

## Facilities Upgrades

*This is one of a series of evidence-based strategies to help states and school districts invest Covid relief aid effectively. Read all 18 strategies in FutureEd's [Covid Relief Playbook](#).*

The pandemic has increased public awareness of the importance of good ventilation in schools, both to prevent the spread of the airborne Covid virus and to create an overall healthy learning environment for students and staff. According to a 2020 U.S. General Accountability Office [report](#), as many as 36,000 schools nationwide had inadequate heating, ventilation and air conditioning (HVAC) systems pre-pandemic. Likewise, an estimated 400,000 schools and childcare facilities use lead pipes to deliver water to staff and students, putting children at risk for damaging lead exposure, according to a [White House proposal](#). Many of these poorly equipped schools are in underserved communities.

### THE RESEARCH

Research suggests that ventilation systems have a significant impact on student achievement. Overheated classrooms can negatively impact learning, according to a 2018 [study](#) led by Boston University economist Joshua Goodman. Goodman's research team found that hotter school days in the previous year were linked to lower results on the PSAT, an impact that was two to three times larger among students living in communities with concentrated poverty than for their more affluent peers. For every degree Fahrenheit of increased heat, the scores dropped by an amount equivalent to 1 percent of a year's worth of learning.

Opening windows can help [dispel](#) Covid particles in classroom air, but can complicate student health in other ways, especially if outside air is polluted by industrial sites or heavy traffic. Air pollution can exacerbate asthma and interfere with brain development, as well as lead to increased school suspensions and absences, several

[studies](#) show. A research team led by Piers McNaughton of Harvard's T.H. Chan School of Public Health found that exposure to particulate air pollution was associated with higher rates of chronic absenteeism, while green space around the school was linked to better attendance. The findings were the same regardless of the student's race or income level, according to the team's 2017 [study](#).

University of Tulsa researchers found in a 2015 [study](#) that improved ventilation and the accompanying decrease in classroom temperatures and carbon dioxide levels were associated with a significant improvement in math scores. Good ventilation can also contribute to better attendance, according to a 2013 [study](#) led by Mark Mendell at the Lawrence Berkeley National Laboratory. Researchers studied 150 classrooms in 28 California schools for two years and found that updating classroom ventilation systems to state standards could bring a 3.4 percent decline in illness-related student absences.

Lead exposure has long been linked to weaker cognitive development and poorer academic performance. The events in Flint, Michigan, where changes to the water supply nearly a decade ago led to widespread exposure to lead, provided a natural experiment for economist Jessica Sauve-Syed, then at Syracuse University. Sauve-Syed compared performance of the same students before and after their exposure to lead in theater and found that the share of those reading proficiently dropped, on average, 12 to 14 percentage points; in math the share of proficient students dropped six to nine points, according to her 2017 [report](#). There is no research showing the impact of replacing lead pipes on student achievement, but other science on lead exposure strongly suggests a positive impact on students.

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## WHAT TO CONSIDER

Capital projects using Covid relief money must receive approval from state and federal authorities and abide by their rules on competitive bids and wages. While the American Rescue Plan and CDC guidance encourage school districts to upgrade ventilation, federal guidance cautions against using relief money for extensive construction projects, since the funds must be obligated by September 2024. Districts that want to pursue this option should start as soon as possible with an assessment of school building needs. The Biden administration's infrastructure proposal, under consideration in Congress, currently provides money for school repairs and replacing lead pipes.

## RESEARCH

- [Impact of Particulate Matter Exposure and Surrounding "Greenness" on Chronic Absenteeism in Massachusetts Public Schools: \*\*PROMISING\*\*](#)
- [Association of Classroom Ventilation with Reduced Illness Absence: a Prospective Study in California elementary schools: \*\*PROMISING\*\*](#)
- [Effects of Classroom Ventilation Rate and Temperature on Students' Test Scores: \*\*MODERATE\*\*](#)

## RESOURCES

- [School Districts Frequently Identified Multiple Building Systems Needing Updates or Replacement](#)
- [Foundations for Student Success: How School Buildings Influence Student Health, Thinking, and Performance](#)
- [The Ventilation Problem in Schools: Literature Review](#)
- [Heat and Learning](#)
- [Lead in the Drinking Water in Our Public Schools: Our American Way of Life](#)