

MINIMIZING DISEASE TRANSMISSION IN SCHOOLS

SEPTEMBER 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. While the research on pediatric cases of COVID-19 is still emerging, the evidence indicates that children are less likely to be infected with COVID-19, less likely to become seriously ill or die, and less likely to transmit the virus. Therefore, schools are not considered high-risk environments and most documented cases of school-based transmission seems to have spread from staff to other staff. However, schools and the broader education system have an important role in educating families and should promote a culture of adopting mitigation measures inside and outside school to keep children, parents, educators, and the wider community safe and healthy.

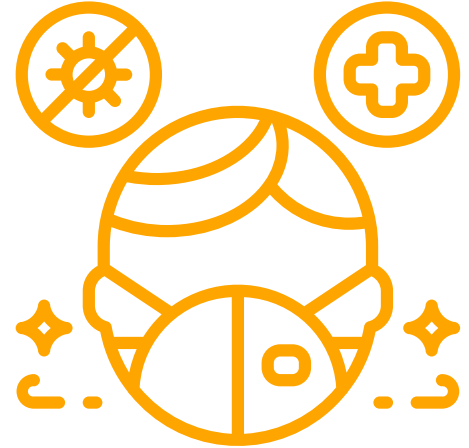


The SARS-CoV-2 virus causing COVID-19 spreads primarily through respiratory droplets exchanged by individuals in close proximity and typically enters the body through the eyes, nose, and mouth. These droplets are emitted when someone coughs, sneezes, sings, talks, or breathes. Evidence shows that the virus can be airborne as well (spreading through aerosols), which means that virus particles can remain in the air even after an infected person leaves the area. The risk of airborne transmission increases in enclosed, poorly ventilated spaces and where an infected person is shouting, singing, or exercising, and the risk is especially high during prolonged instances of such conditions. 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

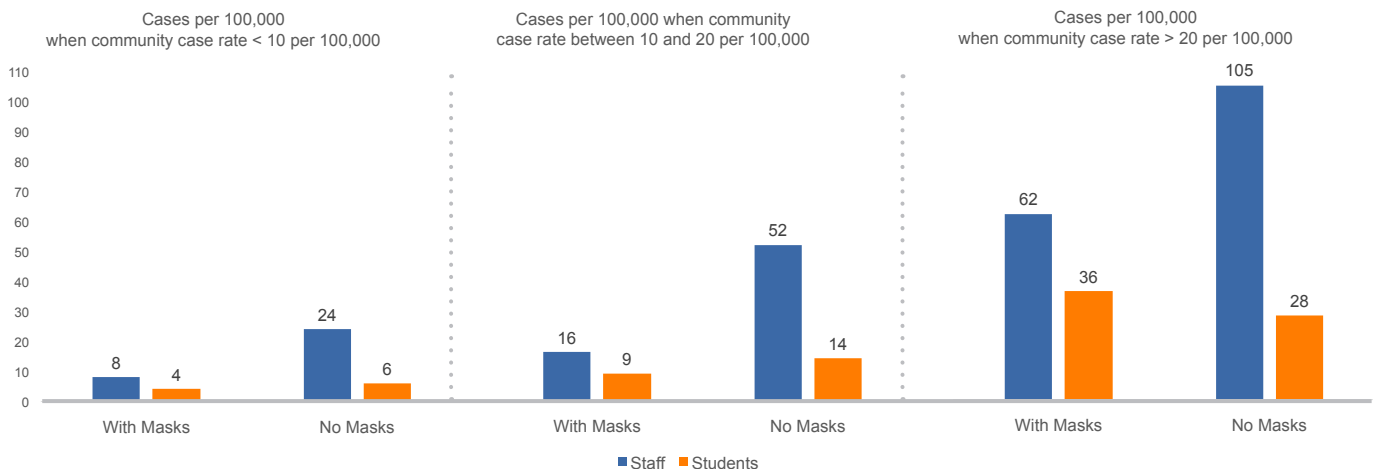
Masks protect the wearer and others by filtering infected particles. They also help prevent people from touching their nose and mouth. Layers of fiber within the mask trap particles carrying the virus through a process called filtration. While masks like the N95 respirator are most effective in filtering 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](#)). A recent randomized control trial in Bangladesh which tracked more than 340,000 adults across 600 villages found that an intervention that encouraged mask use among adults was effective in increasing adoption of masks and reducing symptomatic SARS-CoV-2 infections ([Abaluck et al. 2021](#)). 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, based on data from the [National COVID-19 School Response Dashboard](#) in March 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 (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. However, the advice concerning children still varies. This section lays out the recommendations from public health agencies and policies regarding masks in schools from several countries.

As of August 4 2021, the Center for Disease Control and Prevention (CDC) in the United States released updated guidelines for schools due to the circulating and highly contagious Delta variant. The [CDC recommends](#) universal indoor masking by all students (age 2 and older), staff, teachers, and visitors to K-12 schools, regardless of vaccination status.

In comparison, the [WHO recommends](#) teachers, 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. For children ages six to eleven years old, the WHO recommends 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. Children under five years old and 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.

The European Center for Disease Prevention and Control (ECDC) aligns with the guidance issued by the WHO, [recommending](#) that mitigation measures be adjusted to age groups, educational setting, and transmission levels, and does not recommend masks for children under six. The ECDC recommendation is reflected in many European countries' policy not to require masks for younger children, although some countries have opted to skip the mask requirements for all students. In [Sweden](#) and [Norway](#), masks have never been recommended at any level of schooling and will not be recommended in the fall either. Similarly, in [England](#) and [Wales](#), no students will be required to wear masks, though [Scotland](#) and [Northern Ireland](#) will begin the year with mask requirements for secondary students but review the guidance early in the fall. [Iceland](#) only requires upper secondary students to wear masks while actively moving around in the school, similarly to [the Netherlands](#) that requires masks for secondary students in hallways. [Spain](#), [France](#), and [Italy](#) all require masks for primary and secondary students, but not for children under six in nursery schools. However, all these countries enjoy high vaccination rates, far higher than most low- and middle-income countries. They also implement alternative strategies, such as keeping cohorts of students separate and isolated, that may be unfeasible in many countries.

While accounting for local conditions when developing masking policies is a reasonable strategy, making such judgements places a great deal of responsibility and effort on school staff and administrators to keep abreast of community transmission, even though many countries lack accurate and timely local data. Imposing indoor mask requirements for students above age six, in line with the larger European countries, means erring on the side of caution but is a decision that may be a good fit where vaccination rates are low, testing is limited, and actual transmission levels are unknown. In addition, such a policy would be in line with WHO recommendations, without having to be constantly revised.

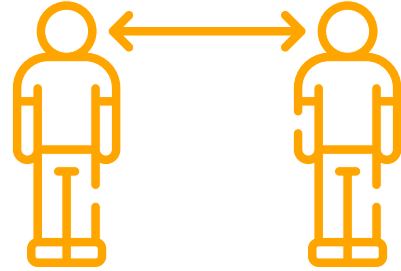
Vaccination is the best way to prevent the spread of COVID-19, but as younger children remain ineligible for the vaccine, masking, along with other safety measures like improving ventilation are important to reduce the spread. With mask requirements, in-school learning is safe and more effective than remote instruction. While wearing a mask may be uncomfortable, and makes it harder to communicate in the classroom, masking in combination with other mitigation strategies can help ensure safe in-person instruction and prevent transmission in schools.

Maintaining Physical Distance

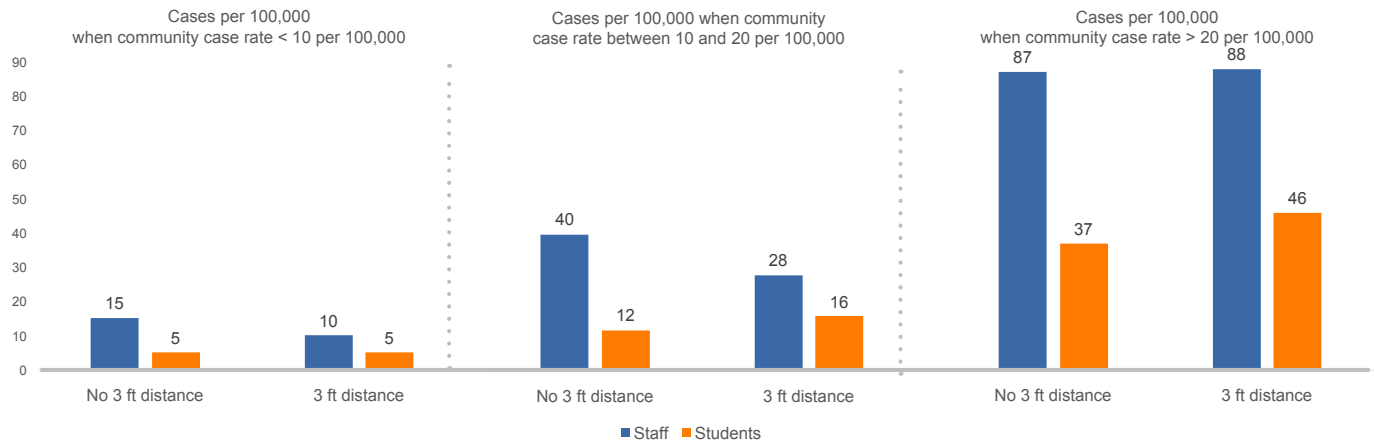
The greater the distance between people, the less likely they will be exposed to each other’s respiratory droplets.

Recommended Distance

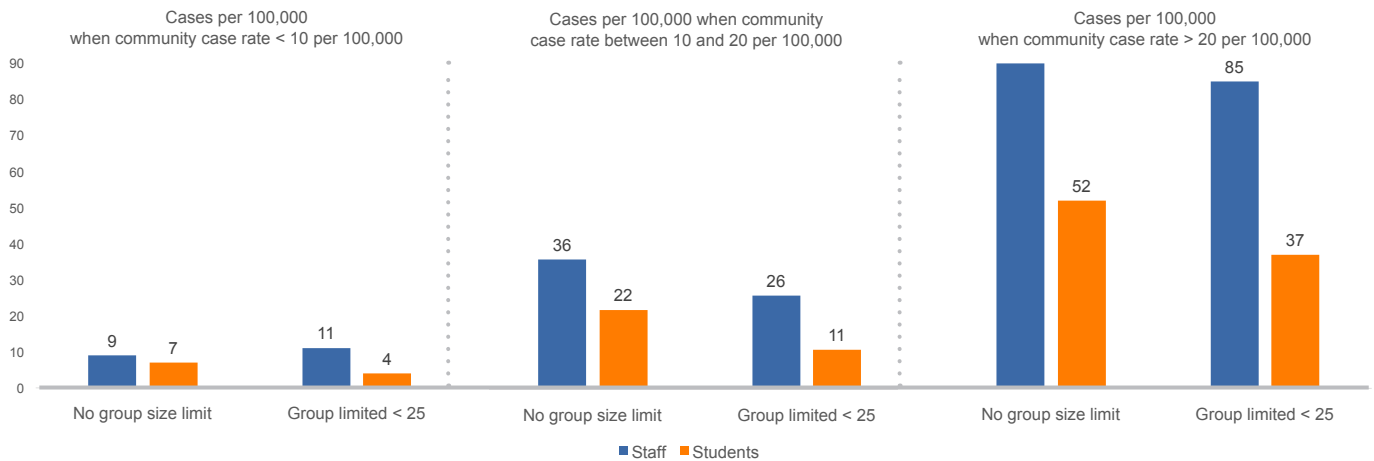
The [WHO recommends](#) that schools maintain at least one meter (three feet) between individuals whenever possible. In the peer-reviewed literature, a systematic review in which most of the included studies were in health care settings, demonstrated “moderate certainty” that policies requiring one meter (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](#) in March 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.



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While the most recent data from May shows significant reductions in cases, both in schools with and without physical distancing measures and group size limits, it likely reflects low overall transmission rates in the United States at that time. As schools open for the fall semester, it is important to keep track of case developments in schools.

Achieving appropriate distancing

Classroom layout

Students' desks or spots on a bench should be separated to ensure a distance of one meter (three feet) between students to the extent possible. 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.



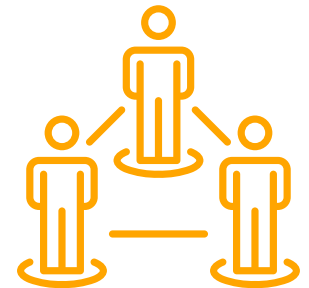
Personal supplies

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 only allow for one-way traffic can help students and teachers maintain distance. Similarly, limiting the situations when students must move as a group also limits proximity and thereby the risk of transmission. 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 one meter (three feet) between students. In these cases, schools might have to break students into shifts, thus limiting their in-person instructional time. Belgium, Denmark, Germany, Greece, Norway, Switzerland and South Korea have all tried reducing class sizes, usually to 10-15 students per class or around 50 percent capacity ([Guthrie et al. 2020](#)). 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. Such a hybrid model with students rotating in shifts on a weekly basis has been implemented in Qatar, with 50 percent of students attending school in person while 50 percent of students engage in online learning at home.



A hybrid instruction model should be applied as necessary but may be more suitable for older children (students over the age of ten) who are more susceptible to COVID-19 and transmit the disease more easily than younger students. Older students can also engage more effectively in remote instruction compared to younger learners. For younger learners, the school day may be broken into two shifts based on grade levels, with half of the students in a morning shift, and half in an afternoon shift, as in primary schools in Uttar Pradesh in India.

Arrival and dismissal

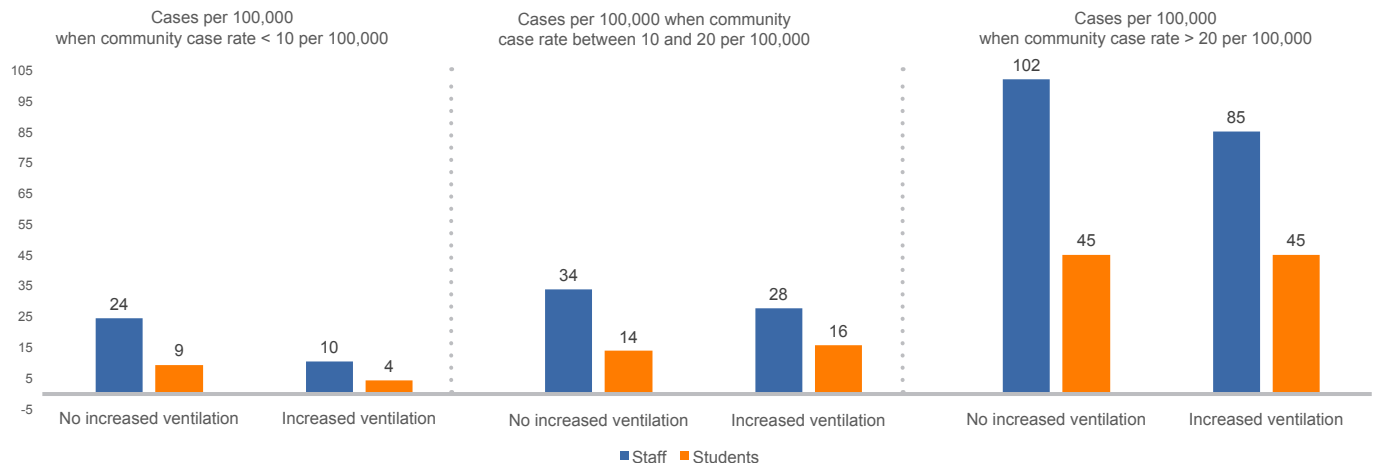
Maintaining an adequate distance is also challenging when parents and students congregate at the entrance of the school when schools open and close for the day. To avoid this situation, schools can stagger the arrival and dismissal times for students or designate grade-specific entrances and exits.



Ventilation

Ventilation plays 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.

A recent large-scale Center for Disease Control and Prevention (CDC) study of school-level prevention measures in Georgia, United States found ventilation to be an effective mitigation strategy. After adjusting for levels of community transmission, the COVID-19 incidence was 39% lower in schools that worked to improve ventilation ([Gettings et al. 2021](#)). In addition, evidence from reopened schools in the United States from the [National COVID-19 School Response Dashboard](#) in March 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.

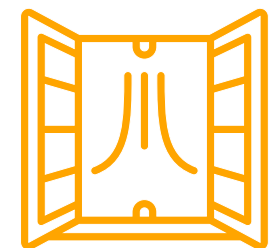
Moving activities outside

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 considerable amounts of respiratory droplets, like singing, recitation, sports, or exercise.



Opening windows and doors

Opening windows and doors is a low effort 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 schools are 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. In the first year of the pandemic Taiwan 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.

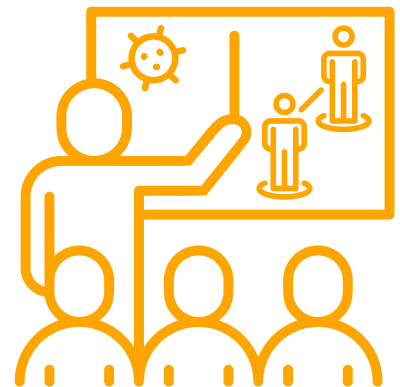
Screening and testing

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 number 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](#)
- [COVID-19 in children and the role of school settings in transmission](#)
- [What we know about COVID-19 transmission in schools \(in French\)](#)
- [COVID and schools: the evidence for reopening safely](#)

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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