Building Healthier Futures:
Transforming School Environments for Student Well-being and Success

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Introduction

CHILDREN'S HEALTH AND ACADEMIC ACHIEVEMENT are largely impacted by their school's physical environment. Exposure to environmental hazards and poor air and water quality in schools are associated with health problems, such as increased respiratory diseases and delayed cognitive development, and can harm a student's ability to learn and succeed in school. The health of school buildings is also important for the larger communities they serve, as schools are often used as community gathering spaces for meetings and events, and as emergency centers and shelters during natural disasters. Many schools lack sufficient funding, policy oversight and a developed workforce to address environmental issues. Since environmental hazards tend to disproportionately harm communities of color and low-income communities, the highest-risk learners often attend schools in the worst condition, placing them at increased risk for adverse health outcomes as well as diminished learning. The public health community has an important role in improving equitable health and education outcomes by building partnerships with schools, providing technical assistance and educational resources, and advocating for policies to ensure healthy school environments.

Physical Infrastructure and Environmental Hazards

MANY SCHOOLS IN THE UNITED STATES face significant issues with deteriorating infrastructure and various environmental hazards, particularly in communities of color and low-income communities. The average public school building was built around 1968 and at least half of all public schools need at least one major facility repair.[1] Indoor air pollution in schools is a significant risk to students' health and academic performance. The U.S. Environmental Protection Agency (EPA) has consistently ranked it among the top five environmental risks to public health.[2] Poor indoor air quality can be characterized by several pollutants including molds, volatile organic compounds, particulate matter, bacteria, and contaminants from road traffic.[3] Inadequate ventilation from outdated heating, ventilation, and air conditioning (HVAC) systems largely contributes to this problem. A 2020 GAO survey found that about 41% of public school districts need to replace or update HVAC systems in at least half of their schools.[4]

As extreme climate events like rising temperatures and wildfire smoke become more frequent, some airborne pollutants become more prevalent,[5] and many schools are forced to close at points during the school year because they don't have air conditioning and/or adequate ventilation to maintain healthy indoor air quality. The number of days school districts cancel classes for heat each year has nearly doubled in the last ten years.[6] School closures lead to declined student participation and exacerbate existing racial, socioeconomic and gender inequalities.[7]

Exposures to chemicals and environmental contaminants are an additional hazard in schools that pose great health risks to the students and staff. An estimated 400,000 schools and child care facilities are at risk of lead exposure.[8] Out of a dozen states with available testing data on lead in school drinking water, about 44% of schools found elevated levels of lead in 2018.[9] Lead can also be found in paint in buildings built before 1978. A survey of school districts in the school year 2016-2017 found that 12% of school districts inspected their schools for lead-based paint and about half of those districts found lead.[10]

On top of that, around 25% of schools still contain polychlorinated biphenyls (PCBs) in lighting ballasts and caulk.[11] A nationwide survey of radon levels in schools estimates that nearly one in five schools have at least one schoolroom with a short-term radon level above the level at which EPA recommends schools take action. However, only about 20% of the schools nationwide have tested for radon.[12] The EPA also estimates that most of the nation's schools have asbestos-containing materials.[13] In a 2015 investigative report, the responses from 15 states showed that more than two-thirds of local education agencies have schools that contain asbestos.[14] Other chemicals and environmental contaminants in schools may include pesticides, brominated flame retardants, phthalates, per- and poly-fluoroalkyl substances (PFASs) chemicals, mercury, and hazardous science lab materials.[15] These hazards have been associated with negative health impacts, including developmental problems, respiratory diseases and cancers.

Indoor air quality

Poor ventilation and indoor air quality (IAQ) are linked to student fatigue, reduced attention span and decreased concentration.[16] Exposure to pollutants and allergens in indoor air — such as mold, dust, pet dander, bacterial and fungal products, volatile organic compounds, mercury, radon, and particulate matter — are associated with asthma and other respiratory symptoms and with a set of building-related symptoms (eye, nose, and throat irritations; headaches; fatigue; difficulty breathing; itching; and dry, irritated skin).[17] Poor IAQ can increase the risk for neurodevelopment disorders, childhood cancer and cardiovascular disease.[18] Schools located near major roadways are more likely to be exposed to higher levels of air pollution from traffic. It's estimated that about one in every 11 public schools are within 500 feet of major roadways.[19] Traffic pollution also harms children who ride diesel-powered school buses, which emit toxic fumes and are linked to several physical and cognitive impacts.[20]

The health of school buildings is also important for the larger communities they serve, as schools are often used as community gathering spaces for meetings and events, and as emergency centers and shelters during natural disasters.

IAQ issues related to extreme weather events affect students' health and ability to learn and achieve. High temperatures increase the risk for short and long-term health conditions and slow cognitive function, leading to higher exam failure rates.[21] In New York City, a study of 75,000 high school students found that students were 12.3% more likely to fail an exam on a 90°F day versus a 72°F day.[22] Another study that analyzed PSAT scores showed that without air conditioning, a 1°F increase in school year temperature reduced that year's learning by 1%, with impacts up to three times as damaging for students in communities with limited financial resources and communities of color.[23] These communities are more vulnerable to extreme heat because their schools are less likely to have air conditioning and more likely to be in urban heat islands without much green space.[24] Harmful effects on health and learning can also arise from wildfire events. Wildfire smoke can pollute classrooms with fine particulate matter and cause short and long-term respiratory problems.[25] Smoke exposure is a greater risk for children, especially those with pre-existing conditions like asthma.[26] A recent study analyzed eight years of standardized test scores from 11,700 public school districts and found that test scores in English language arts and math dropped significantly during smoke exposure, even at low levels.[27] Flooding is another climate event that can worsen IAQ and contribute to respiratory problems by causing mold and unearthing toxic contaminants.[28] Excess moisture and mold growth in buildings have been associated with some upper respiratory symptoms (nasal congestion, sneezing, runny or itchy nose) and respiratory diseases, especially asthma, in children and adults.[29]

While schools are unprepared for the impacts of climate change, climate events are expected to increase in frequency and severity.[30] In 2022, a classroom in Massachusetts reached 100 degrees.[31] That same year, teachers in Columbus, Ohio went on strike to demand functioning air conditioning in schools. The strike led to the teachers' union reaching an agreement that all schools would be climate-controlled by the 2025–2026 school year.[32]

Water Contamination

Contaminants like lead and PFAS in school drinking water can harm children's health. There is no known safe level of lead in a child's blood. Early lead exposure can significantly impair cognitive development, causing lower IQ, reduced attention span, and learning difficulties. Many of these health effects can persist into adulthood, leading to long-term neurological deficits. Lead exposure results in poorer test scores, decreased school performance and increased likelihood of behavioral issues that interfere with learning.[42] The Flint water crisis exposed students to lead and negatively impacted their health and academic performance — students' reading proficiency dropped 12–14% and math scores declined.[43]

PFAS are other contaminants that can be present in school drinking water. PFAS are widely used, long-lasting, human-made chemicals and research has shown that exposure to certain levels of PFAS can cause developmental effects or delays in children, increased risk of asthma and cancer, liver damage, thyroid problems, and decreased fertility, among other harmful health effects.[44] In August 2024, 2,067 contaminated sites and water systems reported

Asthma

Students with asthma face the most severe negative effects of poor indoor air quality. In 2021, 6.5% of all U.S. children — more than 4.5 million children — were diagnosed with asthma.[33] Children with asthma are especially vulnerable to poor IAQ because asthma is exacerbated by exposure to air with pollutants, contaminants and allergens.[34] Pediatric asthma has a high cost, exceeding $5 billion in 2015 prices in direct annual health care costs, according to the most recent available data.[35] Indoor air pollution has been shown to negatively impact the academic performance of children with asthma. Over 2 million children who suffer from asthma live in areas of the U.S. with unhealthy ozone levels.[36] A 2016 study found that if tested on days with high ozone levels, asthmatic students score about 10% lower on reading and math assessments than on days with low ozone.[37] Also, asthma is the leading cause of school absenteeism due to chronic illness,[38] and was linked to 7.9 million missed school days for children aged 5–17.[39] Asthma disproportionately affects Black children — in 2021, 13% of Black children had asthma, compared to 5% of Hispanic, 6% of white, non-Hispanic, and 3% of Asian children.[40] Furthermore, Black children are twice as likely to be hospitalized or visit the ED for asthma and four times more likely to die from asthma compared to white children.[41]

PFAS via the Unregulated Contaminant Monitoring Act.[45] Many of these sites are located near schools and can contaminate their water systems. In 2020, the Environmental Working Group identified 27 school and childcare facilities across 18 states located less than one mile from a facility that could be discharging toxic PFAS.[46] Exposure to contaminated water in schools jeopardizes the health and safety of students, teachers and other occupants.

Inequitable School Siting Perpetuates Health Disparities

A 2023 EPA study found that 41.3% of all public schools were within 0.5 miles of 10+ pollution sources, including major roadways, waste sites, or toxic facilities.[47] Schools serving a higher proportion of students from low-income communities and communities of color are particularly at risk, as they are more often located in larger cities near busy roads.[48] A 2022 national study found that these schools tend to be in areas with higher concentrations of air pollutants.[49] Disparities in exposure to air pollution can be due to historical and socioeconomic factors such as discriminatory redlining policies and land costs.[50] Despite the risks, there are currently no federal regulations for the safe siting of schools near environmental hazards.[51]

Other Environmental Contaminants and Hazards

Children and youth in schools are vulnerable to exposure to other chemicals and environmental contaminants that can be harmful to their health, negatively affecting their ability to learn.

- *Lead-based paint hazards* in buildings are the most common source of lead exposure for children. When lead paint is disturbed due to renovations or deterioration, lead dust can be inhaled or ingested causing elevated blood lead levels in children and contributing to learning difficulties and developmental problems.[52]
- *Radon* is a colorless, odorless radioactive gas naturally occurring in the soil. Over time, radon breaks down into radioactive particles that when inhaled, can damage the lungs by emitting radiation. Long-term exposure to radon poses a great health risk to children. Radon is the second leading cause of lung cancer in the U.S.[53]
- *Polychlorinated Biphenyls (PCBs)* are human-made chemicals commonly used in building materials of schools, like old caulk and light ballasts, built or renovated between 1950 and 1979.[54] Exposure to PCBs in schools can come from indoor and outdoor air, indoor dust, and nearby outside soils.[55] They are probable human carcinogens associated with developmental and cognitive deficits, reproductive health risks, and liver damage.[56]
- *Asbestos* is a naturally occurring fibrous mineral and carcinogen commonly used in building materials (including in schools) between 1945 and 1980. Asbestos exposure occurs when asbestos-containing materials are disturbed, and asbestos fibers are released into the air. It has many severe long-term health risks, especially lung cancer, asbestosis and mesothelioma cancer.[57]
- *Mercury* is a metal used in schools in glass thermometers, fluorescent light bulbs, science equipment and labs, and thermostats. It can vaporize into the air and cause mercury poisoning, affecting the nervous system, lungs and kidneys.[58]
- *Pests and dust mites* can cause asthma and allergies and create sanitation issues that spread pathogens. However, pest mitigation through the overuse and incorrect use of pesticide applications in and around the school can also harm children. Early pesticide exposure is associated with an increased risk for asthma[59] and some childhood cancers, such as leukemia and lymphoma.[60]
- Some *cleaning supplies and chemicals* used in schools for sanitation and preventing infectious diseases can be hazardous to children. They can affect air quality, and chemical exposure from normal use or spills can trigger health problems like asthma.[61]
- *Excessive noise* levels in school classrooms can negatively affect student achievement. For example, studies have shown that excessive noise is connected to cognitive deficits, deficiencies in pre-reading skills, and reduced speech perception, especially for younger children.[62] A Harvard study found that the test scores of 500 8–9-year-old students were 5.5 points lower for each 10-decibel increase in classroom noise.[63]

Students are more likely to come to school when their school environments are properly maintained because they promote a healthy and safe school climate.[68]

Absenteeism and Student Discipline

Poor physical infrastructure and exposure to environmental hazards in schools are associated with student absenteeism. The rate of chronic absenteeism has grown by 13.5% since the start of the COVID-19 pandemic, adversely impacting student success.[64] Student absenteeism has been linked to many test score declines following COVID-19, including declines up to 27% in math and 45% in reading.[65] Visible mold, poor ventilation, and the presence of vermin are all linked to higher rates of absenteeism, especially for younger students and schools in underfunded districts with concentrated poverty.[66] School building conditions are connected to school climate and attendance.[67] Students are more likely to come to school when their school environments are properly maintained because they promote a healthy and safe school climate.[68]

In addition, school closures due to heat, wildfire smoke and flooding are becoming more common each year, causing many students to be sent home and parents to sacrifice income to provide child care. School closures due to the Camp Fire in California in 2018 affected more than 1,500 schools and a million students. This led to a collective loss of over 3,000 school days.[69] Some climate events like flooding can cause lasting damage and force people to move away, leading to low enrollment and even permanent school closures.[70] Climate-resilient school buildings are necessary to be prepared for the impacts of extreme climate events.

School infrastructure and environmental hazards are also tied to student discipline. A Harvard study found that during hotter temperatures, students in schools without air conditioning had higher rates of disciplinary referrals compared to students in schools with air conditioning. These results are likely influenced by changes in student behavior and teacher discretion in responding to student behavior. Heat has been shown to adversely affect physical and mental health, and many students and teachers may feel more frustrated and irritable in the classroom on hot days. Heat-induced increases in disciplinary referrals are much more likely to impact students in schools located in lower-income communities and communities of color.[71] These schools are less likely to have air conditioning and often experience hotter classroom temperatures. It's important to note that Black students already experience disproportionately higher rates of student disciplinary actions than their peers for the same or similar behaviors. Black students are suspended and expelled 3 times more often than white students.[72] Research suggests that increased and/or harsher punishments for Black children can be attributed to teachers' implicit racial bias. Black children are often perceived by adults to be older and more aggressive than they are.[73] Severe punishments, such as suspensions and expulsions, greatly increase the risk of experiencing academic failure, dropping out of high school, and entering the juvenile justice system.[74]

Lead exposure is another hazard in schools that has been associated with student discipline. In Flint, a study found that average lead exposure was connected to an increase of eight disciplinary actions per grade within each school.[75] These issues highlight the importance of school environments when addressing academic disparities.

Challenges to Improving Environmental Health in Schools

THERE ARE SEVERAL MAJOR CHALLENGES to improving the health and safety of school environments: underinvestment in infrastructure, lack of policy and oversight and an underdeveloped workforce.

Underinvestment in Infrastructure

Students suffer the consequences of unhealthy learning environments because the United States is underinvesting around $85 billion per year in public school building infrastructure.[76] The Center for Climate Integrity found that the new HVAC systems and retrofits needed in schools across the US will cost more than $40 billion by 2025.[77] Yet, capital funding for public school facility infrastructure is the most regressive element of public education finance.[78]

Schools rely on local property taxes to fix and build school buildings, but poorer, smaller communities tend to lack a sufficient tax base to address facility and infrastructure needs. Local school districts paid 77% of the costs for K-12 school infrastructure capital projects between 2009 and 2019.[79] Meanwhile, the federal government provides less than 1% of total capital expenditures by U.S. public school districts[80] and 12 states don't pay anything towards district capital construction.[81] At the end of fiscal year 2016, local school districts carried $434 billion in long-term debt, nearly all from borrowing to pay for facility improvements.[82] Low-income school districts are less likely to be able to afford school facility repairs when localities alone must bear the costs.[83] The current funding for public school infrastructure contributes to existing racial and socioeconomic disparities in health and academic outcomes.

Implementing equitable funding models can help school districts reduce inequities for poor and underserved students and provide them with safe and healthy schools. Twenty-eight states address equity in their appropriation policy by providing more funding for school facility construction projects in low-wealth school districts.[84] For example, Colorado established the Building Excellent Schools Today (BEST) grant program in 2008 to provide matching grants from the state for school facility renovations based on several factors, such as district wealth and the share of students receiving free and reduced-price lunch. A higher state match rate goes to districts with more students from low-income households or with lower property valuations.[85]

Lack of Policy and Oversight

A lack of oversight and policy allows school environmental health issues to persist. There are no federal policies or entities that mandate and enforce school environmental safety guidelines and no coordinated system between federal, state and local levels for environmental management in schools.[86] Children and youth, especially the more than 4.5 million with asthma, are vulnerable to health risks of poor indoor air quality.[87] Yet, there are no federal regulations on indoor air quality in schools and there are few federal regulations for airborne contaminants in schools.[88]

Only about half of states have policies requiring schools to address indoor air quality, water quality, and chemical safety, only 18 states require schools to test for lead in water, and 13 states require school testing for radon. Very few states have specific policies that address asbestos, PFAS, PCBs, or mercury in schools.

Chart of State and Federal Policies/Programs and If They Are Mandatory/Voluntary

	Policy and Oversight	
Issue	**State**	**Federal**
Indoor air quality (IAQ)	At least 25 states + DC require districts to establish IAQ plans or policies or include direct mandates for routine inspection and evaluation of indoor air quality in schools.[89]	The EPA has recommendations for improving indoor air quality in schools through the implementation of an IAQ management plan.[90] It also has a voluntary program to reduce the infiltration of pollutants from idling school buses into classrooms.[91] There are no federal regulations on indoor air quality.[92]
Chemical safety	Twenty-eight states + DC require districts to establish the presence of a policy establishing protections for students by prohibiting use of certain harmful chemicals in schools, such as specific pesticides, and cleaning agents; requires parent notification and documentation of chemical applications. Fifteen states encourage districts to reduce chemical exposure in schools.[93]	The EPA has a voluntary school chemical cleanout[94] and management program[95] and a voluntary integrated pest management (IPM) program.[96]
Asbestos	The Asbestos Hazard Emergency Response Act (AHERA) requires schools to inspect buildings for asbestos, develop management plans, and take actions to prevent or reduce asbestos hazards.[97] A federal historic ban on the ongoing use of asbestos was passed in 2024.[98]	
Water Quality	Twenty-six states +DC require districts to establish the presence of a policy establishing water quality programs, potable water standards, and testing protocols to ensure safe drinking water. Three states address water quality in schools in non-codified policies. Seven states encourage districts to address water quality in schools.[99]	The Safe Drinking Water Act (SDWA) regulates public water systems,[100] including the National Primary Drinking Water Regulations which set standards to limit the levels of contaminants in drinking water.[101]
Lead	Forty-five states have adopted laws addressing lead hazards broadly.[102] Eighteen states + DC require school-based testing of lead in drinking water.[103] Four states have policies or regulations mentioning exposure to lead-based paint in schools.[104]	If finalized, the EPA's proposed Lead and Copper Rule Improvements (LCRI) under the SDWA would require community water systems to test for lead in schools, expected to begin in 2028.[105,106]
PFAS	Eleven states have standards such as Maximum Contaminant Levels (MCLs) required for certain PFAS in drinking water. Twelve states have adopted guidance or health advisory levels for certain PFAS chemicals in drinking water.[107]	In April 2024, the EPA announced the final National Drinking Water Regulation (NPDWR) establishing legally enforceable levels for six PFAS and requiring monitoring for these PFAS in public water systems.[108]
Radon	Thirteen states require radon testing in schools.[109]	The EPA has recommendations and guidance for radon testing and mitigation in schools.[110]
PCBs	One state (Vermont) requires schools to test for PCBs (ELI, 2024). Five states provide some sort of PCBs testing guidance for schools.[111]	PCBs are regulated under The Toxic Substances Control Act (TSCA), with removal required at specific levels.[112] The EPA manages regional PCB programs that can provide schools with guidance for assessment and remediation of PCBs in school buildings.[113]
Mercury	Five states prohibit or restrict the use of mercury in schools. Two states (New York and New Jersey) restrict mercury-containing floors.[114, 115]	The Agency for Toxic Substances and Disease Registry's (ATSDR) Don't Mess with Mercury initiative provides resources and guidance on creating mercury policies in schools and remediation efforts.[116]

[1] See the appendix for more information and for lists of states with corresponding policies.

Students suffer the consequences of unhealthy learning environments because the United States is underinvesting around $85 billion per year in public school building infrastructure.[7]

A lack of dedicated funds and staff in school environmental health is an obstacle to the enforcement of related policies. For example, the Asbestos Hazard Emergency Response Act (AHERA) requires school testing and management for asbestos, but its implementation is a challenge. The EPA is responsible for conducting AHEREA compliance inspections in 29 states and providing oversight and enforcement to nine "non-waiver states". Twelve "waiver states" implement and oversee their own school asbestos management programs. Between 2011 and 2015, 87% of required AHERA inspections were conducted in waiver and non-waiver states while the EPA only performed 13% of required AHERA inspections in states under federal jurisdiction. There isn't sufficient funding and staff to successfully manage AHERA inspections in states under federal jurisdiction.[117]

Mitigation is another enforcement and implementation challenge due to inadequate resources. Out of the 18 states with mandatory testing for lead in water, 13 require mitigation if lead is found at or above the state's action level for schools. There are few financial resources available to schools to enact mitigation actions; nationwide, just 15 states offer some type of financial assistance for mitigation. Testing and mitigation requirements can become burdensome when there are not sufficient technical and financial resources available, especially for underserved schools.[118] The U.S. lacks a fully funded, comprehensive and collaborative approach to environmental health problems in schools.

Furthermore, there is no federal collection of data on environmental conditions in school buildings. It's difficult to understand the full scope of environmental hazards in schools and to secure funding to address them when there is little to no recorded data.[119] The Centers for Disease Control and Prevention (CDC) has included in Healthy People 2030 the developmental objective to increase the proportion of schools with official school policies and practices promoting a healthy and safe physical school environment. However, this objective needs more reliable baseline data before it can become a core objective of Healthy People 2030.[120] Access to data in this area can lead to stronger funding, policies and research to protect children from environmental risks in schools.

Underdeveloped Workforce and Lack of Awareness

Currently, school districts and the environmental health workforce lack the capacity to manage school environmental health issues, largely due to the lack of standards/policies, programs, funding, and/or expertise on environmental hazards in schools. Schools have little support for environmental monitoring, interpretation of existing environmental regulations and mitigation practices. Any existing school environmental safety standards may be enforced infrequently through various agencies and with few collaborative connections. Schools may be evaluated by local boards of education, the state department of education, health and general services, or any number of other entities. There is little communication and cooperation between schools, regulators, enforcement and community members on the health of school environments.[121]

In addition, there is not enough awareness of school environmental issues and their effects on student health and learning. Most schools do not have a school health program or access to environmental health specialists who can provide important training and guidance to address and manage school environmental issues. Many schools do not have management plans or programs to reduce environmental risks, relating to indoor air quality, chemical safety and pesticide safety. School environmental health programs can provide comprehensive building assessments, assistance with the creation of management plans, and school-site participatory demonstrations of effective interventions and approaches to remediate environmental risks.[122]

Recent Unprecedented Federal Investments Show Promise for Improving School Infrastructure

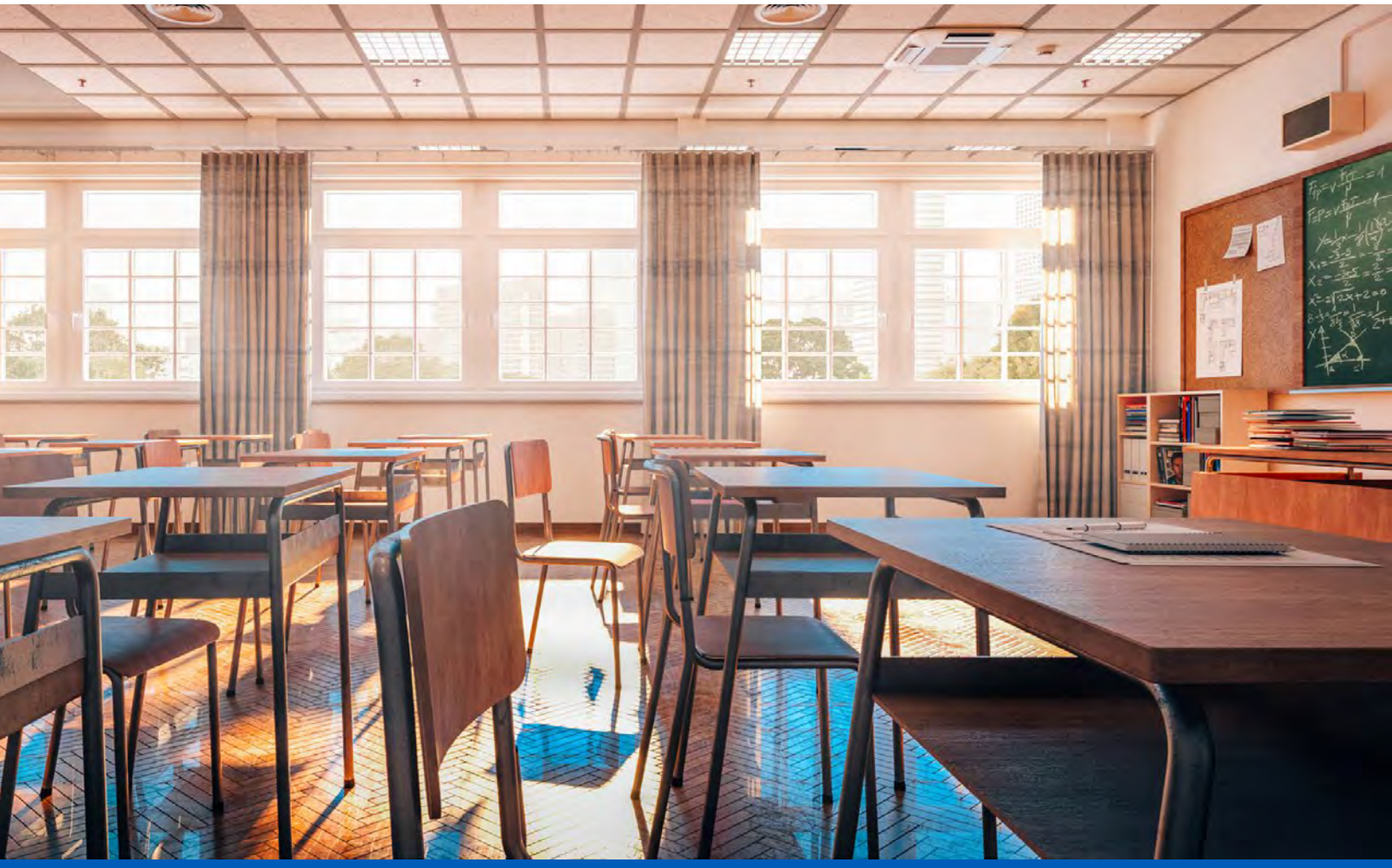
In 2021, more than $122 billion was awarded to the Department of Education for Elementary and Secondary School Emergency Relief (ESSER) funds through the American Rescue Plan Act (ARPA)[123] — the largest-ever federal investment in K-12 schools in U.S. history.[124] These funds have provided schools with critical resources to address important health and safety issues. An early expert analysis of school districts' plans projected plans to spend up to $9.8 billion of these funds to upgrade heating, ventilation and air conditioning systems and another $4.9 billion on repairs to prevent illness, which includes lead abatement, removing mold and mildew, or replacing leaking roofs.[125] For example, Vermont created the American Rescue Plan School Indoor Air

Quality Grant Program using $15 million in ARPA funds to improve school ventilation,[126] with priority given to buildings with no mechanical ventilation. The program has already substantially improved the safe and healthy learning environments of many classrooms.[127]

Additionally, the U.S. Department of Education awarded funding to the University of California, Berkeley, to establish the National Center on School Infrastructure, a clearinghouse for research, policy resources, effective practices, data, and funding opportunities for school infrastructure.[128] The center will develop technical assistance services and school facility data tools. Funding from the U.S. Department of Education was also used to create the Supporting America's School Infrastructure Grant Program to build state capacity to better support high-need schools in improving school environments.[129]

Federal funds for clean energy and sustainable upgrades have also been made available for schools, supporting healthy school environments with fewer emissions. The Department of Energy (DOE) leads the Renew America's Schools Program, funded by the Bipartisan Infrastructure Law, which awards $500 million over five years (2022–2026) for grants for energy efficiency, clean energy and alternative fueled vehicle upgrades.[130] William Penn School District in Pennsylvania was one of 24 selected for a grant in 2022–2023 and they are using the funds to construct a high-efficiency ambient heat pump heating cooling system and solar PV-roofing, among several other upgrades to move the school toward 100% electrification and zero emissions.[131] DOE also leads the Efficient Healthy Schools Program to provide technical support that improves energy performance and promotes a healthy learning environment in schools.[132] Finally, the Inflation Reduction Act's final rules now allow schools to claim clean energy tax credits and participate in new clean energy projects.[133] These federal funds support upgrades that can improve indoor air quality and reduce health risks related to pollutants in schools.

These investment opportunities are considered "Justice40 covered programs" because they fall in the scope of the Justice40 Initiative — a commitment established by the Biden Administration in 2021 to allocate 40 percent of overall benefits from federal investments to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution. The initiative includes investments in clean energy and energy efficiency, remediation and reduction of legacy pollution, the development of clean water infrastructure, and other areas.[134]



Promising Strategies for Improving Environmental Health in Schools

SEVERAL EFFECTIVE STRATEGIES have been proven to improve school environmental health, including the improvement of school infrastructure and increased ventilation, indoor air quality management programs, chemical management programs, integrated pest management programs and community engagement.

Infrastructure and Ventilation

Improving infrastructure and increasing ventilation is key to safe and healthy school environments. A 2017 literature review found that classroom ventilation rates are often far less than recommended or required by standards. In all eight studies of classrooms with 20 or more students in the United States that were reviewed, peak CO2 concentrations exceeded 1000ppm, indicating that ventilation rates were below minimum recommended standards. Research has shown increases in classroom ventilation rates are associated with significant improvements in academic performance and with reduced student absences and respiratory health effects.[135] In California, the estimated benefits of increasing the ventilation rate in K-12 classrooms were 30 times greater than the estimated energy costs, not including the savings.[136] Important infrastructure upgrades may include HVAC systems, energy sources and other sustainable building adaptations. Proper installation, operation and maintenance of HVAC systems provide adequate ventilation and improve indoor air quality in classrooms.[137]

Other infrastructure improvements, such as green building upgrades and electrification, provide health benefits and advance climate resiliency for extreme weather events. Installing solar energy and using electric school buses reduces air pollution and emissions, improving the air quality of school environments.[138, 139] It is estimated that each replacement of a diesel school bus for

Funding for quality infrastructure is integral to improving health and academic outcomes for all students.

an electric school bus may amount to $247,600 in health and climate benefits.[140] Additionally, school infrastructure that provides passive cooling solutions through smart surfaces can significantly reduce heat exposure, such as expanding tree cover, reflective pavement, solar canopies, and cool roofs/walls. Learn more about APHA and their partners' work on smart surfaces here.[141]

Students' health and education are benefitted by supporting mental and cardiovascular health, social connectedness, and learning outcomes. Funding for quality infrastructure is integral to improving health and academic outcomes for all students.

Indoor Air Quality Management Programs

Healthy indoor air quality in schools improves student health and performance and can be maintained with a management program, like the one outlined in the EPA's IAQ Tools for Schools. A comprehensive program should include plans to control airborne pollutants, temperature, humidity and ventilation, as well as required testing for radon, lead, asbestos and PCBs.[142] Indoor air quality management programs can decrease absenteeism and reduce health issues resulting from harmful environmental exposures. In the Omaha Public School District, the frequency and severity of asthma attacks lowered after implementing an IAQ management program based on the EPA's IAQ Tools for Schools checklist. Connecticut also saw benefits after creating an IAQ management program for schools. Some school districts in the state reported respiratory cases declined by 48%, absenteeism rates decreased by more than half, and asthma cases fell by 21.2%.[143]

Case Example: Boston Reduce Lead in School Drinking Water

Boston Public Schools (BPS) are the oldest public schools in the nation and 72% of the school system's students are considered low-income. The facilities management team has been working to remediate lead exposure in school drinking water in Boston since the 1980s. In 2016, elevated levels of lead were discovered in the drinking water, so BPS created a water quality policy that requires annual testing of all sources of drinking water and water used for food preparation, immediate deactivation of any sources with elevated lead levels, and the implementation of a comprehensive communication protocol. Test results across 80 schools showed that samples with lead or copper exceedances went from 12% in 2016 to 0.7% in 2019. In 2020, the EPA awarded BPS $6.2 million in grant funding to provide new, filtered water fountains bottle filling stations to schools. This important investment will continue Boston Public Schools' work to improve equitable drinking water access for students, as well as better health and academic outcomes.[157]

Chemical Management Programs and Integrated Pest Management Programs

School chemical management programs can prevent costly and dangerous chemical spills and exposures by raising awareness of chemical hazards and ensuring proper management. The EPA's Toolkit for Safe Chemical Management in K-12 Schools gives guidance on school policies and plans related to the purchasing, storage, inventory, use, and/or disposal of chemicals present in schools to maintain chemical safety. After conducting an inventory of its chemical management system, Arlington Public Schools in Virginia successfully removed over 600 pounds of outdated, excess, and unknown chemicals from its secondary schools.[144]

The need to control pesticide use and manage pests in schools to prevent pesticide exposure and health concerns is related to chemical safety. Integrated Pest Management (IPM) is a comprehensive approach to prevent pest infestations and reduce pesticide use in buildings.[145] Schools implementing a high-level IPM model in 10 school districts across seven states averaged a 71% reduction in pesticide applications and a 78% reduction in pest complaints.[146]

Creating more equitable outcomes requires the intentional engagement of those who are most impacted by environmental health hazards. When parents, students, teachers and community leaders are involved, it creates systems of prevention, resilience, and preventive action.

Meaningful and Ongoing Community Engagement

Creating more equitable outcomes requires the intentional engagement of those who are most impacted by environmental health hazards. When parents, students, teachers and community leaders are involved, it creates systems of prevention, resilience, and preventive action. There are several ways to meaningfully engage communities:

- *Within public health,* the Agency for Toxic Substances and Disease Registry (ATSDR) has a Public Health Assessment Training to increase environmental health competencies in the evaluation of hazardous exposures and provide recommendations on how to engage communities in the process. The training is designed for a range of professionals who work with communities, including health educators, community health workers, program managers and medical officers.[147]
- *Within school districts and schools,* health and safety committees, also called school health advisory boards, can help improve school environments for better student health, stronger academic performance, and increased student attendance. They bring together community and school partners who are interested in developing and supporting environmental health programs in schools. This may include district officials, school board members, school administrators, facilities staff, nurses, teachers, public health representatives, parents and students. Members may be elected or appointed by the district's school board or by school principals.[148] Out of 44 state surveys conducted by the CDC, 51.6% reported having at least one group in schools that offers guidance on the development of policies or coordinates activities on health topics.[149] New York State requires health and safety committees for all public schools, and New York State United Teachers (NYSUT) created a guide about how to organize a committee and the best practices to follow.[150] Partnership and coordination across sectors provide an opportunity to address school environmental health from a broader community context.[151] In 2016, a citizens' ad-hoc committee of parents, community members, and district staff developed a facilities plan for Auburn Public Schools in Washington that led to a record $456 million bond issue being approved to replace and expand several degrading schools in the district.[152]
- *Locally,* parents and caregivers are important members of school communities that may be interested in taking action to promote healthier and safer schools. Groups like the Parent Teacher Association (PTA) or an environmental club can be effective advocates for change in their schools, such as improving air quality and ensuring chemical safety through management plans. Parents and guardians can also join community organizations, like Mom's Clean Air Force[153] or Action for Healthy Kids,[154] that work with families to improve schools and protect children's health. CDC's Parents for Healthy Schools provides resources to encourage parent engagement in school health.[155] In Lake Zurich, Illinois, parents with concerns about poor indoor air quality in schools organized together and contacted the state public health department and the U.S. EPA Region 5 office for assistance. This led to the school district developing and adopting an IAQ management plan, creating plans to reduce indoor air pollutants through routine maintenance, building evaluations, and IAQ-specific policies.[156]

Public Health's Role in School Environmental Health

THE PUBLIC HEALTH COMMUNITY should foster collaborative partnerships with schools, school districts, and community members to address school environmental health through community engagement, education and awareness building, technical expertise and training, and advocacy.

Community Engagement

1

Communities' needs, interests and voices must be prioritized when addressing school health issues to advance health equity and build community resilience.

Share power with community members to make effective changes in schools.

- Incorporate community participation in program and policy development to identify environmental health needs, goals and opportunities for intervention or remediation.
- Establish health and safety committees that involve various community and school partners to improve school environments.
- Partner with community-based environmental justice organizations.
- Invite students to participate in projects to improve school environments and student health.
- Conduct surveys to understand the perceptions of the students, staff, and parents on school environments..

Education and Awareness Building

2

Existing resources on school health should be disseminated to increase awareness about how environmental hazards contribute to disparate health and academic outcomes among children.

Create school health programs in public health agencies. These programs can support schools in a variety of ways:

- Provide resources on best practices to reduce environmental risks and exposures in schools.
- Disseminate new and existing resources such as toolkits and fact sheets on school environmental health issues to spread awareness. Prioritize resources, including those developed by the Children's Environmental Health Network, that address the impacts on health and academic achievement and promote equity.
- Guide and advise schools on intervention and remediation strategies for environmental issues in school environments.
- Assist schools in the implementation of integrated pest management (IPM), chemical safety, and indoor air quality programs and plans, as well as other effective intervention strategies.

Technical Expertise and Training

3

Public health professionals can offer opportunities to develop skills and knowledge to address school environmental health.

- Build and strengthen school district capacity by providing guidance and assistance on environmental health inspections and remediation in schools.
- Lead trainings, workshops and webinars with local and state health departments, school risk managers, school administrators, school boards, school advisory committees, unions parents/guardians, and community members on environmental risks and exposures in schools and concerns for sensitive populations.
- Create workforce development opportunities for environmental health professionals.

Advocacy

4

Public health professionals can partner with school districts, parents and community leaders to advocate for policies that create healthier schools.

- Establish environmental public health systems for children's environmental exposures in schools.
- Develop minimum federal standards for protecting children's environmental health in schools and accounting for our changing climate.
- Provide additional funding to existing programs testing and inspecting for lead, asbestos, radon, mercury, and other environmental contaminants in schools, as well as establishing periodic reporting requirements.
- Mandate indoor air quality (including pollutants, temperature and moisture) and chemical safety standards in school buildings to reduce exposure to pollutants and ensure healthy learning environments.
- Collect and report data across multiple divisions and making the data publicly available.
- Form equitable school financing models that prioritize school facility renovations in low-wealth school districts.

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Appendix

Policy Chart: State Policies

Indoor air quality (IAQ)	Twenty-five states (Arizona, California, Colorado, Connecticut, Delaware, Florida, Illinois, Indiana, Maine, Michigan, Mississippi, Montana, New Hampshire, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin) + DC require districts to establish IAQ plans or policies or include direct mandates for routine inspection and evaluation of indoor air quality in schools. The state policies on school IAQ policies are drawn from the Environmental Law Institute's (ELI) Indoor Air Quality in Schools (2024) database and the number reflects those that meet NASBE's IAQ policy database (2019) definition. The ELI database highlights laws that address IAQ in schools directly, but it may not include general laws that potentially affect schools indirectly. Thus, the chart does not include every state law that addresses indoor air quality in schools. The ELI database does not include policies from Arkansas, New Mexico, or the Virgin Islands whereas the NASBE database does.
Chemical safety	Twenty-eight states (Arkansas, California, Colorado, Connecticut, Delaware, Florida, Hawaii, Illinois, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Montana, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Utah, West Virginia) + DC require districts to establish the presence of a policy establishing protections for students by prohibiting use of certain harmful chemicals in schools, such as specific pesticides, and cleaning agents; requires parent notification and documentation of chemical applications. Fifteen states (Alaska, Arizona, Georgia, Indiana, Iowa, Michigan, Minnesota, Missouri, New Hampshire, Tennessee, Vermont, Virginia, Washington, Wisconsin, Wyoming) encourage districts to reduce chemical exposure in schools.
Water Quality	Twenty-six states (Colorado, Delaware, Florida, Idaho, Illinois, Indiana, Kentucky, Maine, Maryland, Minnesota, Montana, Nevada, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia) +DC require districts to establish the presence of a policy establishing water quality programs, potable water standards, and testing protocols to ensure safe drinking water. Three states (Hawaii, Michigan, Wyoming) address water quality in schools in non-codified policies. Seven states (Alabama, Arizona, California, Connecticut, Louisiana, Nebraska, New Hampshire) encourage districts to address water quality in schools.
Lead	Forty-five states (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, DC, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin) have adopted laws addressing lead hazards broadly. Thirteen states (Washington, Oregon, California, Minnesota, Illinois, Tennessee, Virginia, New York, New Hampshire, Rhode Island, New Jersey, Maryland+ DC) require school-based testing of lead in drinking water. Four states (Maine, Minnesota, Oregon, West Virginia) have policies or regulations mentioning exposure to lead-based paint in schools.
PFAS	Eleven states (Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Washington, and Wisconsin) have standards such as Maximum Contaminant Levels (MCLs) required for certain PFAS in drinking water. Twelve states (Alaska, California, Connecticut, Colorado, Hawaii, Illinois, Maryland, Minnesota, North Carolina, New Mexico, Ohio, and Oregon) have adopted guidance or health advisory levels for certain PFAS chemicals in drinking water.
Radon	Thirteen states (Colorado, Connecticut, Florida, Illinois, Maryland, Minnesota, New Jersey, New York, Ohio, Rhode Island, Tennessee, Virginia, West Virginia) require radon testing in schools.
PCBs	One state (Vermont) requires schools to test for PCBs Five states (Connecticut, Massachusetts, Minnesota, New Jersey, Vermont) provide some sort of PCBs testing guidance for schools..
Mercury	Five states (Minnesota, Ohio, Illinois, Vermont) prohibit or restrict the use of mercury in schools. Two states (New York and New Jersey) restrict mercury-containing floors.

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