

The Science is Clear: Layered Infection Prevention and Control Measures Allow Return to Safe In-Person Learning

Across the nation, K-12 schools are opening or preparing to reopen for in-person learning. To ensure broad support from educators, administrators, and families, they must be able to offer safe learning environments, even in instances of high levels of community spread of COVID-19.

More than a year into the pandemic, the science is clear: Robust school-based infection prevention and control (IPC) programs are key to opening schools safely for in-person learning. By providing layered protection strategies, applied at the school level, IPC programs have proven effective at preventing in-school transmission. Schools across the nation that have implemented robust IPC programs have successfully stayed open without significant outbreaks.

In this consensus statement, a group of leading scientists confirms and explains the evidence-base on which effective IPC programs are built. The scientific basis for these IPC measures has expanded even further in recent months, and the latest CDC guidance reflects this matured body of evidence. Because the CDC guidance included adjustments to prior recommendations, however, it has also surfaced new questions — for example about the role of ventilation or the considerations for requirements about spacing between students.

Building on and adding to the latest CDC guidance, we are publishing this consensus statement to clarify remaining questions and to share evidence that supports effective IPC strategies. With clear, actionable guidance at hand, states and districts can access the American Rescue Plan funding provided by Congress to design and implement robust IPC programs and safely open America's schools.

OPENING SCHOOLS SAFELY: LAYERED INFECTION PREVENTION AND CONTROL IS KEY

Schools across the nation and the world have been open for in-person learning to varying degrees for the 2020-21 school year, providing many opportunities to study effective ways to prevent in-school transmission. The accumulated body of evidence, including studies specific to U.S. schools

and schools in areas with high community spread, shows that robust, layered infection prevention and control measures allow schools to continue to operate even in areas with high community spread.^{1, 2, 3, 4, 5, 6} Rather than community infection levels, what matters most for making decisions about in-person instruction is each individual school's success in consistently implementing effective IPC measures in a layered way across settings.

To promote safe in-person learning environments for students and staff, school leaders must develop effective practices in each of these seven categories of infection prevention and control:

1. Universal and correct use of masks
2. Ventilation and filtration
3. Handwashing and respiratory etiquette
4. Testing and Contact Tracing
5. Spacing and physical distancing
6. Cleaning and disinfection
7. Vaccines

Schools, district leaders, and communities also need to understand the interactions among these measures. Effective IPC is rooted in multiple layers of mitigation: Schools require robust ventilation and air filtration as well as proper mask wearing, hand washing, testing and contact tracing, and other measures mentioned above.

Each of these layers must be independently defined, but cohesively implemented. Just as the safety of a car requires well-gripping tires, effective brakes and working seat belts (with none of them being a substitute for the other), IPC in schools requires focus on each area but all of them implemented together. This means that in order for recommendations in one layer to translate into improving safety, other layers must be properly implemented as well.

Leading institutions and groups with relevant expertise have consistently recommended these interventions, and there is agreement that applying them in layered prevention programs is key to keeping in-school transmission at or near zero.^{7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20}

RESOLVING REMAINING QUESTIONS

Two of the seven IPC measures, and the evidence supporting them, are at this point well-established and well-understood: Universal masking, and handwashing and respiratory

etiquette (see the end of this document for a quick overview and further resources on these two measures.)

The remaining five IPC measures, and the evidence supporting them, are still in need of further clarification: Ventilation and filtration, testing and contact tracing, spacing and physical distancing, cleaning and disinfection, and vaccines.

VENTILATION AND FILTRATION

In the context of a virus that is spread through aerosol particles in exhaled breath, coughing, and sneezing, both close-range and far-field within-room transmission need to be addressed. At close range, the primary prevention control measure is masks. To prevent far-field transmission, which can happen when respiratory aerosols build up in a room, ventilation and filtration are key to infection prevention and control in schools. It is now clear that building controls play a critical role in mitigating airborne transmission, and that air exchanges that result in fewer virus particles present in a room are both achievable and affordable in schools regardless of built environments.^{20, 21, 22, 23}

We recommend schools target four to six air changes per hour, which is achievable in most classroom spaces.²⁴ Studies have demonstrated that opening even a single window in a classroom can be effective in reducing in-school transmissions.²⁵ When windows cannot be opened or only be opened partially, purchasing cheap portable cleaners with HEPA filters can achieve the recommended improvements in air quality.

Wherever possible, schools should upgrade their ventilation systems for better circulation, utilizing state and federal funding allocated to schools in the American Rescue Plan. As these systems may take a while to upgrade, temporary measures (such as open windows, cleaners with HEPA filters) must be implemented as well.

As improved filtration and ventilation become standard in schools, leaders should be aware that not all systems available on the market are of equal quality. Expert resources are available that provide ways to identify effective filtration systems, and tag those which should be avoided.²⁴

Recent studies also show that physical barriers, such as plexiglass shields, between students or students and staff can interfere with proper ventilation, and that as long as there is strong adherence to mask wearing, these barriers do not provide additional protection.^{26, 27, 28, 29} Barriers are never a substitute for mask wearing, and never a substitute for good ventilation or filtration because they do

not prevent accumulation of aerosols in a room. Overuse of barriers can dramatically interfere with airflow.

Barriers may be considered in contexts where a staff member has to face many different people face to face every day without the capacity to enforce proper mask wearing. Examples here include bus drivers, or cafeteria workers. Schools that have barriers or are considering them must conduct a thorough ventilation assessment to determine if barriers are adding protection or generating new risks.

Next to classrooms, schools need to consider air quality in settings that are at increased risk of transmission, such as gyms and auditoria, where larger groups may congregate. Schools also need to consider air quality settings at certain times within their daily operations, such as lunch time. Cafeterias pose an increased risk because eating results in times when masks are off, so next to proper ventilation and filtration, extra distancing is recommended.

When considering ventilation and filtration, schools should further understand how students and staff move around the building for classroom changes, breaks, and at the end of the school day. Proper ventilation and filtration controls should extend beyond the school environment, into transportation and extracurricular settings. On school buses, for example, windows should be open even if just a few inches, masks must be worn correctly at all times, and if an air-conditioning system is on, it should not be in recirculation mode.

Specific needs and solutions will necessarily vary on a school-by-school basis based on different built environments, but each school's and district's infection prevention and control protocol should be guided by scientific evidence and up to date official guidance.

DIAGNOSTIC TESTING, ROUTINE TESTING, AND CONTACT TRACING AND SUPPORTED ISOLATION

Testing is a key tool to understand whether infection prevention and control measures are adequate and successful at preventing in-school transmission, especially from asymptomatic spread. Combined with robust contact tracing efforts, testing allows school leadership to understand if the virus is present in the school, and where transmission is occurring.^{30, 31} Proper testing and tracing contacts of individuals who test positive can identify small clusters, which can indicate where infection control protocols may be needed (for example, on the bus) or may have broken down (for example, during lunch). Frequent testing regardless of symptoms, and getting results on site or

within a few hours, can also reduce the risk of in-school transmission by identifying infections early, before they have had a chance to spread.³² Finally, and importantly, testing engenders trust among parents, staff, and students.³³

There are three types of testing that schools can use for different purposes:

Diagnostic testing of students and staff showing symptoms. Participants are identified by daily screening mechanisms, which include basic wellness checks and symptom monitoring. This is enabled by education to parents about the importance of staying home when sick or if a child has been exposed to an individual infected with Covid-19. Diagnostic testing and family education about symptoms are an essential part of IPC and should be applied in all schools.

Screening testing of all students and staff. Frequent (1-2x per week), routine testing of all students and staff can be used as an additional mitigation measure, breaking chains of transmission to help stop spread from an infected but asymptomatic or pre-symptomatic individual. This type of testing is recommended, especially when community case levels are high.

Surveillance testing to help understand school prevalence for decision-making. This involves less frequent routine testing (less than 1x per week) of either all or a random subset of both students and staff. This type of testing will not significantly affect transmission of the virus but can be informative regarding if in-school transmission is occurring. This type of testing is recommended as an alternative to screening testing, especially when community case levels are low.

Note that testing and contact tracing are only useful if schools enforce all quarantine and isolation procedures when positive cases are identified. Isolation and quarantines reduce the chances of transmission for symptomatic and asymptomatic cases both within schools and in the surrounding community. Regardless of symptoms, schools should mandate that every positive student and staff isolate for at least ten days, and provide paid sick leave and additional supports where appropriate.^{34, 35}

Schools should also immediately inform local health departments of positive cases, so that health officials can identify close contacts and mandate additional quarantines.

SPACING AND PHYSICAL DISTANCING

All schools should be implementing interventions that allow physical distancing at all times. Since COVID-19 is caused by an airborne virus, and mask wearing and respiratory etiquette must be part of any IPC protocol, the key question for schools is: How much distance is enough to avoid transmission? The answer to this question depends on several factors:

- Is the interaction happening between children only, between children and adults, or between adults only? Are the children of elementary, middle or high school age?
- Are additional infection control measures in place, such as masks, cohorting and ventilation?
- Are one or more individuals in the interaction fully vaccinated?

Consistently, studies have shown that younger children, particularly those in elementary school, demonstrate low susceptibility to SARS-CoV-2 infection and significantly lower rates of transmission.^{6, 36, 37, 38, 39, 40, 41} For these students, three feet of distance, provided there is mandated mask wearing and proper fit and ventilation and filtration, are adequate to maintain close to zero or zero transmission in the school.

Several global studies, referenced by the CDC in its updated guidance, have recommended three feet of physical distancing in schools.^{4, 5, 6, 42, 43, 44, 45, 46, 47, 48, 49 50, 51, 52, 53, 54, 55, 56, 57} These studies find limited difference in risk for students and staff between districts that implemented three feet of physical distance and those that implemented six feet, assuming a strong baseline of IPC measures (for example, mask wearing and adequate ventilation).

This is why the recommendation of three feet of distance for students has replaced the previous recommendation of six feet of distance between students in the latest CDC guidance for schools — as long as other key infection control measures such as proper mask wearing and hand washing are in place.⁶ There is only one exception to this latest CDC recommendation: In communities with high transmission rates (per CDC community transmission levels) where schools cannot use cohorting, middle and high school students should still be six feet apart.

For adult-adult interaction and for student-adult interaction, or in situations where students take their masks off (such as during lunch) the recommendation remains to maintain six feet of distance.

CLEANING AND DISINFECTION

The risk of catching COVID-19 from a surface such as a table, pen or doorknob — while theoretically possible — is extremely low (less than 1 in 10,000.) Many studies have confirmed this, which is why

the CDC recently relaxed its guidelines on deep cleaning and disinfection, aligning with and summarizing this robust body of evidence.^{58, 59, 60}

Surface cleaning with water and soap once a day is generally sufficient in schools, unless there has been a suspected or confirmed case of COVID-19 in the prior 24 hours. If a suspected or confirmed case becomes known, disinfection of all affected indoor areas is recommended.⁶¹

This means that measures such as closing for deep cleanings or quarantining library books are no longer recommended. To be sure, proper hand washing and respiratory etiquette (mask wearing), remain essential and should be implemented and enforced throughout.^{62, 63, 64}

VACCINES

The Pfizer, Moderna and J&J COVID-19 vaccines, now available in all states for all adults, are 100% effective at preventing hospitalizations and deaths in adults, dramatically reduce transmission to non-vaccinated individuals, and are transformative in protecting school communities.^{65, 66, 67}

Vaccinations are a very powerful layer in the IPC program, adding substantial protection as more and more individuals get vaccinated.^{7, 68}

By getting vaccinated, educators and school staff can protect their own health as well as the health of others who may not be able to get a vaccine for medical reasons. The same will be true for children, once vaccines become available for younger ages. Currently, only the Pfizer vaccine is approved for ages 16+, and states are preparing to vaccinate high school students with it. Vaccines for 12-15 year olds may be available as early as this summer.⁶⁹

Schools have a key role to play in promoting vaccination.⁷⁰ Schools can be a partner in community vaccination efforts, serve as vaccination sites, and provide reliable, trusted information about the efficacy and safety of vaccines, and about the important role vaccines play in keeping schools and communities safe. The more community members are fully vaccinated, the better.

MASKS & HANDWASHING

The importance of universal and correct use of masks, handwashing and respiratory etiquette has been well established, and schools should continue to apply these measures in all settings and with all people. Studies established early on that those infected with COVID-19 can spread the virus through aerosol particles in exhaled breath, coughing, and sneezing.⁶² Recent CDC studies confirm

that wearing any kind of mask blocks aerosol emissions and aerosol exposure much more effectively than no mask, and that the better the filtration and fit of the mask, the stronger the protection.⁶³ The current recommendation is for a minimum 2- or 3-layer mask. Proper handwashing and bathroom and respiratory hygiene — including covering coughs and sneezes — can also sharply diminish the risk of infection.⁶⁴

At this point, we do not have concrete information about when schools will be able to relax key mitigation measures such as mask wearing or distancing.⁷¹ High vaccination rates among students and staff will play a role, as will continued absence of cases in schools, and overall low case rates in the community. Additional indicators will likely emerge in the coming months.

CONCLUSION

The seven IPC elements outlined in this statement are supported by a deep scientific evidence-base, including many studies in U.S. schools. They represent alignment across experts, organizations, and the CDC. When implemented consistently, in a layered IPC program, they become the backbone of COVID-19-safe schools, even when community spread is high.

Effective, layered IPC programs, applied at the school level, will allow schools to return to safe in-person learning and keep in-school transmission at or near zero in this pandemic, and ensure we are prepared for the next one.

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