should stay home when they feel unwell. If a student or staff member shows any symptoms of illness or has contact with a person known to have COVID-19, schools should have protocols for isolating the individual, identifying with whom in the school the individual was in contact, and quarantining the sick person and the individual's contacts if a COVID-19 diagnosis is made. Taiwan, for example, where there was never a full closure of all schools, used a protocol called classroom suspension. If one or more students or staff in a class had a confirmed COVID-19 diagnosis, that class and any other class attended by the sick students or staff was suspended for 14 days. If two or more cases were confirmed in a school, the school closed for 14 days. If, following this protocol, one third of schools in a city or district had to close, then all schools had to close.

Keeping students in cohorts and minimizing interactions between cohorts can aid in tracing a sick person's close contacts—individuals who came within one meter (three feet) of a COVID-19 case in the period spanning two days before to fourteen days after the onset of illness. These contacts should be notified and advised to quarantine, self-monitor, and get tested.

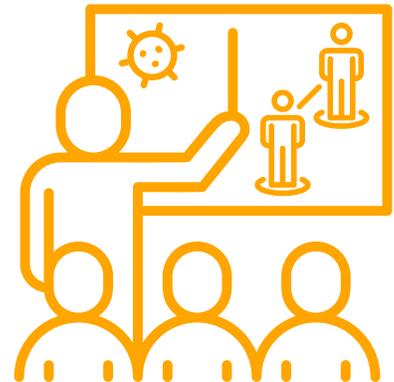
Screening and testing

Schools in many of the countries that reopened early administered daily temperature checks and identified any symptoms when students arrived at school. The WHO recommends that schools consider daily screening for fever in the previous 24 hours and connecting symptomatic individuals to local health care providers for testing. Recognizing that it might not be feasible, the United States' CDC does not recommend universal testing of students or staff (that is, testing both symptomatic and asymptomatic individuals), although some school districts have implemented testing with pooled or batch samples, where several samples are pooled together and test with a single diagnostic test, increasing the number of individuals that can be tested using the same amount of resources. The US Food and Drug Administration, however, [warns](#) that the dilution of samples increases the chances of false negative test results and that this approach works best when case prevalence is low.



Educating Communities

Even before the COVID-19 pandemic, schools often served as information hubs for communities. In this time of uncertainty, when not only are transmission rates in communities fluctuating but also our knowledge of what is safe is improving, the role of schools to educate communities is even more important. Minimizing disease transmission in schools requires that students and staff adhere to mitigation measures in school and in the community (see Communication with Stakeholders). Schools can communicate their expectations for maintaining mitigation measures when students and staff are not in school (for example, when using public transport or when socializing) and publicize a policy of having students and school staff remain at home when sick.



Useful Resources



Reopening Strategies

- [Reopening Schools in the Context of COVID-19: Health and Safety Guidelines from Other Countries](#)
- [What we know about COVID-19 transmission in schools \(in French\)](#)

Masks

- [Coronavirus Disease \(COVID-19\): Children and Masks](#)
- [Your Guide to Masks](#)

Physical Distancing

- [Schools and the Path to Zero: Strategies for Pandemic Resilience in the Face of High Community Spread](#)

Ventilation

- [5-Step Guide to Checking Ventilation Rates in Classrooms](#)
- [Ventilation in Schools and Childcare Programs](#)

Handwashing and Sanitizer

- [Guide to Local Production: WHO-Recommended Handrub Formulations](#)

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