WOMEN for a Healthy ENVIRONMENT
Healthy Schools

State of Environmental Health in Pennsylvania Schools

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The Heinz Endowments

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About Women for a Healthy Environment

The mission of Women for a Healthy Environment (WHE) is to educate citizens about environmental risks and advocate for a community where children live, learn and play without threat of environmental harm.

About Healthy Schools Pennsylvania

Healthy Schools Pennsylvania is a program of WHE, and was created to act as a resource-rich information hub for the school community, including parents, teachers, staff and administrators. Since 2010, WHE has delivered curricula in the classroom to schools across Southwestern Pennsylvania (SWPA). Through technical assistance, Healthy Schools PA ensures that environmental risk factors are identified and eliminated in school buildings. The program provides information, support and hands-on assistance so that the region's children can thrive and learn to their fullest potential in a healthy, toxic-free learning environment. Healthy Schools PA is designed to empower parents, students, educators, staff and administrators to take an active role in creating healthy school environments. By providing tools, guides and other resources, Healthy Schools PA acts as a bridge between communities and their schools, effectively creating an advocacy network capable of bringing about social and policy change throughout the school system. Healthy Schools PA works to increase awareness in the school systems about environmental health factors and supports policies that directly correlate to improved health outcomes and academic performance by engaging the school community.

The goals of the program are:

- To serve as a central voice and hub for information across the region by engaging students, parents, community leaders and school district personnel;
- To increase awareness in the school systems about environmental health factors;
- To recognize and celebrate schools for steps they have taken toward achieving a healthy learning environment;
- To deliver environmental health curricula in the classroom;
- To provide guidance on policies and practices that directly correlate to improved health outcomes and academic performance; and
- To develop a platform that connects organizations such as parent-teacher associations, state agencies and non-government organizations to encourage collaboration for creating a green and healthy learning environment.

When we invest in schools we invest in a healthy, safer, cleaner future where all can have the opportunity to thrive and succeed.

Executive Summary

Every child deserves to learn in a healthy school. The global COVID-19 pandemic has shown us how vital schools are to families and communities across the country. The Commonwealth's K-–12 education system serves more than 1.7 million students across 500 public school districts.

The importance of healthy schools cannot be overstated. Environmental hazards in the built environment can affect the healthy development of a child, which in turn can impact their ability to learn and perform well in school. Healthy schools are not just about our buildings, but rather about our commitment to ensuring that every child has the opportunity to succeed. That opportunity includes learning in an environment that is safe, clean, healthy, dry, and pest-free; in an environment that encourages health promoting behaviors, where green space is accessible, and healthy nutritious food is available to all; and where mental, behavioral, and socioemotional services, are accessible to help serve the growing needs of families across the commonwealth. Schools are a reflection of our community values. When we invest in schools we invest in a healthy, safer, cleaner future where all can have the opportunity to thrive and succeed. The research is clear that when we act, we see a difference – improved absenteeism, improved health outcomes, healthy cognitive development, and the ability to achieve academic potential.

Schools have enormous funding priorities, one of which is sustained funding for their building infrastructures. A pattern identified throughout this report is that schools who serve a larger percentage of students from lower-income or economically disadvantaged families, and a larger percentage of special education students, are opting out of taking action on preventing exposure to environmental hazards in their schools. These schools do not necessarily spend less per student than their counterparts who do test; they do however have competing priorities when it comes to how to spend the limited funding they receive from local tax bases and state and federal governments. As of 2016, no state funding has been available for Pennsylvania public schools for infrastructure-related expenses, including new construction and continued maintenance of school buildings.

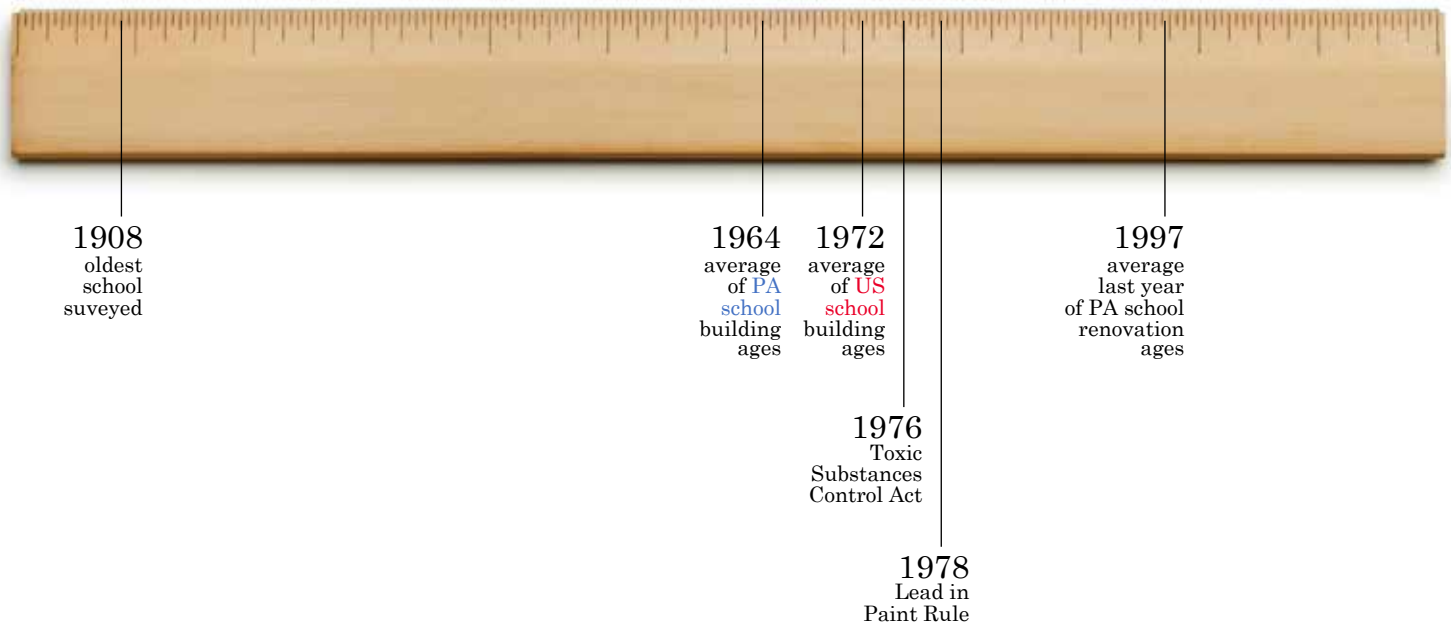
For far too long, Pennsylvania public schools, like public schools across the nation, have been underinvested in. Unlike schools across the nation, Pennsylvania public schools are uniquely vulnerable to environmental hazards. The global COVID-19 pandemic has taught us, more urgently than ever, that indoor environments matter for students' health, safety, and academic potential. This report is a call to action. We have an unprecedented opportunity to reinvest in our schools for the long-term—to fund school infrastructure that can positively impact current and future generations of learners across the commonwealth. The challenge ahead of us is to act to ensure a healthy school for every child to grow, learn, and play.

Key Findings

The key findings below reflect data taken from a randomized sample of 65 public school districts (SD) that serve over 175,000 students across the state of Pennsylvania.

Pennsylvania school districts are uniquely vulnerable to environmental health hazards because of aging infrastructure.

The average PA school building was built in 1964. This is almost a decade older than the national average age of public-school buildings, which were built in 1972. Majority of PA public schools were built before federal laws that affect healthy indoor environments were enacted, such as the Lead in Paint Rule (1978) and the Toxic Substances Control Act (1976), increasing the likelihood that certain environmental hazards are present in the built environment.



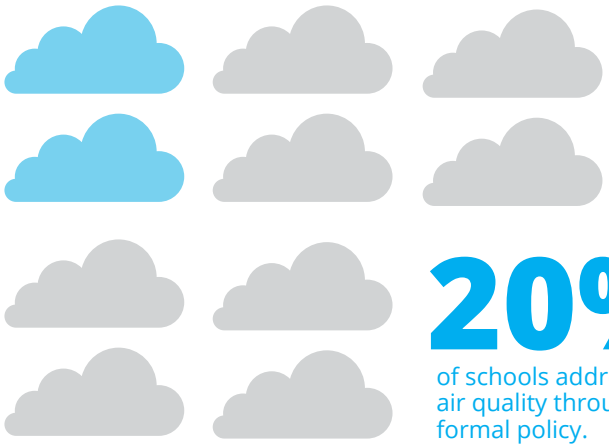
Key Findings

Environmental hazards testing reveals environmental health risks exist in PA schools.

The most tested environmental hazards are lead in drinking water (89% of SDs in sample) and mold (72%). Testing for other water quality contaminants (48%), radon (20%), lead in dust and paint (9%), and polychlorinated biphenyls (8%) was less common in the statewide sample. Though testing occurred, it was not consistent: some districts tested only a single building, a handful of classrooms or specific outlets; or tested buildings in different years; or a combination of the above.

Despite identifying hazards, not all school districts are taking action to remove or remediate these hazards. Remediation was recommended for majority of SDs testing for environmental hazards. However, not all SDs took action to remove or remediate hazards, putting the health of students and staff at risk. Of public school districts who tested, 91% found lead in drinking water, 78% reported mold in their buildings, 33% reported lead in dust and paint exceedances, 38% reported radon exceedances, and 23% reported other water quality issues. Remediation was noted for only 86% of school districts with mold, 9% of school districts with lead in drinking water, 40% of radon, and 14% of other water quality issues. Remediation was not noted in any of the schools who found lead in dust or paint.

72% of schools still contract with a pesticide company to apply chemical pesticides on school grounds.



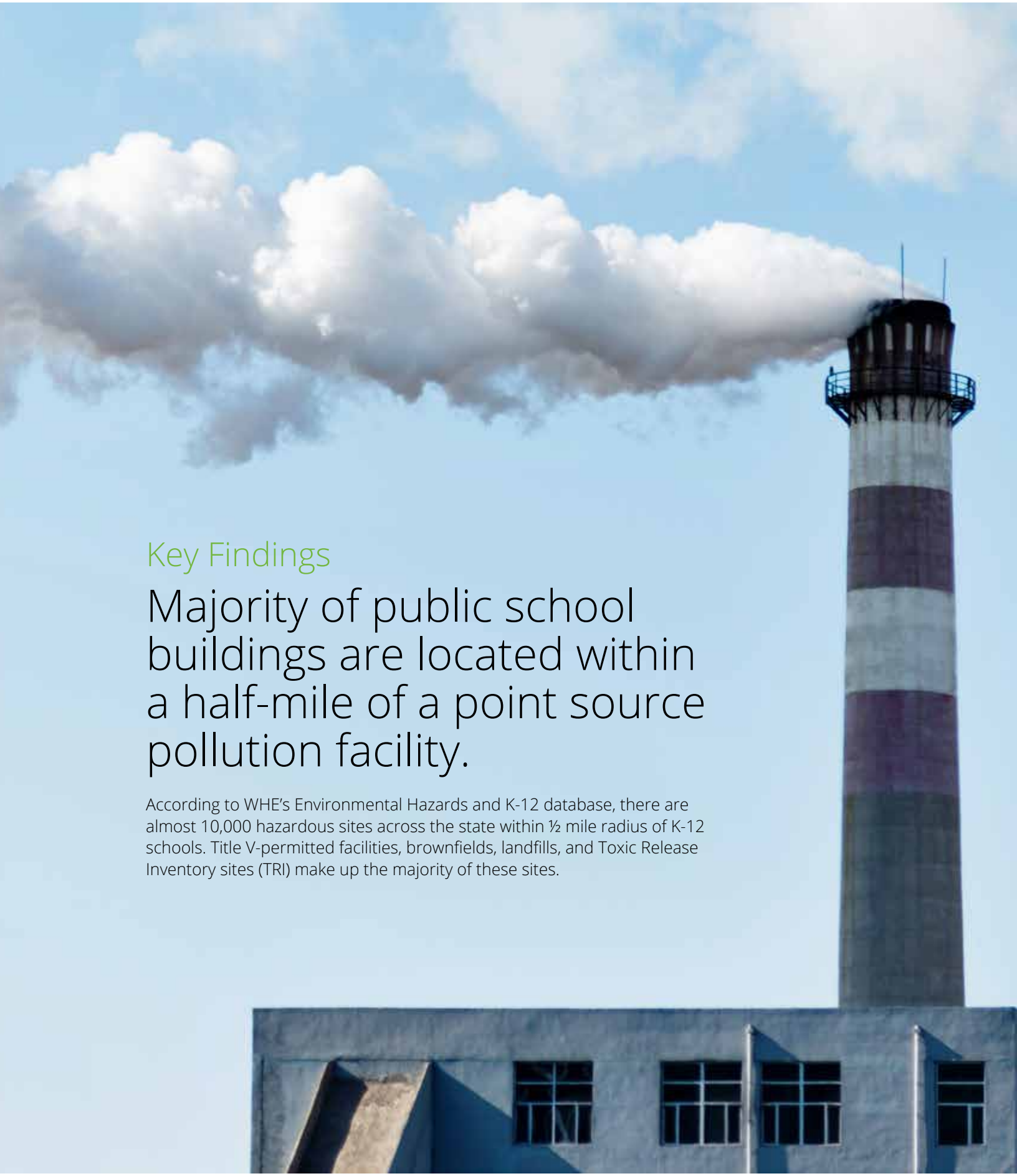
20% of schools address air quality through a formal policy.

52% of school districts surveyed had any anti-idling signs

Key Findings

While some healthy schools policies are present, they are not uniformly or consistently enforced.

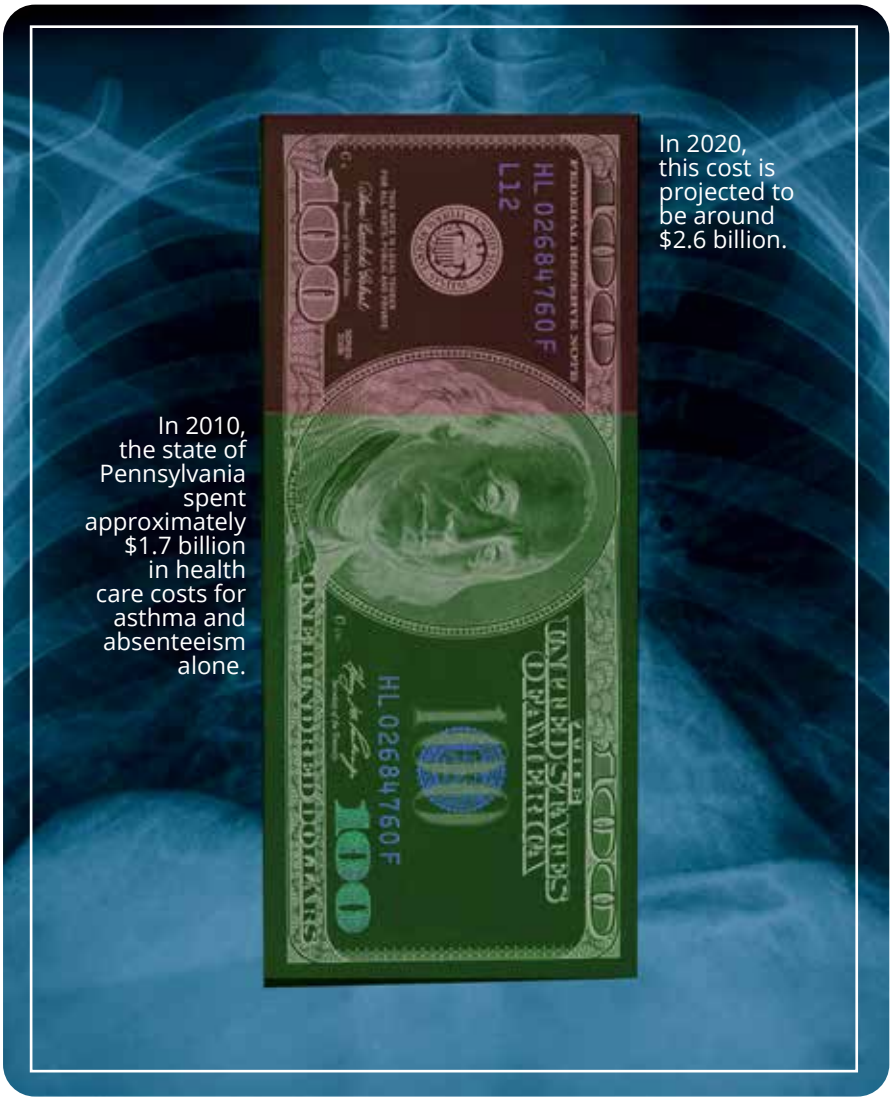
The presence of an Integrated Pest Management policy (95% of SDs) does not mean that majority of schools are using IPM principles meant to decrease chemical pesticide use. Majority of schools (72%) still contract with a pesticide company to apply chemical pesticides on school grounds. Only 20% of schools address air quality through a formal policy. Despite a state law requiring anti-idling signs for school buildings, only about half (52%) of school districts surveyed had any anti-idling signs.



Key Findings

Majority of public school buildings are located within a half-mile of a point source pollution facility.

According to WHE's Environmental Hazards and K-12 database, there are almost 10,000 hazardous sites across the state within ½ mile radius of K-12 schools. Title V-permitted facilities, brownfields, landfills, and Toxic Release Inventory sites (TRI) make up the majority of these sites.



There is greater asthma prevalence for school districts who serve more low-income, non-white, and special education students.

In addition, school districts with a greater student population, a higher student to school nurse ratio, and more school buildings tend to have a greater asthma prevalence within their student populations.

Key Findings

Schools who serve a greater percentage of low income, and special education students are less likely to test for environmental hazards. When these schools do test, they are less likely to remediate the hazards.

Key Recommendations

1. Create a statewide database for school environmental health data to be collected and reported publicly. Teachers and school staff have a right to know about the occupational hazards present in the workplace environment. Every student deserves to learn in a safe and healthy environment. A state clearinghouse would also provide more information on equitable distribution of state and federal funds for large capital projects to improve the environmental quality of buildings.

2. End the moratorium on PlanCon and fund school infrastructure investments through the General Fund. Funding should include new construction and renovation projects, as well as support the Maintenance Grant Program.[i] Funding should be a shared responsibility between the federal and state government, and local school districts.

3. Work with statewide advocates, scholars, practitioners, educators, contractors to create an equitable funding formula for the disbursement of PlanCon and Maintenance Grant Program awards to prioritize school districts with older buildings, and who are less likely to remediate hazards found in their buildings—those who serve a greater percentage of low-income, special education, and minority students.

4. Advocate for safe siting laws to protect schools and their occupants from harmful, proximal point sources of pollution. No pollution creating facility should be within a mile of a school.

5. Create evidence-based policies that proactively prevent negative health impacts. School environmental health policies should include mandatory reporting for environmental health data, enforcement action, and required communication with the school community.

6. Invest in training and professional development for school facilities staff, collaborating with researcher, building and engineering specialists, and public health professionals, to ensure construction and maintenance best practices are utilized to increase energy efficiency and lifetime use of school facilities.

7. Incorporate resiliency into new construction and renovation standards so that school facilities can continue serving as emergency shelters in times of disaster. Schools should be designed to withstand flood, weather, seismic, and wind events.

Introduction

The State of Environmental Health in Pennsylvania Schools biennial report is the first-of-its-kind, taking a deep dive into the environmental quality of school facilities across the commonwealth.

To gain a better understanding of environmental health hazards potentially facing more than 1.7 million children enrolled in 500 public school districts across Pennsylvania, Healthy Schools PA— a program of Women for a Healthy Environment—requested information during the 2019-2020 school year from 156 public school districts across the state. Public schools are defined as primary and secondary schools that are operated and funded under the authority of the General Assembly and local elected school boards.[ii] The main goal of this white paper was to collect information in a consistent manner in order to assess the types of environmental hazards and health risks that exist in public school facilities, examine the levels at which these schools

This report outlines the existing environmental hazards that public school districts are investigating.

are taking action through practice or policy, and identifying opportunities to prioritize funding and public health focused responses. This report outlines the existing environmental hazards that public school districts are investigating, including pollutants that affect indoor air quality, water quality, that come from operations inside the school built environment, and around school grounds. In addition, we analyze available data on student demographics to understand what is driving or hindering action on environmental health hazards present in the school environment.

Approach

During the 2019-2020 school year, Healthy Schools PA requested information from public school districts through the Right-to-Know (RTK) process to collect and summarize data related to potential environmental hazards in school buildings. In Pennsylvania, the RTK law is an act that provides access to public information from state-related institutions. The RTK law is applicable to public school buildings operating in the commonwealth. In a school district, the Agency Open Records Officer duties often fall under the auspices of the administration or the district's solicitor.

Data Collection for the Statewide Sample

In order to ensure representativeness, 10% of all school districts in each of the Pennsylvania Department of Education's (PDE) six region area were sent RTK requests. These districts were randomly sampled from the PDE public school district database. Requests were distributed between 'large' school districts (five buildings or more) and 'small' school districts (four buildings or less). Healthy Schools PA program staff sent 74 RTK requests to AORO staff via email and paper letters through the U.S. Postal Service. Data was compiled and analyzed during the 2019-2020 school year. Of those who responded, 65 school districts across the commonwealth were randomly selected to represent the statewide sample. The student demographics of the districts represented in this study are representative of the student demographics across the commonwealth ***(See Appendix: Table 1, Supplemental Table 1).***

Data Analysis

If districts answered the request even in part, they were included in the analysis. Where schools did not submit complete records in response to the RTK request, that is indicated

in the results. The RTK request contained 12 specific requests. For school districts in the statewide sample, the request was phrased "In the last 10 years, please submit records pertaining to" the topics listed below.

1. Radon testing, results of radon testing, and records of remediation
2. Lead in drinking water testing, results of lead in drinking water testing, and records of remediation
3. Water quality testing, results of water quality testing, and records of remediation
4. Lead in paint or dust
5. Indoor air quality and mold
6. Polychlorinated biphenyls
7. Artificial or turf sports fields
8. Natural grass sports fields
9. Integrated pest management
10. Cleaning and disinfecting products
11. Building years and renovations
12. Asthma rates for students

Additional data sources used in our analysis included point source pollution facilities from Women for a Healthy Environment's Environmental Hazards Mapping project, school funding data from PA Schools Work, student asthma data from PA Department of Health, and student demographic data from PA Department of Education. The most recent years for the abovementioned datasets were included in the analysis, while the analysis from the RTK data includes information from the past ten years.

A Special Note on Southwest Pennsylvania Schools

For this report, Southwest PA (SWPA) is defined by the Southwestern Pennsylvania Commission's 10-county area which includes Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington and Westmoreland counties. Because our initial report, published in September 2018, addressed only SWPA schools, a goal of the 2021 report was to compare baseline data from the 2018 report to the updated findings based on responses received in the 2019-2020 school year. In addition to the 12 SWPA school districts included in the statewide sample, data from 87 additional SWPA school districts were collected for this regional comparison. The districts who participated in the 2018 report were asked to include data from only the past three years. The districts who did not participate in the 2018 report were excluded from the comparison, and asked to provide data within the past ten years.

Intended Audiences

This public report and its accompanying executive summary will be shared with those invested in the school community, including:

- Pennsylvania Department of Education, Pennsylvania Department of Health, and Pennsylvania Department of Environmental Protection
- Intermediate Units
- State legislature and local elected officials
- Other stakeholders, including nonprofits and community partners
- School district communities across the southwestern Pennsylvania region, including school staff, school nurses, school board directors, and parents

The research is clear that indoor air quality can impact the health, cognitive development, and academic potential of K-12 school students.

Indoor Air Quality

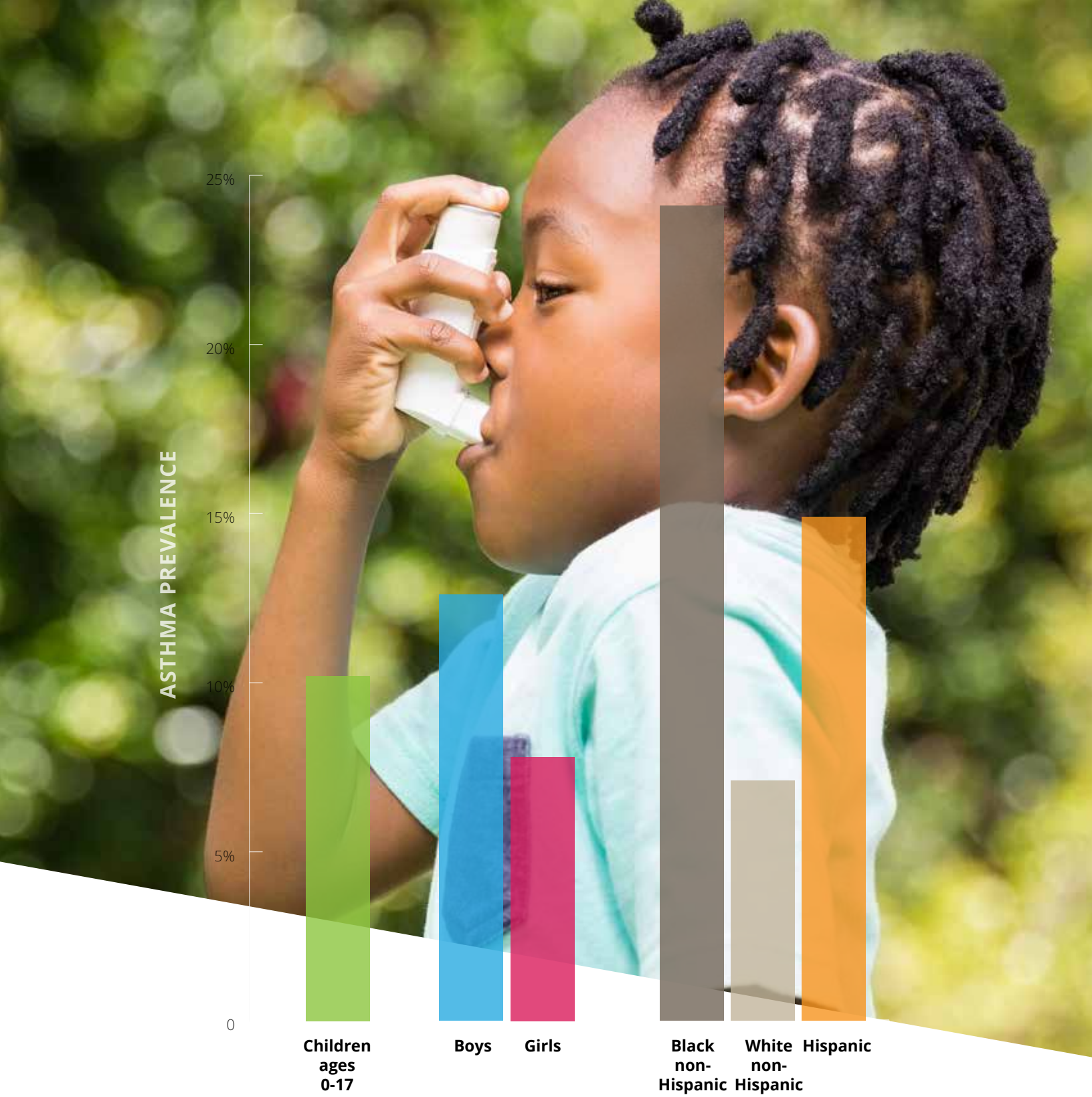
According to the American Lung Association, the average American spends approximately 90% of their time indoors. The U.S. Environmental Protection Agency (EPA) estimates that concentrations of some pollutants are often 2–5 times greater indoors than outdoors and may be as much as 100 times greater. Since the 1970s, building ventilation rates have decreased in order to conserve energy, which has increased exposure to indoor pollutants and decreased oxygen levels. This increase in exposure over time has led the EPA to consistently rank indoor air pollution among the top five environmental health risks. While indoor air pollution poses a risk to all, the risk is greater for children since their bodies are still developing and they breathe a higher volume of air relative to their body weight. After the home, the school environment is where children spend the majority of their time. Despite this, many public schools are in disrepair.

The research is clear that indoor air quality can impact the health, cognitive development, and academic potential of K-12 school students.[iii] In this section, we explore the available data on indoor air quality in Pennsylvania school facilities. In particular, we investigate how and when schools are acting on common indoor air quality issues that impact environmental health, including mold and radon testing and remediation, the presence or absence of policies regarding air quality, student asthma prevalence, and cleaning and disinfecting programs and protocols.

A Long History of Disinvestment in Public School Infrastructure

In 1995, the U.S. General Accounting Office (GAO, 1995) published a report on the condition of U.S. schools projecting that $112 billion in repairs and upgrades were needed to improve school facilities to good overall condition, including to ventilation systems and improvements to indoor air quality. Over two decades have passed, and not much has changed. In 2020, the GAO provided an updated report that highlighted monitoring and remediation health hazards as a top priority for schools across the nation, third only to improving security and student access to technology. An estimated 54% of public school districts need to update or replace multiple building systems or features in their schools, according to GAO's national survey of school districts. For example, an estimated 41% of districts need to update or replace heating, ventilation, and air conditioning (HVAC) systems in at least half of their schools, representing about 36,000 schools nationwide that need HVAC updates. In about half of the 55 schools GAO visited in six states, officials described HVAC-related problems, such as older systems that leaked and damaged flooring or ceiling tiles. If not addressed, such problems can lead to indoor air quality problems and mold, and in some cases, causing school closures. According to GAO's survey of the 50 states and District of Columbia, most states do not conduct statewide assessments to determine school facilities' needs and instead leave this task to school districts.[iv]

According to the GAO report, Pennsylvania has required school districts to conduct facilities condition assessments, though this requirement is not current. PA also reported providing capital funding from the state for school facilities through a process called PlanCon, but PlanCon has had a moratorium on accepting applications since 2016.



Childhood asthma prevalence across the state of Pennsylvania is not equally distributed.

Asthma Prevalence

Children cannot learn if they cannot breathe; even worse when conditions in school facilities can exacerbate asthma. Asthma prevalence across the state of Pennsylvania is not equally distributed. The 2015 Asthma Prevalence in Pennsylvania Report published data on current asthma prevalence rates by gender, age, race, educational status and income status. A fact sheet summary of children with asthma in Pennsylvania follows.

- The current asthma prevalence in children ages 0-17 is 10.2%.
- The current asthma prevalence was higher in boys (12.6%) compared to girls (7.8%).
- Black non-Hispanic children had the highest current asthma prevalence (24.1%) compared to white non-Hispanic children (7.1%) and Hispanics (14.9%).
- Children ages 10-14 had the highest lifetime asthma prevalence of 18.8%.
- In 2010, the state of Pennsylvania spent approximately $1.7 billion in health care costs for asthma and absenteeism alone. In 2020, this cost is projected to be around $2.6 billion.

Although there is no cure for asthma, the severity of symptoms and associated costs have been shown to reduce with effective management through education, medical care, and interventions within the indoor built environment to reduce environmental triggers.

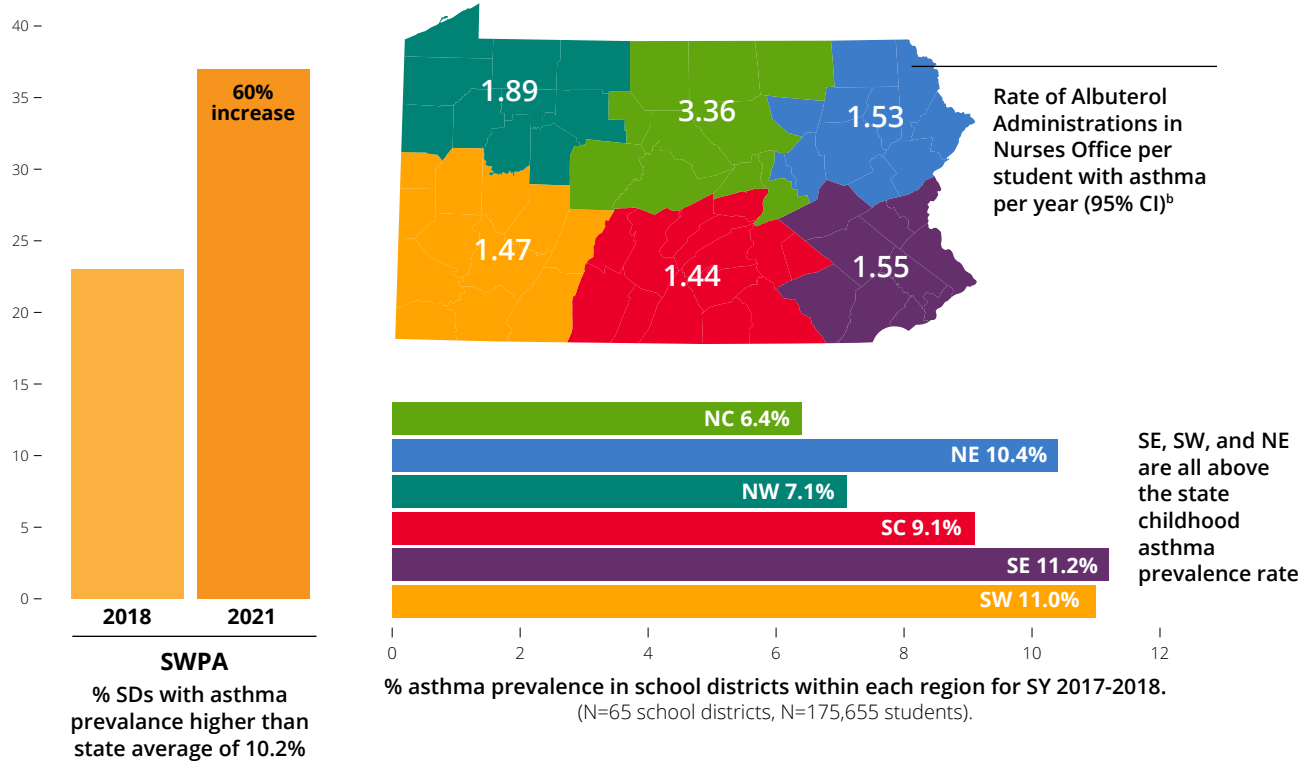
SWPA Data Comparison

In 2018 (n=93):

- 23% of SWPA districts exceeded the state average of 10.2%
- The highest asthma rate recorded was 19%

In 2019/2020 (n=99):

- Average asthma prevalence was 9% for the region
- 37% of SWPA districts exceeded the state average of 10.2%
- The highest asthma prevalence reported was 19%
- One school district recorded administering approximately 5,000 inhaler does per year
- Another district reported that in the 2015-2016 school year, 450 students took 1322 doses of inhaler/nebulizer



% asthma prevalence in school districts within each region for SY 2017-2018.
(N=65 school districts, N=175,655 students).

Regional Disparities in Asthma Prevalence

Asthma is the leading cause of chronic absenteeism for school-aged children nationwide. In Pennsylvania, 10% of children have an asthma diagnosis according to the PA Department of Health Asthma Prevalence 2015 Report.[v] One in 4 school districts in the sample had asthma prevalence above the state average. However, this distribution of asthmatic children is not equal across the commonwealth. The SEPA region had highest percentage of school districts (75%) with asthma prevalence above the state average, followed by the SWPA region (58%).

School districts in the southeast and southwest region of the state have the highest percentage of children with asthma, with 11.4% of students in the southeast sample (51,988 students) and 11% (29,667) of students in the southwest sample.

School Populations with Lower-Income and Minority Students Have a Higher Asthma Burden

The data shows that school districts across the state with higher asthmatic student populations do share some similar characteristics. These school districts tend to have a larger student population and a higher student to nurse ratio. They also tend to serve more non-white minority students, special education students, and students from low-income or economically disadvantaged families. In addition, school districts with a higher adequacy gap of spending per student and older buildings also tend to have a greater number of students with asthma.

Proximity to Environmental Hazards and Asthma Prevalence

WHE's environmental hazards mapping shows an overabundance of active gas well pads, pipelines, and Title V permit facilities within a district's boundaries in all regions.[vi] There were an average of 12 air emission sources within district boundaries for school districts in the Southeast sample, and an average of 78 air emission sources within district boundaries in the Southwest sample.

For Children with Asthma, Asthma Medication Necessary while in School

A count of albuterol doses administered is a measure of how many times asthma management medication such as inhalers were used inside a school building for a given school year. Data was shared from the Pennsylvania Department of Health indicated that every school district in our sample recorded at least seven or more doses of albuterol administered in a single school year. One school district reported 5,139 albuterol doses administered for students with asthma (9% of student population) within a single school year. The school district with the highest asthma rate in our sample had almost one in five of their students with school-nurse reported asthma (19%). Both of these school districts are located in Southwest Pennsylvania.

Recommended and Required Actions

Pennsylvania currently has several state policies in place that require school districts to create asthma medication policies, obtain student health records and histories, and ensure that students have a right to self-carry and self-administer their medication.[vii] However, Pennsylvania does not require that schools maintain asthma incident reports for attacks or medication. Maintaining records can allow districts to track trends of symptoms and attacks to eliminate potential triggers. : The EPA recommends that schools develop IAQ management programs that include asthma management strategies. Asthma management plans should outline policies regarding inhalers and other medications, as well as emergency procedures for asthma attacks. Additionally, school nurses should obtain Asthma Action Plans from students' parents or doctors, which outlines asthma triggers, medications, and emergency contact information. Pennsylvania also does not require schools to develop IAQ management plans or have emergency protocols for asthma. Additionally, the Asthma and Allergy Foundation of America recommends that a school districts nurse to student ratio be one school nurse for every 750 students or better, and Pennsylvania has not yet met this standard.[viii]

Mold

Several studies have found that there is a relationship between the presence of visible mold, humidity, and poor ventilation and increased absenteeism.[ix] The American Lung Association found that children in the U.S. miss more than 10 million school days each year because of asthma, which can be triggered by the presence of mold.[x] Mold is a known asthmagen, and asthma is the leading cause of school absences for students with chronic diseases. One study found that the average mold remediation project (with an average cost of $500,000), improved math and reading scores, and increased student probability of passing standardized tests by 3-4%. Larger scale mold remediation projects, including ventilation and roof upgrades and installations, produced even larger academic gains in students.[xi]

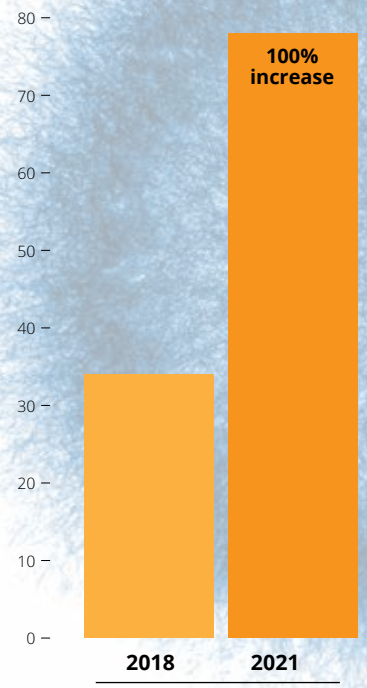
SWPA Schools

In 2018 (n=93):

- 34% of districts tested for mold in at least one building
- When school districts tested for mold, it was frequently as a result of health complaints submitted to administration

In 2019 (n=99):

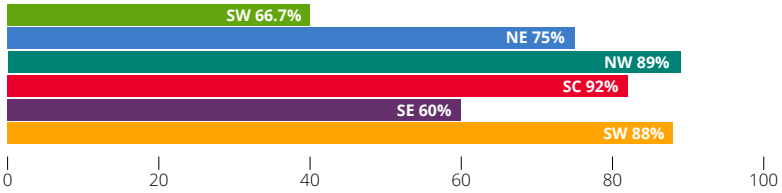
- 78% of districts tested for mold in at least one building
- In the 59 districts tested, remediation was recommended in 77%. Of those, 52 completed remediation while seven did not have documentation of remediation being done
- In 28% of districts that tested, the test was a result of visible signs of mold growth, health complaints, or odor complaints
- 10% of districts that tested did so as a result of high humidity weather or a leak in building structure
- At the beginning of the 2018-2019 school year, seven southwestern Pennsylvania districts were forced to postpone the first day of school due to mold issues



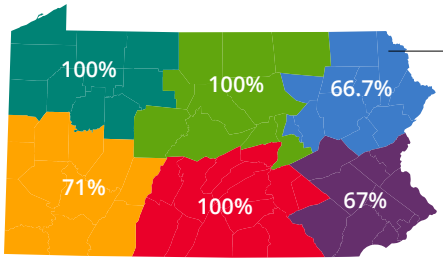
SWPA
% SDs testing for mold

% Mold testing in school districts within each region.
(N=65 school districts, N=175,655 students).

% remediation recommended



% remediation completed



In SDs where remediation recommended, mold remediation done

Testing for mold doubled within the past three school years for majority of SWPA schools. Similar to the statewide sample, majority of SWPA schools required remediation to address mold and moisture issues. However, unlike the statewide sample, more school districts in SWPA sent records of remediation. For schools who postponed school start dates due to mold, majority of them attributed this to high humidity weather, aging HVAC infrastructure, and structural damage allowing moisture to infiltrate the building.

Mold Testing Prompted by Occupant Concerns Occurred in the Majority of PA School Districts

72% of school districts in the sample reported testing for mold in at least one of their school buildings in the last five years with half of SDs testing in the past two school years (2017-2019). However, not all districts followed a similar testing protocol for all their buildings, with only five school districts in the sample reporting testing for mold in all of their buildings. Over half (57%) of the mold testing was prompted by student and staff complaints about odors, visible mold growth, or allergy symptoms; with the remaining testing being done as a 'routine test' or in response to flooding, high humidity, or other weather-related concerns. School districts sampled in the North East and South Central regions of the commonwealth had the highest percentage of school districts testing for mold (89% and 87% respectively). 67% districts required remediation in NEPA and 79% in SCPA.

While mold testing is not a preventive action, it does highlight the unique vulnerabilities of aging public school buildings across the state. When school districts test, they are prompted primarily by building occupant concerns rather than routine testing, high humidity, or weather-related flooding events. Mold exposure has the ability to harm all building occupants by exposing them to a known asthma trigger, and long-term exposures can be linked to negative chronic health impacts.

Remediation for Mold Contamination and Moisture Intrusion Required in Most PA School Districts

For districts that tested for mold, only 21.3% of schools required no action or remediation to be taken as reported in the official mold testing report provided by the industrial hygiene company. The majority of school districts' mold testing reports required some type of remediation to be completed to address mold and moisture issues. 10% of school districts had mold testing reports that recommended remediation, but no official records of remediation being completed were shared by those districts. Remediation varied from school district to school district, and included cleaning the affected areas (surfaces, carpets, ceiling tiles, and HVAC system components), purchasing dehumidifiers and HEPA vacuums, relocating students and staff, applying chemicals to prevent future microbial growth to surfaces, and replacing insulation, carpets, ceiling tiles, and other building materials. Notably, none of the remediation activities reported responding to moisture intrusion and prevention activities such as fixing leaks from structural building damage, which are known to be effective and are recommended actions in guidance documents from the EPA and from the National Institute of Occupational Safety and Health (Mold in Schools).

Mold Issues Cause School Closures and Lack of Communication Around School Closures

Unresolved mold and moisture intrusion issues can impact student learning. 57% of schools completed remediation without requiring school closures, while 10% of school districts reported that their mold and moisture issues required a school closure during the school year, with at least two school districts delaying the start of the school year due to mold remediation. Concerningly, less than a fourth of school districts (25%) of school districts in the sample sent any form of communication to parents and the school community regarding their testing and remediation activities.

While there was no statistical difference between school districts testing for mold and those who did not, in general, schools that opted out of testing served a larger proportion of students with special needs, and from lower-income and economically disadvantaged families.

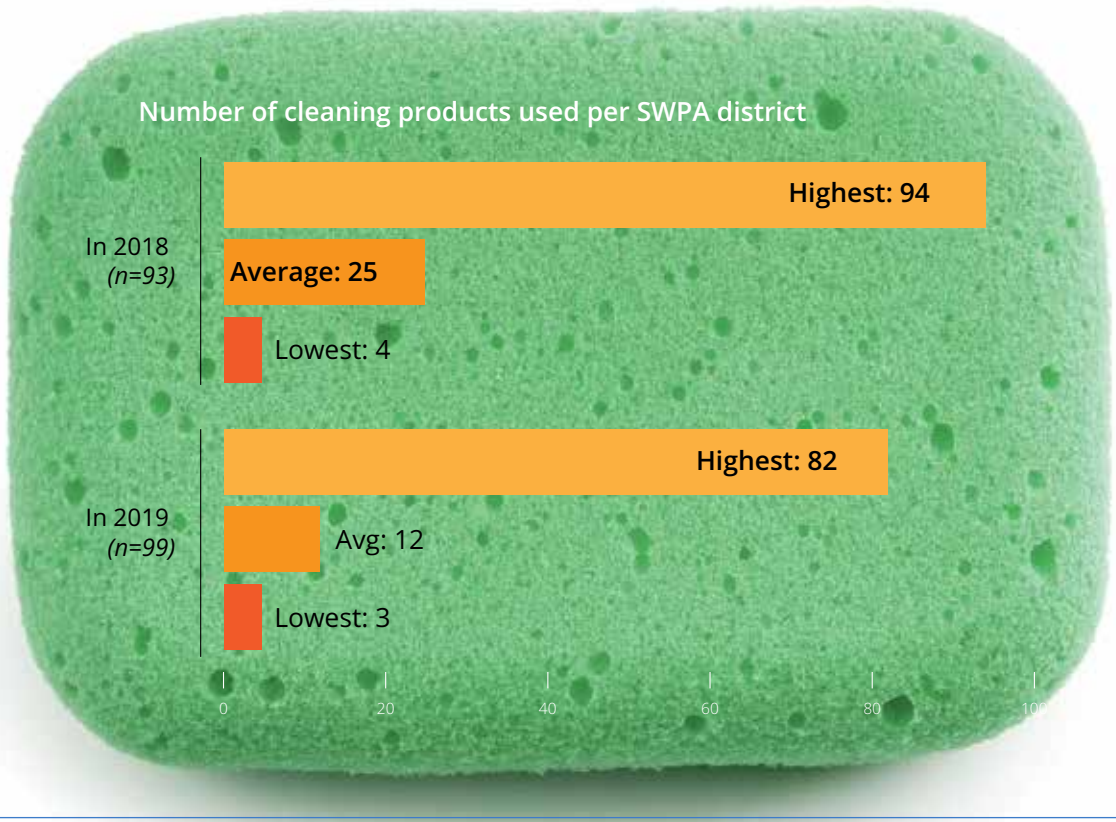
Recommended and Required Action

The best way to prevent mold inside school facilities is to prevent moisture from entering the building. Schools can take several steps to proactive protect their buildings and building occupants from mold exposure, including sealing building leaks and upgrading HVAC systems. There are currently no federal regulations concerning mold remediation in schools and no state policy in Pennsylvania. Testing for mold in schools is usually conducted in response to a complaint or presentation of allergy or asthma symptoms by school occupants.

Green Cleaning

Cleaning as Infection Prevention for COVID-19

As more school districts re-evaluate their cleaning programs to help protect students and staff from COVID-19 transmission within their school buildings, there is a great opportunity to ensure that products used to clean and disinfect are used correctly according to their label and do not exacerbate indoor air quality concerns within our school facilities. Custodial staff need support and education to ensure proper chemical application, storage, disposal, and compatibility with surfaces in schools that require daily or weekly cleaning and disinfecting. Currently, there is no state-level training or professional development program available for schools to learn more about chemical safety in their cleaning programs.



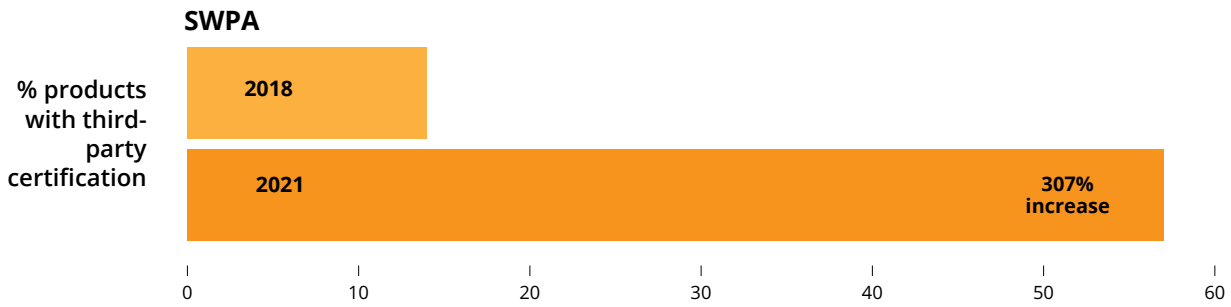
SWPA data comparison

In 2018 (n=93):

- The lowest number of cleaning products used in one district was four
- The average number of cleaning products used per district was 25
- 94 was the highest number of cleaning products used in one district
- 14% of school districts use at least one green cleaning product

In 2019 (n=99):

- The lowest number of cleaning products used in one district was three
- The average number of cleaning products used per district was 12
- 82 was the highest in the southwest sample
- School districts use an average of two environmentally friendly products
- 56 districts (57%) reported using at least one green cleaning product



In the past three years, we have observed an increase in school districts purchasing third-party certified green cleaning products, and a decrease in the number of cleaning and disinfecting products purchases. These indicate that more and more school districts are changing their behavior through purchasing and practice, and introducing and using less chemicals to clean and disinfect their buildings.

PA Schools Taking Steps to Improve their Cleaning Programs

15.4% of school districts in the sample had no third-party certified green cleaning or disinfecting products on their list. 10.8% of products on school districts cleaning and disinfecting lists (an average of 3.8 products) is third-party certified. The greatest number of cleaning and disinfecting supplies purchased in one year included over 300 products, while the least number of cleaning and disinfecting supplies reported by one district was three. Most school districts in our samples submitted unique lists for each school building's cleaning and disinfecting supplies. Even within a school district, different cleaning programs and products are used from facility to facility. This can present a host of challenges for janitorial and custodial staff who may rotate between buildings and who may need additional training to learn a new cleaning program, including which products can be used together, which must be used separately, how to properly store and dispose of chemicals, and how to protect themselves with PPE and other measures for products they do not regularly use.

Recommended and Required Action

There are many cost-effective and safer product alternatives for a school to incorporate in their cleaning program. Products with third-party certifications that measure a cleaning product for its environmental and health impacts are now more accessible than ever. The three most common certifications for green cleaning products are the EPA's Safer Choice, Green Seal, and Eco-Logo. These certified green cleaners meet standards that specifically address health and safety concerns of custodial workers, as well as building occupants. Additionally, these products must meet stringent criteria to ensure they are free of ozone-depleting chemicals, less toxic to aquatic life, and less smog-producing.[xii]

The United States Environmental Protection Agency (EPA) encourages all schools to adopt green cleaning practices to safely clean their classrooms and school grounds. To date, 14 states and the District of Columbia have passed Green Cleaning in Schools legislation. Pennsylvania is not one of them.

Radon

Because it cannot be seen, smelled, or tasted, the only way to determine radon presence is to test for it.[xiii] When trapped indoors, however, radon concentrations can increase to dangerous levels. While even low levels of radon pose some risk, the U.S. EPA has established 4 pCi/L as the radon action level and recommends that levels remain below this limit in homes and other buildings, including schools.[xiv]

School buildings are as susceptible to radon infiltration as any other building type, and high levels have been found in many schools. A nationwide survey of radon levels in schools conducted by the EPA indicates that nearly one in five schools has a classroom with radon levels above the established action levels. It is estimated that more than 70,000 schoolrooms in use today have high short-term radon concentrations.[xiii]

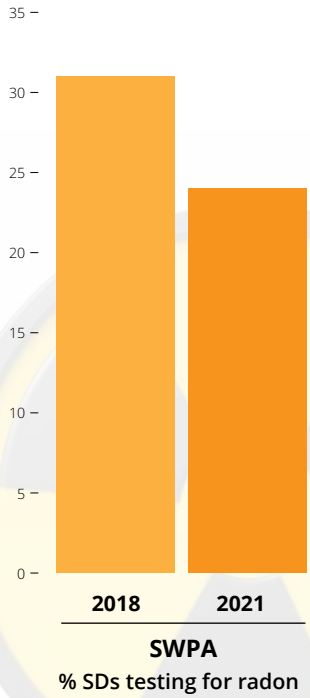
SWPA data comparison

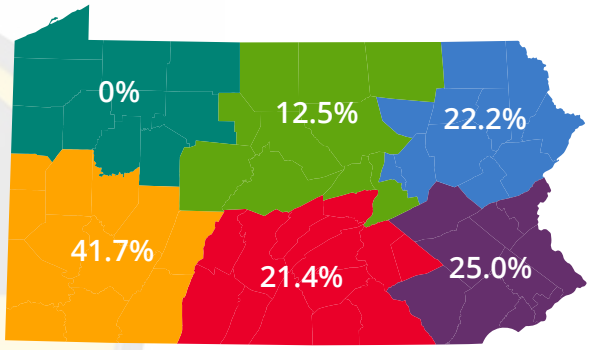
In 2018 (n=93):

- 31% of school districts conducted radon testing
- Only 1 district reported remediation for radon reported mitigation and retesting
- In one school district, 14 of 31 rooms tested had values that exceeded EPA's Action Level of 4 pCi/L for radon

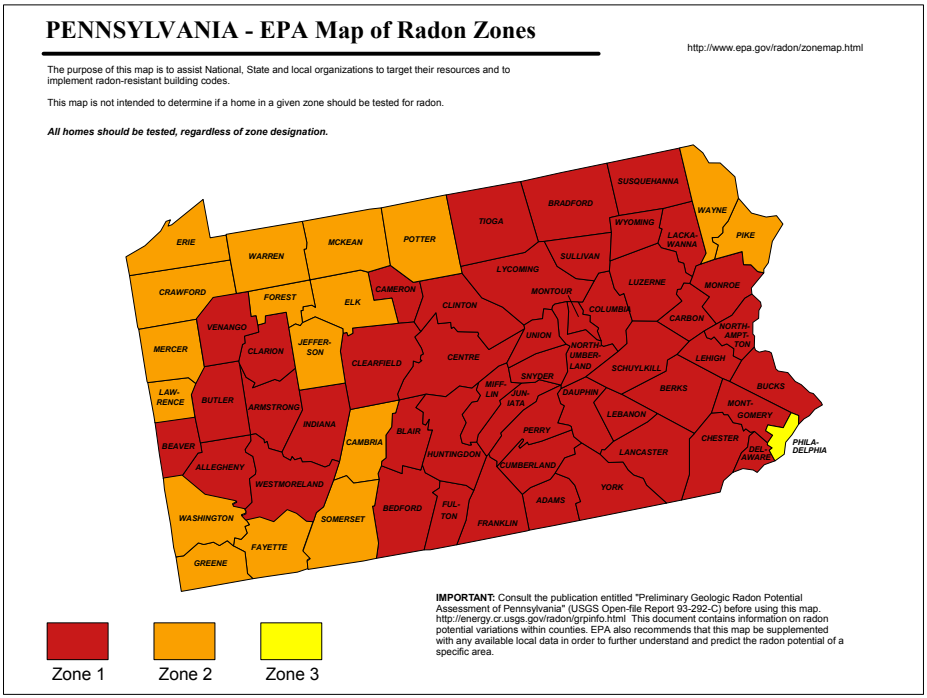
In 2019 (n=99):

- 24% of school districts conducted radon testing
- Of the districts that tested for radon, 63% tested all school buildings, 29% only tested some buildings, and 8% did not specify how many building had been tested
- In 38% of the school districts that tested, radon results were above 4 pCi/L
- One district reported radon levels as high as 23.5 pCi/L. This district did not disclose any remediation efforts.
- Another school district found high radon levels in over 44 samples
- Of the districts with elevated levels of radon found, only two districts reported any kind of remediation efforts





% of SDs testing for radon in at least 1 building



Radon Testing Uncommon and Inconsistent Across PA Schools

One-fifth, or 20% of school districts in our statewide sample tested for radon. 38% of school districts who tested for radon reported at least one occupied classroom or space that had a level above the EPA action level of 4 pci/L. This level is almost 20% higher than the EPA estimate of 1 in 5 classrooms having an elevated short-term radon level.[xiii] All but 5 school districts who tested for radon in their school buildings were located in radon risk zone 1. The remaining 5 were located in radon risk zone 2.

There is massive variability in how school districts test for radon, with some districts only testing in a few of their buildings rather than in all of their buildings. According to the EPA's Guide for Radon Testing in Schools, which is the officially recognized guidance document by the Pennsylvania Department of Environmental Protection, radon tests should be placed in every occupied space on the ground floor of a school building, and in 10% of occupied spaces in every other floor. A survey of the radon testing results provided by school districts show that some districts tested as little as 8 classrooms for 1 building, with another district reporting 440 radon tests for 2 buildings. Due to the erratic nature of radon testing in Pennsylvania, certified radon testing companies must follow the DEP and EPA's official guidance document. Of those with a high radon level, only 2 school districts reported any remedial action taken to mitigate radon exposure for students and staff.

Older Buildings More Vulnerable to High Indoor Radon Levels

School districts who had radon levels above 4 pci/L tended to test all the buildings in their district. The average age of buildings in their district was also older than the average age of buildings who tested but found no levels above the action limit (26 years compared to 12 years). Older buildings tend to have more structural issues that may more easily allow radon to enter the building.

Recommended and Required Actions

The EPA recommends all schools should be tested for radon, but in most states, this is not a requirement. According to the EPA, approximately 20% of schools nationwide have conducted some radon testing.[xiii] Currently, radon testing is only legislated in 11 states; however, Pennsylvania is not one of them. This is an opportunity for policy change to better protect the health of school occupants. The Radon in PA Schools Workgroup, convened by Women for a Healthy Environment, is actively advocating for policies that protect the health of students and staff through mandatory radon testing of existing school and childcare facilities, as well as mandate radon resistant construction standards be used for new K-12 and childcare buildings.

Indoor Air Quality Policies

Air quality policies help protect student and staff health by encouraging preventive maintenance, outlining procedures for testing and remediation, and increasing accountability and trust between school facilities staff and the school community. They acknowledge the importance of indoor air quality not just as a building specific issue but as an investment in the safety and stewardship of healthy learning facilities for all students and staff.

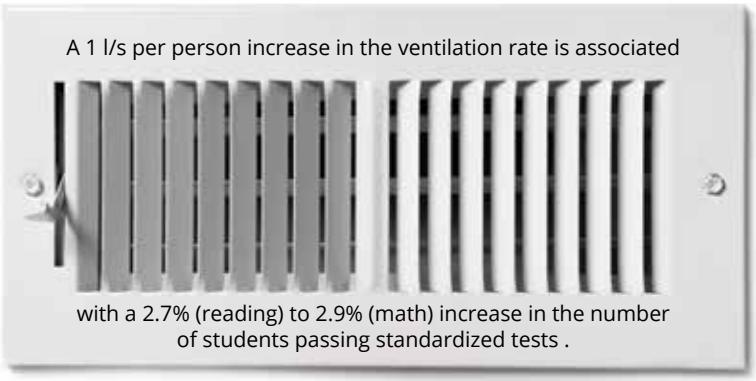
Only 15% of schools in the statewide sample reported having an air quality policy. Districts in NW (n=2), SC, SE (n=2), and SW (n=1) PA reported AQ policies (Supplemental Table 7), with half of the districts with air quality policy located in South Central PA (n=5).

IAQ Policies More Common in Newer Buildings

School districts that have an air quality policy, in general, have fewer special education students, fewer economically disadvantaged, and fewer low-income in the population. They also tend to have newer buildings (average age 15 vs. 19). In the statewide sample, of the schools that reported testing for mold (n=47), only seven (14.9%) school districts had an air quality policy. Only six of these school districts, where remediation was recommended (n=37), sent communication to parents. There was no statistically significant difference between expenditures per student for schools who had an air quality policy (15%) and those without air quality policies (85%). However, there were notable differences between student populations. Among the school districts that did not have an air quality policy, their student populations tended to have a larger portion of students in economically disadvantaged, low-income families.

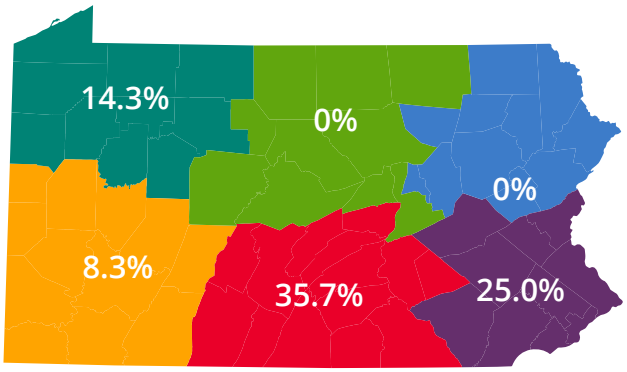
Academic outcomes and air quality

Multiple studies have linked poor IAQ to negative health outcomes across childhood. Acute exposures, such as those caused by the application of chemicals in cleaning or disinfecting products that are known respiratory irritants, or the incidence of mold spores in indoor air, may cause immediate and long-term health effects that can affect cognitive function and academic performance.



Studies have found that exposure to air pollution and high-pollen days can reduce academic performance on standardized tests.[xv] However, upgrades or renovations meant to improve a school's indoor air quality, such as roof repairs, upgraded ventilation systems, and increased air flow, are positively associated with increased academic performance. One study on air quality and children's educational outcomes found that performance on Texas' standardized math and reading tests before and after school renovations that improved indoor air quality found substantial improvements in test scores following renovations to remediate mold or improve ventilation.[xv] After controlling for confounding factors and student demographics, one long-term study found that, for classrooms with ventilation rates in the range of 0.9–7.1 liters/second (l/s) per person (which are lower than recommended), a 1 l/s per person increase in the ventilation rate is associated with a 2.7% (reading) to 2.9% (math) increase in the number of students passing standardized tests.[xvi]

Indoor Air Quality Policy in District



School Building Materials

According to data from the statewide sample, the average school building was built in 1964 with average year of last renovation in 1997. This is about 20 years older than the national average age of public school buildings, according to the EPA's Tools for Schools program. The oldest school building in the dataset was built in 1908. 11.0% were built or most recently renovated before 1978. School facilities located in the NCPA reported the oldest median school building age of 62 and the oldest average year of renovation 1970. Notably, the schools in our sample from this region also serve the greatest percentage of students from low-income families.

Because PA public schools are older, they are uniquely vulnerable to hazards within the built environment. The majority of schools in our sample did not report any testing for hazards such as polychlorinated biphenyls or lead in dust, paint, or soil. Because of how persistent these hazards are in the built environment, they are important priorities when considering updating and renovating Pennsylvania's aging school infrastructure. In addition, PA schools, like many other schools across the nation with aging infrastructure, have known hazards within the built environment, including asbestos, phthalates, flame retardants, mercury, and volatile organic compounds. These environmental exposures have been linked to acute and chronic health effects for students and staff.

Polychlorinated Biphenyls

Polychlorinated Biphenyls, or PCBs, are a group of man-made organic chemicals consisting of carbon, hydrogen, and chlorine atoms. PCBs are very stable mixtures that are resistant to extreme temperature and pressure, making them widely used in caulk, electronics, fluorescent light ballasts, plasticizers, insulation, and other building materials from the 1950s to 1970s.[xvi] PCBs have been classified as a probable human carcinogen and have been demonstrated to cause a variety of adverse health effects. Environmental and occupational exposures to PCBs have been linked to negative impacts on kidney, liver, neurological, and reproductive health. In children, studies have shown that PCB exposure could adversely affect immune responses to childhood vaccinations, as well as affect enamel development on teeth[xl]. Yet, PCBs remain in over an estimated 25,000 school buildings.[xvi] Congress banned the commercial production of PCBs in 1976 due to toxic health and environmental impacts. In 1979, the US EPA banned the use of PCBs, however, PCBs are still present in many products and buildings developed before this year. PCBS do not readily break down once in the environment and can cycle between air, water, and soil for long periods of time.

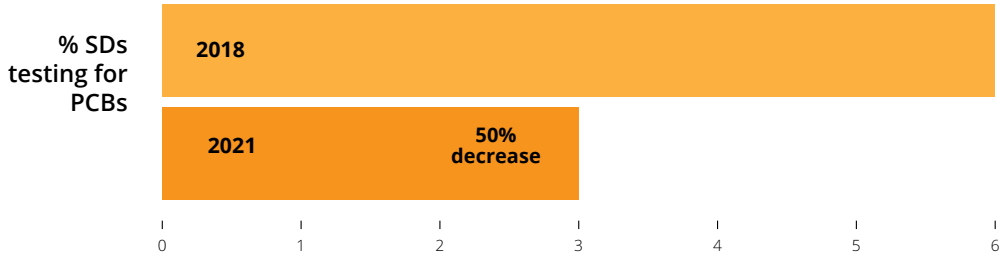
SWPA Data Comparison

In 2018 (n=93):

- 6% of districts completed PCB testing

In 2019 (n=99):

- 3% of districts conducted PCB testing
- 97% did not respond to the question or indicated that no records were available, even though the average southwest school building was built in 1961 (well before the PCB ban)



Testing for PCBs was completed in few PA school districts.

PCB testing occurred in only 8% of districts in the sample. School districts who tested tended to have older buildings, spend more per student, and have a lower ranked adequacy gap. 53% of school districts in the sample reported the renovation year for their school facilities before 1978. Since PCBs were banned in 1979, over a decade after most school facilities were built (mean: 1964), the risk of PCB contamination may be higher in Pennsylvania schools.

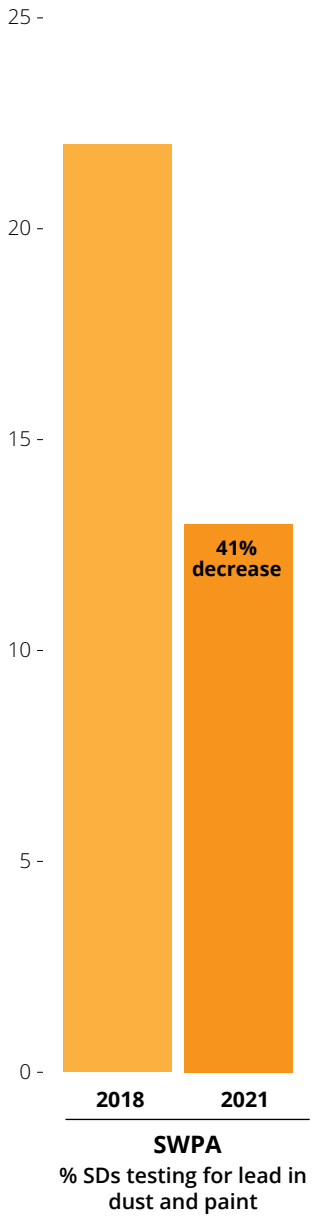
Recommended and Required Action

Schools built or renovated between the 1950s and 1970s may have PCB-containing building materials. In response to concerns about PCBs in schools, the EPA has been conducting studies to identify and evaluate sources of PCBS in schools and better understand exposure risks. Research results have indicated that caulk put in place before 1979 may contain as much as 40% PCBS, which can also contaminate surrounding materials such as wood.[xvii] Additionally, fluorescent light fixtures that still contain their original PCB ballasts are well beyond their intended lifespan, and the risk of rupture and emittance of PCBs is significantl. It is important for schools built or renovated during these years to be prepared to address this hazard. Replacing PCB-containing lighting fixtures in school buildings with energy-efficient lighting eliminates a public health hazard, provides better lighting for students and staff, decreases energy costs, and reduces the potential risk of a future emergency concerning PCB exposure.

Lead in dust and paint

Due to its natural occurrence, lead can be found in paint, dust, soil, and consumer products in addition to water. This section of the report will focus solely on testing for lead in paint, dust, and soil.

Lead-based paints used to be commonplace and were utilized to enhance drying time and resist moisture. It was not until 1978 that the use and sale of lead-based paints was banned by federal law.[xviii] According to the EPA, the most common source of lead exposure in children is from paint in buildings built before 1978.[xix] With the average Pennsylvania public school being built in 1964, lead presence in these buildings is likely. There is an even higher possibility of lead presence in paint for those schools built before 1960. When lead paint begins to deteriorate by peeling, chipping, cracking, or other means, it becomes a hazard and requires immediate attentioniiiiii. This deterioration process creates lead paint chips and dust that can be easily ingested by children. Any surface covered with lead-based paint where the paint may wear by rubbing or friction is likely to cause lead dust including windows, doors, floors, porches, stairways, and cabinets. Young children under 6 years old most at risk for lead poisoning because of their hand-to-mouth behaviors and curiosity about their surroundings.[xx] Older children are primarily exposed through dust inhalation and can still carry lead poisoning.



SWPA Data Comparison

In 2018 (n=93)

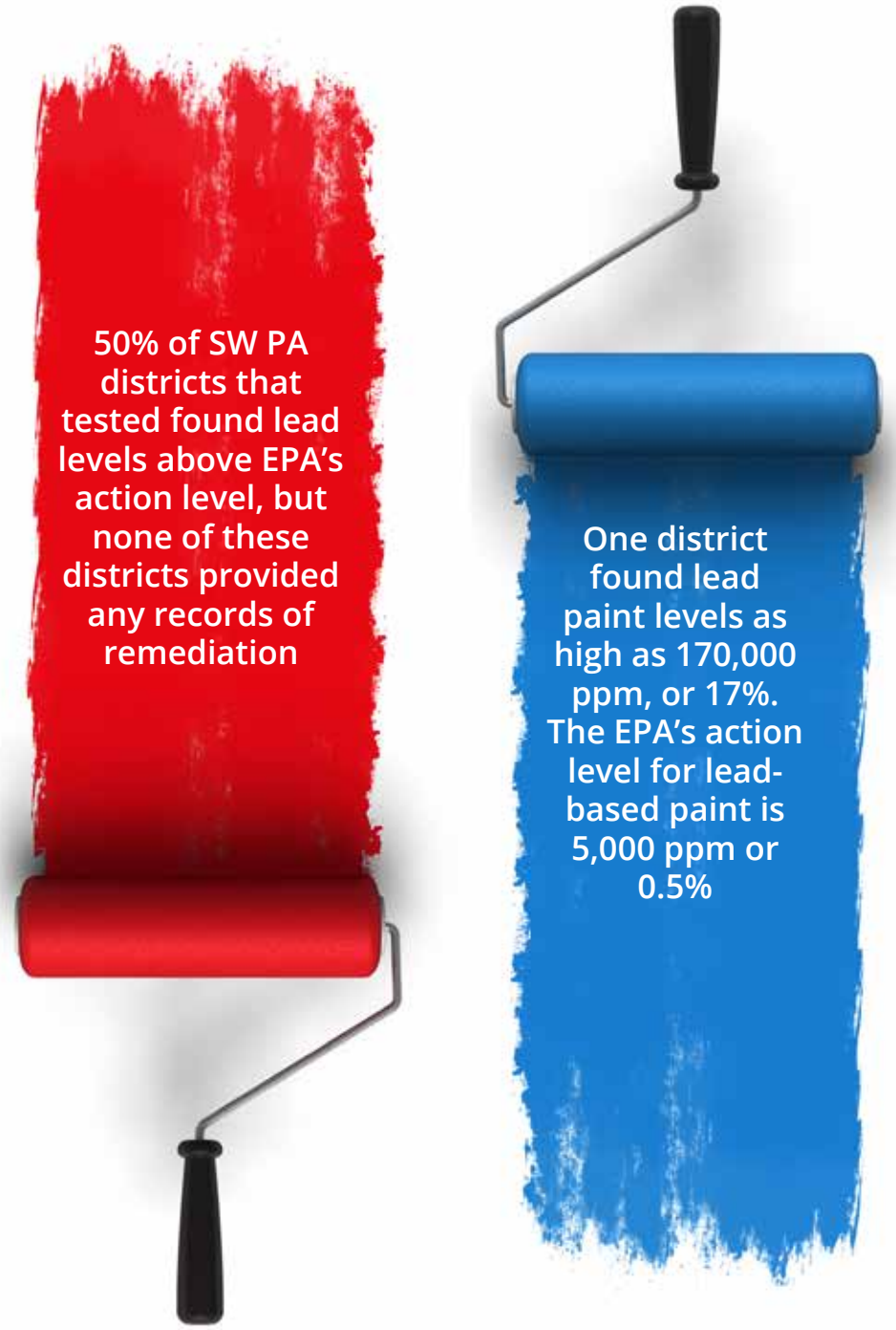
- 22% of districts reported that lead testing was conducted
- Of the 307 school buildings reported in the study, 83% (256) were originally built before 1978, the year that federal regulations prohibited lead from being used in paints.

In 2019 (n=99)

- 13% of SW PA districts reported that lead testing was conducted
- 50% of SW PA districts that tested found lead levels above EPA's action level, but none of these districts provided any records of remediation
- Of the SW PA schools that provided lead in paint testing records, none of them tested for lead in paint/dust in all district buildings
- One district found lead paint levels as high as 170,000 ppm, or 17% The EPA's action level for lead-based paint is 5,000 ppm or 0.5%

Testing for Lead Paint Rare, Despite Age of PA School Buildings

Less than 10% of schools in a statewide sample conducted lead in paint, dust, or soil testing in the past 10 years. Schools who tested did trend towards having older buildings by about 8-10 years. Half of the districts who tested had exceedances in lead paint levels. None of the districts with exceedances noted any form of remediation.



Recommended and Required Action

The EPA's Lead Renovation, Repair, and Painting Rule (RRP) requires that firms performing renovation, repair, or painting projects that will disturb lead-based paint in homes, childcare facilities, or schools built before 1978 be certified by the EPA or use EPA-certified renovators.[xxi] Enforcement of the RRP rule is generally conducted by the EPA on a complaint-driven basis. However, under-reporting and a lack of federal resources can create significant barrier to effective enforcement

Water Quality

Access to safe and clean drinking water is a fundamental right guaranteed by the Pennsylvania state constitution. Schools across the nation have grappled in recent years with the challenges of aging infrastructure in school facilities, exposing students and staff to harmful water contaminants like lead and copper. In addition, the COVID-19 pandemic has brought to the light how vulnerable school buildings are to environmental hazards after prolonged periods of no occupation. Legionella and other microbial cysts can grow in and around water outlets within school facilities. Exposure to these bacteria can cause severe health impacts to both school staff and students. In this section, we investigate the available data on water quality issues, including lead in drinking water testing requirements. We also discuss the large number of school districts who receive some of their water from private wells and what challenges they might face.

Lead in Drinking Water

We now have over 40 years of research on the effects of lead poisoning in children. Needleman et al. (1979) examined lead levels in first and second graders' and found that students with higher lead-levels (>17.2 ppm dentine lead) appeared to be highly distractible, more dependent, frustrated, hyperactive unable to follow simple directions and sequences, and had low overall functioning compared to students with lower lead level (<5.1 ppm dentine lead). In the same group of students, it appeared that full scale IQ was significantly lower in high lead students compared to low lead students with specific deficits in information, vocabulary and overall verbal IQ. Similar findings have been reported, leading public health agencies and authorities to conclude that there is no safe level of lead exposure for children.[xxii]

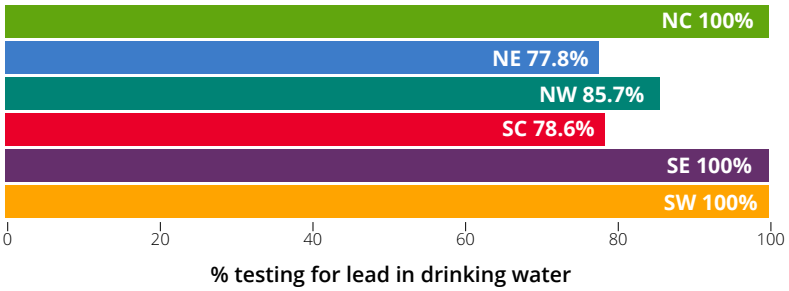
SWPA Data Comparison

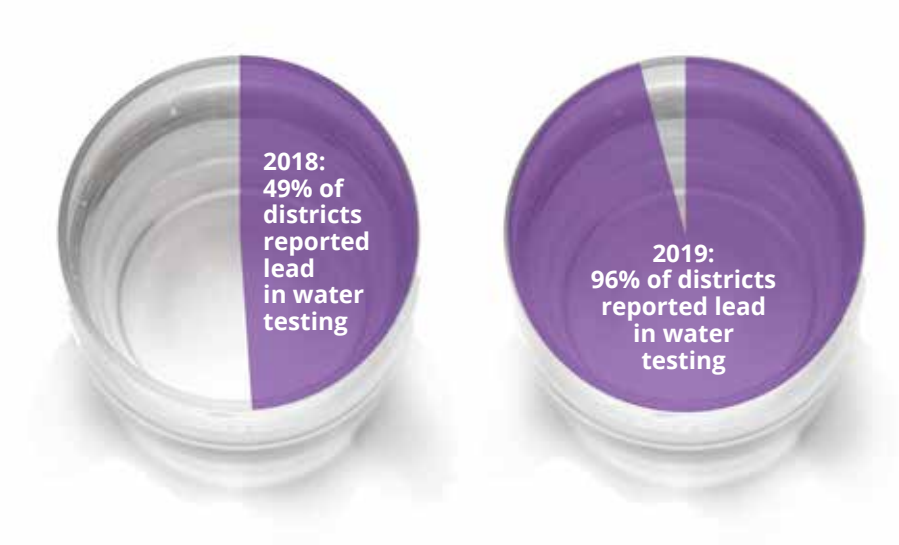
In 2018 (n=93)

- 49% of districts reported lead in water testing
- 7% of districts relied on municipal testing
- Lead testing in one district revealed concentrations on "1st draw" samples – the first water out of the outlet testing reached 149 ppb, significantly above the 20 ppb threshold set by EPA for action

In 2019 (n=99)

- 96% of districts reported lead in water testing
- 65.8% of these districts tested in the 2018-2019 school year
- Only 66.7% of the districts who tested performed these tests in all their school buildings
- Of the schools that tested, 70.7% reported an exceedance above 5 ppb
- Of the school districts with lead levels exceeding 15 ppb, 43.8% sent remediation records
- Lead testing in one district revealed concentrations on "1st draw" samples reached alarming levels of 1,920 ppb





Required Lead in Drinking WaterTesting is Inconsistent

In a statewide sample, only 82% of school districts reported testing for lead in drinking water, despite the statewide requirement. The majority of schools in the sample reported testing for lead in drinking water in the 2018-2019 school year (72%), but only 62% of schools who tested for lead in drinking water performed these tests in all their school buildings, as required by Act 39 in the PA School Code. There is not a statistically significant difference between the student demographics within schools who tested and schools who did not test. It is unclear how school districts created sampling plans for which water outlets to test. There is some guidance provided by PDE.[xxiii]

Of schools who tested, 71% reported an exceedance above 5 ppb. Many school districts reported only results over 20 ppb despite the PA School Code's reporting limit being set at 15 ppb.

Barriers to Remediating Lead in Drinking Water Exist

In school districts that exceeded the PA School Code's reporting limit of 15 ppb, only 62.5% noted that they had performed and/or completed remediation for those outlets. It is uncertain whether those school districts who did not remediate these outlets are in violation of the PA School Code as there is no enforcement action within the school code requirement. The most common remediation activities reported to PDE were replacing fixtures and removing outlets from service. Only one school district installed filters on their outlets.

Recommended and Required Actions

The EPA has developed the 3Ts: Training, Testing, and Taking Action, to provide tools for schools, childcare facilities, and water systems to reduce lead in drinking water.[xxiii] This toolkit aims to train school officials on the occurrences, causes, and health effects of lead, encourages regular lead testing, and provides resources for taking action to reduce lead levels. The federal Safe Drinking Water Act also requires the EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. These levels are based on potential health risks and are called maximum contaminant level goals (MCLGs). Based on the best available science, the EPA has ruled the MCLG of lead to be zero. According to the EPA, World Health Organization, American Academy of Pediatrics, and others, no amount of lead exposure is considered safe for children.

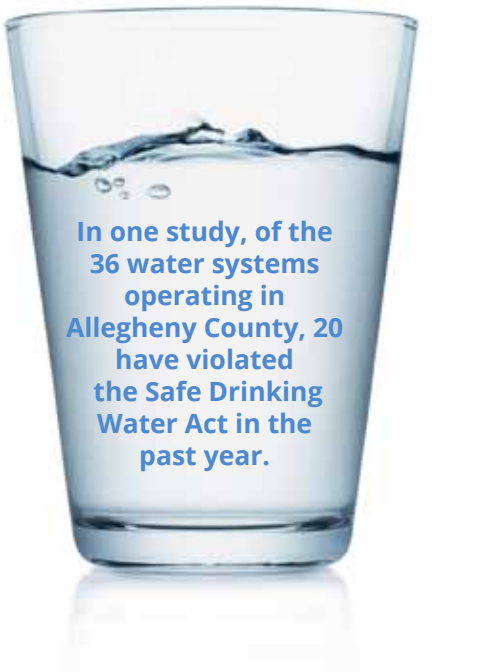
Under Pennsylvania's Act 39 of the Public-School Code, school districts are encouraged to test for lead in their drinking water in every building and are required to act if results exceed the EPA's drinking water standard of 15 parts per billion (ppb) or 0.015 mg/L.[xxiv] Any school with elevated lead levels must immediately implement a plan to ensure that no child or adult is exposed to lead contaminated drinking water and provide alternate sources of drinking water. If a school chooses not to test for lead, then the school must discuss its reasoning at a public meeting once a year[xxxvii].

Water Quality Issues

Water quality testing is conducted to determine the presence of coliform bacteria, heavy metals such as lead and copper, trihalomethanes, haloacetic acids, and other contaminants. Because these contaminants cannot be seen, smelled, or tasted, it is important to test and monitor for them regularly. In one study, of the 36 water systems operating in Allegheny County, 20 have violated the Safe Drinking Water Act (SDWA) in the past year. 16 of these violations were due to a failure to monitor, 3 were related to having multiple contaminant exceedances, and 3 failed to submit their Consumer Confidence Reports (CCRs).[xxv] Schools reflect the communities in which they reside; exceedances of contaminants in community water sources can indicate poor water quality in school buildings.

Sources of Drinking Water in PA Schools

School facilities typically get their water from a public municipal water source. From publicly available data on the Pennsylvania DEP website, we found 334 public wells located on school district property whose water use was labelled for withdrawal for institutional use.[xxvi] This indicates that water from these wells may be used within school facilities as potable water. The EPA has identified several potential contaminants from well water that include microorganisms, heavy metals, agricultural byproducts such as nitrites and organic chemicals, and radioactive nuclides like radon.[xxvii]



SWPA Data Comparison

In 2018 (n=93)

- Water quality tests that included copper and other contaminants were performed in 49% of districts
- 7% of districts relied on municipal water testing
- One school district had to close for several days because its schools tested positive for coliform bacteria, including E. coli.
- Water in the restroom in the administration building in one school district exceeded the EPA Action Levels of 1.3 mg/l of copper for drinking water with a 2.35 mg/l reading.

In 2019 (n=99):

- Water quality tests that included copper and other contaminants were performed in 49% of districts
- 6% of school districts relied on the local water authority's report
- One school district had copper levels that exceeded the EPA Action Level of 1.3 mg/l of copper for drinking water with a 16.1 mg/l reading.

Water Quality Results Show Exceedances within School Buildings

Though not as common as lead in drinking water testing, about half of all schools in the statewide sample reported conducting water quality tests (48%). About a quarter (23%) of school districts used municipal testing reports to represent the water quality within their school facilities. Seven school districts reported water quality levels above exceedance limits, but only one school district reported any remediation action. Exceedances in water quality tests included toxic heavy metals and gasses like copper (8), chlorine (3), and barium (1), chemicals such as HAA5 (1), TTHM (2), fluoride (1), and bacteria such as E. coli (1). Turbidity issues were also noted in two school districts.

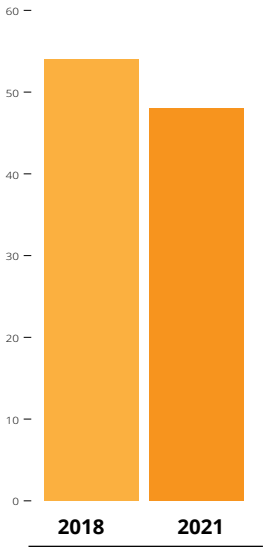
School Grounds

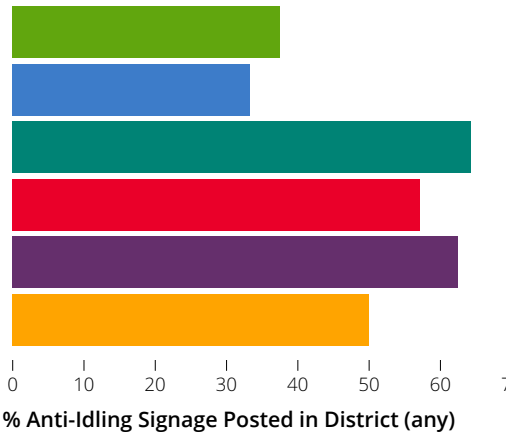
School buildings and their encompassing grounds are important environments for students to learn, grow, and play. The location of schools is vital to informing community planning and development. While we require children to attend school, there are not many requirements to protect these spaces where children learn from environmental hazards, including major roadways, railroads, landfills, unconventional (fracking) wells, and point source pollution sites. The environmental health and safety of all children must be considered when siting a new school or renovating an old one so that children can learn in a safe and toxic-free setting.[xxviii] Outdoor air pollution, pesticide exposures, chemical mixtures, and other hazards currently exist on school grounds, but their effects disproportionately impact low-income and minority student populations. Children's lungs, which are still developing, are larger in proportion to adults' lungs, so children inhale 50% more air per pound of body weight than adults. Individuals routinely exposed to diesel exhaust face higher risks of stroke, cancer, asthma, heart attacks and other chronic illnesses.

Diesel Emissions

The U.S. EPA points to diesel exhaust as among the most dangerous forms of air pollution. Diesel exhaust releases high levels of toxic particulate matter which travels deep into our lungs. Children, as well as people with existing heart and lung conditions, are especially vulnerable to diesel pollution.[xxix] School buses produce diesel exhaust every time they park with the engine running, often while waiting for children to enter or exit the bus. Idling exhaust pollutes both the outdoor air and the air inside the school building as school ventilation systems often draw air ventilation from areas where buses and other vehicles circulate. School districts must be cognizant of where buses pick up and drop off children. For instance, queuing parallel to each other, rather than parking front to back, reduces exhaust from entering into the bus and exposing children and the driver to additional harmful fumes.

Not only is idling dangerous to health, it also puts a great stress on bus engines and wastes fuel. In addition, pollution from car exhaust is created when parents queue up to drop off or pick up their children. Green school initiatives often include incentives that reduce the number of children driven to school. These include rewarding carpooling, walking and riding bikes.





SWPA comparison

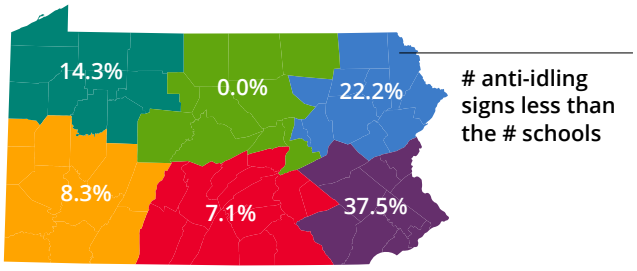
In 2018 (n=93)

54% of schools did not have anti-idling signs

5 – average number of anti-idling signs

In 2020 (n=99):

48% of schools reported no anti-idling signs. Of those with signs, 41% had at least one anti-idling sign per school facility. (Table 8)



Anti-Idling Signage Absent in Half of School Districts Sampled

Only 53% of school districts in the sample reported any anti-idling signs posted on their school facilities. Of those school districts with posted anti-idling signs, only 39% reported having at least 1 anti-idling sign per school facility. School districts in the Northwest and the Southeast regions reported the greatest percentage of school districts with anti-idling signs, with over 60% of districts in the sample with signs. Northeast and Northcentral regions, more rural areas of the state, reported the least, with only a third of their school districts reporting signs (38% and 33% respectively).

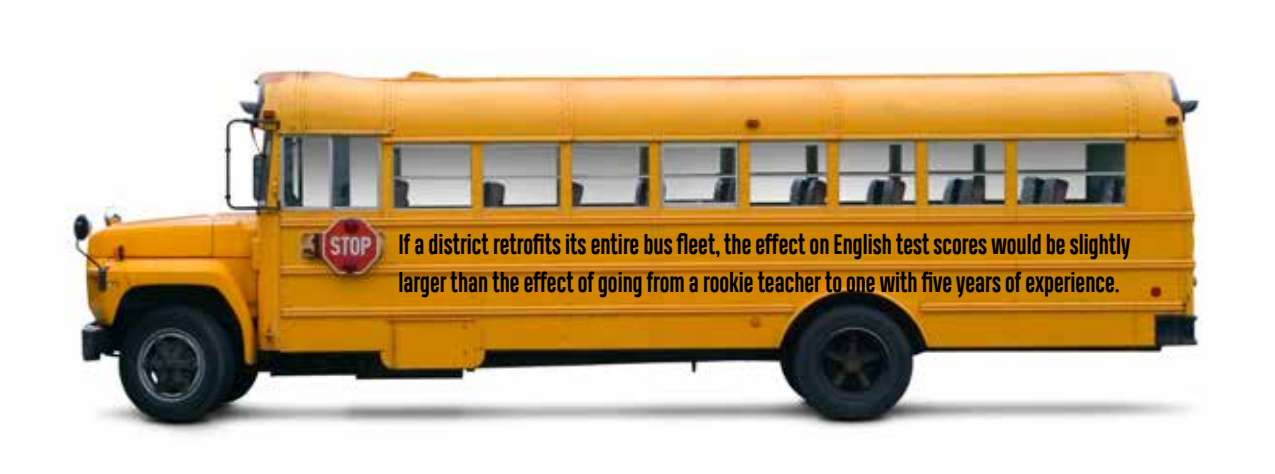
A Missed Opportunity for Protecting Children from Diesel Emissions

In 2019, the Pennsylvania DEP, launched the Driving PA Forward Grant and Rebate Program with funds from the Volkswagen Emissions settlement. The goals of this grant program were to incentive grants and rebates to reduce harmful air pollution, including those emitted by diesel school buses. As of December 2020, only seven school buses were replaced with new diesel vehicles. These school buses transport students in 5 counties. None of these bus companies sought to purchase and install retrofits, but rather the funds were used to purchase new diesel vehicles.[xxx] The average cost to purchase these new diesel school buses was $40,000-$50,000.

Based on data from the US Department of Transportation's Congestion Mitigation and Air Quality Improvements grant, $11.2 million dollars were made available to retrofit 1890 school buses, bringing the average cost of a school bus retrofit to just under $5,300 per school bus. In a study of school bus retrofits in Georgia, the average cost of school bus retrofits was estimated at $8,000 per school bus. Depending on the type of particulate filter installed, a school bus retrofit can cost as little as $600 for a diesel oxidation catalyst with emissions reductions of 20-40% for particulate matter and 10-60% for carbon monoxide. More expensive filters can cost $15,000 but can remove emissions from particulate matter by 70-90% and carbon monoxide from 70-95%.[xxxi] For the same amount awarded to purchase seven new diesel buses, 35 school buses could have retrofitted filters installed, for the same reductions in particulate matter and carbon monoxide.

Recommended and Required Action

School districts either purchase their own school buses and manage an inhouse transportation department or contract this service to a third party. Regardless of what entity owns the buses, all schools must follow state regulations and comply with the Pennsylvania Diesel Powered Motor Vehicle Idling Act (Act 124).[xxxii] Act 124 forbids diesel-powered vehicles, including school buses, to idle more than five minutes in any continuous 60-minute period. It states, "An owner or operator of a location where subject vehicles load or unload or a location that provides 15 or more parking spaces for subject vehicles shall erect and maintain a permanent sign," which informs drivers that idling is restricted in Pennsylvania.[xxxi] By law, schools and school districts must post at minimum one sign to alert school bus drivers of idling restrictions. Act 124 also applies to diesel-powered vehicles that visit the school, such as delivery trucks. The idling restriction in Act 124 is a good guide for parents waiting in school pick-up and drop-off lines.



Diesel Emissions and Academic Performance

Diesel emissions from school buses expose children to high levels of air pollution; retrofitting bus engines can substantially reduce this exposure. From data pulled from over 2,500 school bus retrofits, researchers saw significant improvements in students' respiratory health.[xxxii] Retrofitting districts saw a sizable increase in aerobic capacity scores. The effect was twice as large when we restricted the sample to elementary-school students, who are more affected by air pollution than their older peers.

Based on estimates, if a district retrofits its entire bus fleet, the effect on English test scores would be slightly larger than the effect of going from a rookie teacher to one with five years of experience. Retrofitting an entire district's fleet is at least as effective as moving all students from a district with average air pollution levels to one with air pollution levels in the 10th percentile.[xxxiii]

Proximity to Point Source Pollution Sites

There are no existing regulations in Pennsylvania that protect school building occupants from harmful environmental contaminants from point source pollution sites. For this analysis, we utilized data from our Environmental Hazards in Pennsylvania K-12 Schools GIS mapping project. Our analysis found almost 10,000 hazardous sites (n=9,496) across the state within ½ mile radius of K-12 schools. Title V-permitted facilities, brownfields, landfills, and Toxic Release Inventory sites (TRI) make up the majority of these sites.

While there are a multitude of environmental hazards included in the mapping project, this analysis focuses specifically on Title V permitted air emission sources and sites included in the U.S EPA's 2019 TRI report.

Both these data sets include sites that emit pollutants in exceedance of the Clean Air Act and Clean Water Act's standards. There are 1,438 toxic release sites located within ½ mile of 848 school facilities. Schools in SEPA have the most TRI sites within half mile, followed by SCPA and SWPA. Most of these TRI sites are located close to elementary schools. One elementary school in NWPA has 10 TRI sites within a ½ mile border.

Proximity to environmental hazards and student academic outcomes

Unlike criteria air pollutants (e.g., particulate matter) which have been regulated for decades, little is known about the effects of most of the chemicals released by TRI facilities because most of the chemicals emitted have never undergone any kind of toxicity testing (US Department of Health and Human Services, 2010) and were essentially unregulated until 2011.[xxxiv]

According to one research study, "contemporaneous exposure to pollutants in schools has significant, negative impacts on test scores: a TRI site opening within one mile of a school is associated with approximately 2.4 percent of a standard deviation lower test scores for students in the school"lxxi. Researchers also found that pollution affects the likelihood a student will be suspended or absent from school. These effects vary by age, with a stronger negative effect of TRI site openings on younger students' test scores, but that cumulative exposure over several years causes worse outcomes. TRI sites were also correlated with a school-level academic rankings: a TRI site opening within one mile of a school is "associated with lower performance on school accountability measures, equivalent to a 2.7 percentage point increase in the likelihood a school's ranking drops one or more levels."[xxxv]

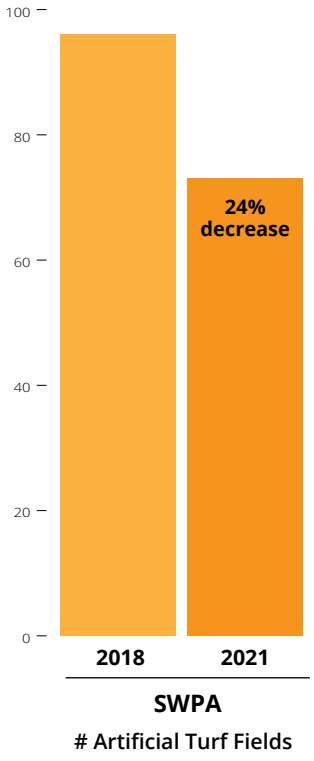
Artificial Turf Fields

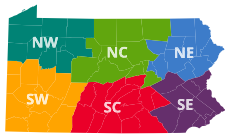
Synthetic playing surfaces, also known as artificial turf, are widely used in athletic fields, running tracks, playgrounds and other commercial facilities, including schools. Synthetic turf contains a variety of substances with disconcerting health and environmental effects. In 14 crumb rubber samples analyzed by Environment and Human Health Inc. (EHHI), 92 different chemicals were found.[xxxvi] Half of these chemicals had not been tested by the government for health impacts, and those that had undergone some government testing contained 11 carcinogens and 20 chemicals that can irritate skin, eyes, and lungs.[xxxv] Beyond toxicity, artificial playing surfaces are also drastically hotter than natural grass playing fields. Crumb rubber absorbs heat, resulting in surface temperatures of up to 150 degrees Fahrenheit.[xxxvii] Temperature disparities between synthetic playing surfaces and natural grass fields were noted during data sampling conducted by Healthy Schools PA staff in September 2018 and 2019. The surface temperature of synthetic fields often ranged from 10-30 degrees higher than the surface of the adjacent natural grass, and 10-20 degrees higher than the observed ambient air. These excessive temperatures can contribute to burns, dehydration, and heat exhaustion, especially during rigorous exercise or gameplay.[xxxv]

SWPA Data Comparison

In 2018 (n=93):

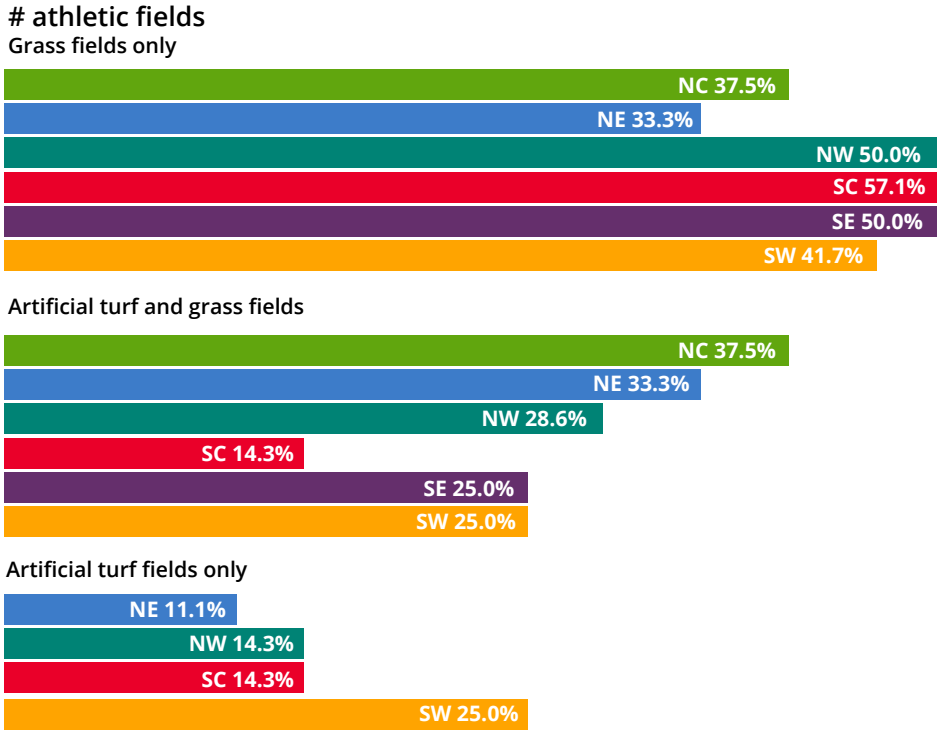
- 96 synthetic playing surfaces were reported
- 1 was the average number of synthetic fields per district





In 2019 (n=99):

- 73 synthetic playing fields were reported
- The highest number of synthetic fields per district was 4 (three different districts had this number of synthetic fields)
- Artificial turf fields were reported by 60% of school districts (35% had both turf and grass fields; 14% had synthetic fields only), 37% had all grass fields, and 13% provided no response



Artificial Turf Fields Common in PA Schools

Artificial turf fields were reported by 39% of school districts. 26% of public school districts had both turf and grass fields; 12% had synthetic fields only, 46% had all grass fields, and 15% provided no response.

Of the 78 synthetic turf fields, 9 were installed 10 or more years ago; 25 are 5 to 9 years old; 14 have unknown installation years, and the remaining 30 were installed less than 5 years ago (2020). The majority of the artificial turf fields in the dataset are located in Western PA.

Artificial turf fields are a growing trend for the majority of Pennsylvania public school districts. Majority of the artificial turf fields reported were installed less than 5 years ago. Only 10 artificial turf fields were installed more than ten years ago. The average life cycle for artificial turf fields is 5-15 years depending on the manufacturer, field use, and maintenance schedule. The average costs of these fields presents a sizable capital expense, especially for school districts with shrinking tax bases and an adequacy gap in funding from the state. Grass fields, on the other hand, have can be used forever with proper upkeep and maintenance.

Recommended and Required Action

States, cities, counties, and other entities across the United States have begun to phase out the use of crumb rubber and synthetic playing surfaces due to potential health risks. For example, the New York City Department of Parks and Recreation stopped installing fields with crumb rubber in 2008, and the Los Angeles Unified School District followed suit in 2009 with a temporary ban. Scientific studies continue to research the safety and efficacy of synthetic turf fields. Both the United States Environmental Protection Agency (EPA) and the Consumer Product Safety Commission (CPSC) no longer support safety claims for synthetic turf fields and are investigating crumb rubber and other infill materials for their health effects.[xxxv]

Pesticides on School Grounds

The research is clear that children are particularly susceptible to pesticide exposure, and that these chemical exposures can have long-term consequences on the health and development of a child. Even at lower levels where symptoms are not observed in pregnant mothers, researchers have found that "levels of exposure common among the U.S. population can lead to neurological and behavioral deficits (e.g., motor, memory, and attention) in school-aged children."[xxxviii] Motor control deficits,[xxxix] developmental delays,[xl] and ADHD diagnoses[xli] are more common in school-aged children with long-term or maternal exposure to pesticides.

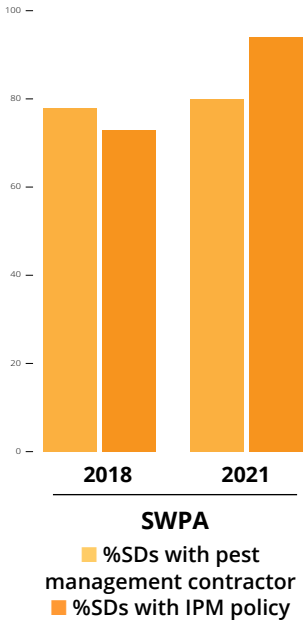
SWPA Comparison

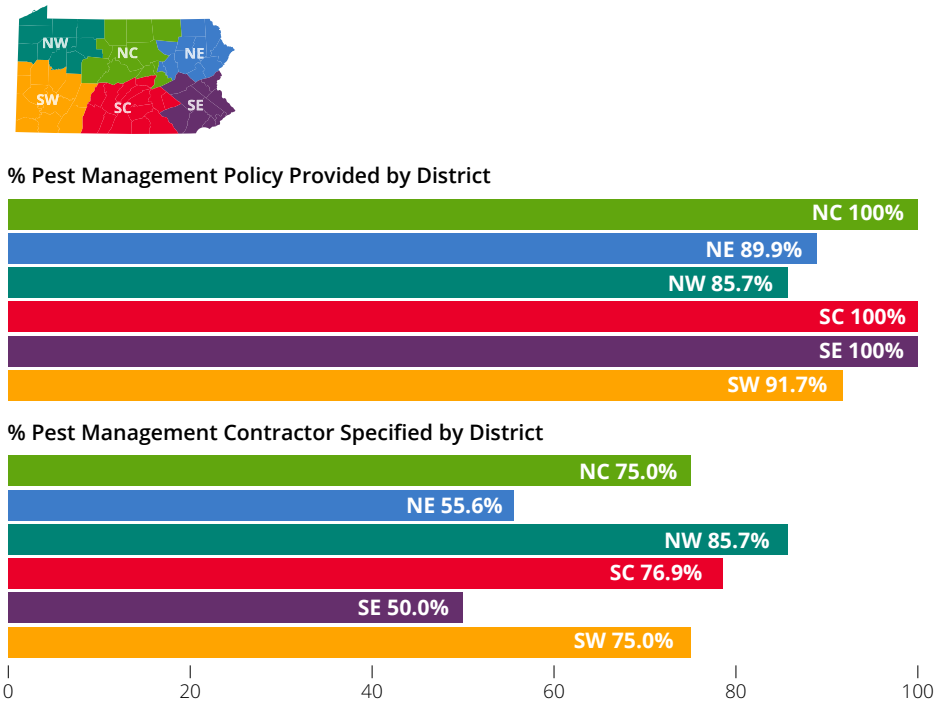
In 2018 (n=93):

- 78% of districts reported using at least one pest-management contractor or performing services in-house
- 6% indicated they do not contract with a pest management company
- 16% did not respond to the question

In 2019 (n=99):

- 94% of school districts had a pest management policy
- 73% specified a pest management contractor, while 21.2% did not specify a contractor





Despite IPM Policies, Pesticides Are Still Actively Being Applied on School Grounds

94% of school districts in the statewide sample reported having an IPM Policy. However, 73% of school districts also reported using a third-party pesticide company to apply pesticides on school grounds in the 2018-2019 school year. A review of pest management contracts indicates that pesticides are applied, on average, at least twice during the school year as 'preventive maintenance'. This is not in accordance with IPM best practices, as outlined in the Penn State Extension's Integrated Pest Management for Schools and Childcare Centers updated manual (2020).[xlii]

IPM Enforcement Lacking

There is no enforcement action attached to Act 35 or 36, which means that there is no way for parents to know whether IPM best practices are being utilized on their school grounds. Most districts do not have the funds to employ a dedicated integrated pest management coordinator. However, district facilities and maintenance staff can be trained and certified as pesticide applicators and develop specific internal policies and procedures for dealing with pests within their district.

The EPA recommends that all schools districts consider implementing programs that promote IPM to protect the health of children. In Pennsylvania, state regulations require schools to implement IPM plans and alert parents and staff of chemical pesticide application prior to use. Pennsylvania Senate Bill 705 (Act 35) requires all state schools to adopt IPM programs, and Pennsylvania House Bill 1289 (Act 36) requires notification of pesticide use in state schools. Including Pennsylvania, twenty-three states have a school IPM law or regulation.[xliv]

Required and Recommended Actions

The presence of pests can be avoided with integrated pest management (IPM). In contrast to the traditional application of pesticides to combat pests, IPM focuses on pest prevention and utilizes a more environmentally friendly approach. IPM revolves around six essential components: monitoring, record-keeping, action levels, prevention, tactics criteria, and evaluation.[xliii] This approach aims to respond to pest problems with the most effective, least-risk option by reducing or eliminating the use of pesticides to minimize the toxicity of and exposure to harmful chemicals. Applications of pesticides are always a last resort in IPM programs. The most successful IPM plans are those that properly educate school staff on the purpose and benefits of IPM strategies as opposed to pesticide use.

Call To Action

Almost 50 years of public health research has connected the importance of the built environment on the health and development of children. Pennsylvania law requires that children attend school. We must take action to protect children's health in the spaces where they grow, learn, and play.

Healthy schools are necessary.

The research is clear that the learning environment has significant impact on student health, cognition, and academic performance. If we want to give every child the best opportunity to reach their full potential, we must take the necessary actions to improve the environmental quality of school facilities.

The COVID-19 pandemic has never made so clear the reality that schools are community institutions. For a growing number of children and their families, schools are a primary source of health and human services—providing access to primary care, dental, and vision health professionals; increasing food security and Internet access in both rural and urban settings; and providing family case management services through the community school model. Public schools also serve an important role in community safety and emergency management, acting as emergency shelters during times of man-made and natural disasters[xlv].

Healthy schools are possible.

There is a once-in-a-lifetime opportunity to invest in public school infrastructure. The American Rescue Plan has approved uses that include:

- training and professional development for school buildings and grounds staff;
- repairs and infrastructure improvements to reduce virus transmission and eliminate exposures to existing environmental health hazards;
- funding to support student health needs and creation of public health protocols to maintain the health and safety of students, educators and other staff.[l]

The Pennsylvania Department of Education encourages schools to evaluate long and short-term needs, consult stakeholders, and consider the best available research when deciding how to use their allocated funds.[xlvi] Given the findings presented in this report, PA public school districts should invest in long-term solutions, addressing structural repairs, upgrades to their HVAC systems, and elimination of environmental health hazards to impact student and staff health, safety, and academic performance.

Healthy schools are what our children deserve.

Investing in healthy schools is foundational to combatting inequity in our communities. The data bears this out. Schools that serve more minority, low-income, and special education students struggle with proactively performing environmental hazards testing. These schools also face competing budget priorities that present challenges to remediating identified hazards in their school buildings. According to an analysis completed by Research for Action, a Philadelphia based think-tank "All of Pennsylvania's neighbors [Ohio, West Virginia, New York, Maryland, and New Jersey] have established and funded similar programs to specifically address facility issues that make a school unhealthy".[l] Across the state, there is a lack of consistency in how schools are testing, remediating, and communicating environmental health risks. While all schools can use support and guidance navigating environmental health in the school environment, investments should be made equitably across the Commonwealth to consider the needs of school districts who are under-resourced across urban, suburban, and rural settings.

Acknowledgements

We would like to acknowledge and thank all of our external reviewers who provided valuable insight into this report. We would like to express our sincere gratitude for the public school districts who responded to our Right-to-Know requests.

Abington School District
Albert Gallatin Area School District
Aliquippa School District
Allegheny Valley School District
Allegheny-Clarion Valley School District
Ambridge Area School District
Apollo Ridge
Armstrong School District
Avella Area
Avonworth
Baldwin-Whitehall School District
Beaver Area School District
Belle Vernon Area School District
Bellefonte Area School District
Bentworth School District
Bethel Park School District
Big Beaver Falls Area School District
Blackhawk School District
Blairsville-Saltsburg School District
Bradford Area School District
Brentwood Borough School District
Bristol Borough
Brownsville Area School District
Burgettstown Area School District
Burrell School District
California Area School District
Canon-Mcmillan School District
Carlisle Area School District
Carlynton School District
Central Greene School District
Central Valley School District
Charleroi Area School District
Chartiers Valley School District
Chartiers-Houston School District
Clairton City School District
Cocalico School District
Commodore Perry School District
Connelsville Area School District
Cornell School District
Coudersport Area School District
Danville Area School District
Deer Lakes School District
Derry Area School District
Dunmore
Duquesne City School District
East Penn School District
Eastern Lancaster County School District
Ellwood City Area School District
Fort Cherry School District
Fox Chapel Area School District
Franklin Regional School District
Frazier
Freedom Area School District
Freeport Area School District
Freeport Area School District
Gateway School District
Girard School District
Greater Latrobe School District
Greensburg Salem School District
Greenville Area School District
Harmony Area
Hempfield Area School District
Highlands School District
Hopewell Area School District
Indiana Area School District
Jeannette City School District
Jefferson-Morgan School District
Karns City Area School District
Keystone Oaks School District
Kiski Area School District
Lackawanna Trail School District
Lakeland School District
Laurel School District
Leechburg Area School District
Ligonier Valley School District
Littlestown Area School District
Lower Merion School District
Marion Center Area School District
Mars Area School District
McGuffey School District
McKeesport Area
Meyersdale Area
Millersburg Area School District
Moniteau
Montour School District
Mt. Lebanon School District
Neshaminy School District
Neshannock Township School District
New Brighton Area School District
New Castle School District
Newport School District
North Allegheny
North Hills School District
Northern Lebanon School District
Northern Tioga
Northgate
Norwin School District
Oley Valley School District
Oswayo Valley School District
Otto Eldred School District
Oxford Area School District
Penn Hills School District
Penn-Trafford School District
Penns Manor Area School District
Pine-Richland School District
Pittsburgh Public Schools
Plum Borough School District
Punxsutawney Area School District
Purchase Line School District
Quaker Valley
Quakertown Community School District
Ridley School District
Ringgold School District
Riverside Beaver County School District
Riverview School District
Rochester Area School District
Saucon Valley School District
Schuylkill Haven Area
Scranton School District
Seneca Valley School District
Shaler Area School District
Slippery Rock Area School District
South Allegheny School District
South Butler County School District
South Eastern School District
South Fayette School District
South Park School District
South Side Area School District
Southeastern Greene School District
Southmoreland School District
Spring Cove School District
St. Mary's Area School District
Steel Valley School District
Sto-Rox School District
Tamaqua Area School District
Titusville Area School District
Trinity Area School District
United School District
Upper St. Clair School District
Valley Grove School District
Wallenpaupack Area School District
Warwick School District
West Allegheny School District
West Greene School District
West Jefferson Hills
West Middlesex Area School District
Western Beaver County School District
Wilkinsburg School District
Williams Valley School District
Wilmington Area School District
Woodland Hills School District
Wyoming Area School District

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