

HVAC Webinar: Improved Air Quality for all the Right Reasons

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Mary Ann Dewan, Ph.D., Santa Clara County Superintendent of Schools
David Putney, Ed.D., Director Of Special Projects
Kyle Peerless, MPH, California Department of Public Health

Today's Goals

- Increase awareness of the importance of air quality
- Gain an appreciation for the link between air quality and student learning outcomes
- Review CDPH's best practices for improving air quality
- Clarify Cal OSHA Requirements, Cost Decision Making recommendations, and Identify Funding Opportunities
- Learn how to respond to environmental hazards, wildfire smoke, excessive heat, and respiratory diseases that include COVID-19
- Q & A



Importance of Air Quality: Improving Health in Schools

- Approximately seven million children in the United States—an average of one out of every ten school-aged children—have asthma.
- Asthma is also a leading cause of school absenteeism.
- Every year, more than 10.5 million missed school days are attributed to this disease.
- Controlling asthma as part of a comprehensive indoor air quality (IAQ) management program can lead to reduced absenteeism and increased student performance for students and staff.

- Air pollution is the leading environmental toxin ([Landrigan et al., 2017](#)), attributed to diseases responsible for an estimated 16% of premature deaths globally.
- The World Health Organization declared air pollution an unequivocal carcinogen ([Loomis et al., 2013](#)). Other adverse health effects include asthma attacks, acute and chronic bronchitis, respiratory symptoms, pneumonia, increased risk for acute myocardial infarction, loss of work and school days, and premature death ([Hall, Brajer, & Lurmann, 2008](#); [Samet & Krewski, 2007](#)).
- Communication about air quality has the potential to reduce the adverse effects of air pollution through generating awareness and catalyzing public opinion in support of policies for air pollution reduction and through education for individual risk mitigation behaviors; all are components of environmental health literacy.

Air Pollutants and Health Effects

Who's at Risk

Ozone

Particulate Matter

Poor air quality can irritate the eyes, nose, and throat, cause shortness of breath, aggravate asthma and other respiratory conditions, and affect the heart and cardiovascular system. Breathing polluted air for long periods of time can cause more serious problems.

People Most at Risk

Children





STUDENT HEALTH AND ACADEMIC PERFORMANCE

Quick Reference Guide

The Scientific Evidence is Mounting

Qualitative and quantitative evidence demonstrating the relationship between IAQ and human performance and productivity has become more robust. Studies demonstrate that improved IAQ increases productivity and improves the performance of mental tasks, such as concentration and recall in both adults and children.⁶ This strengthens the case for schools to develop IAQ management plans, which include critical maintenance tasks, as a key part of an education development strategy.



STUDENT HEALTH AND ACADEMIC PERFORMANCE

Quick Reference Guide

The Effects of Air Ventilation on Health and Performance

Most schools' ventilation rates are below recommended levels.¹⁰ However, ensuring adequate air ventilation rates in all classrooms can:

- Reduce absences and the transmission of infectious diseases.¹¹
- Improve the overall health and productivity of teachers.
- Improve test scores and student performance in completing mental tasks.^{12, 13, 14, 15, 16, 17}



STUDENT HEALTH AND ACADEMIC PERFORMANCE

Quick Reference Guide

In one study, students in classrooms with higher outdoor air ventilation rates scored 14 to 15 percent higher on standardized test scores than children in classrooms with lower outdoor air ventilation rates.¹⁸

In addition, ensuring that heating, ventilation and air conditioning (HVAC) drainpans and other components are clean reduces the chance of occupant illnesses.

Improving Indoor Air Quality in Schools: Lessons Learned for COVID-19 & Beyond

Kyle Peerless

California Department of Public Health

July 2023



Virus & Cigarette Smoke Analogy



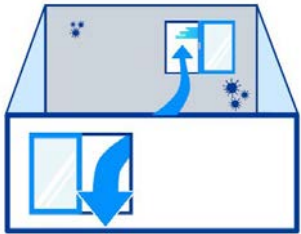
What Reduces “Smoke” Inhalation Risk?

- **Dilute** the smoke with outdoor air, opening the windows, etc.
- **Filter** out smoke particles in the air with air filter/HEPA filter

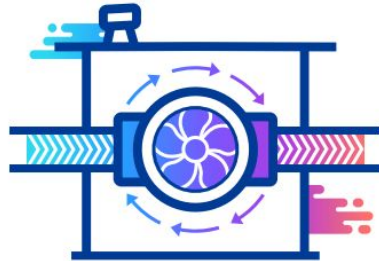
How Do We Improve Indoor Air Quality?

Ventilation

Natural

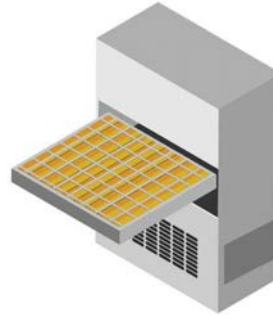


Mechanical

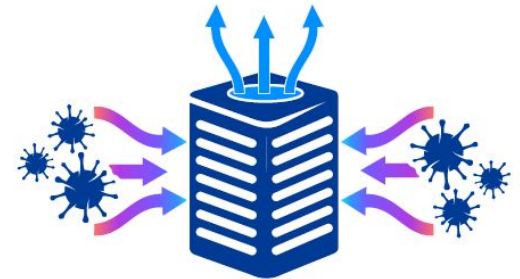


Filtration

HVAC

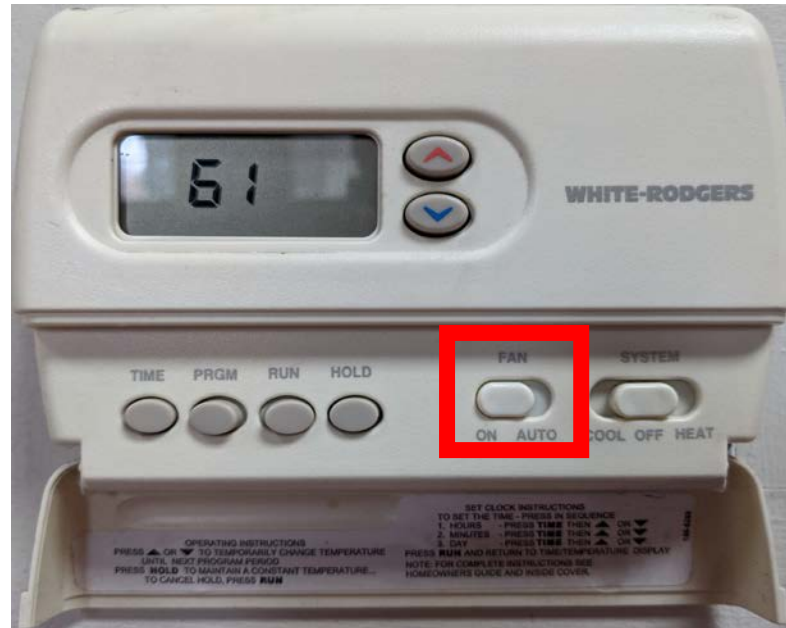


Portable



Tip #1: Run System Continuously

- Set system to “ON” instead of “AUTO” during school hours
- If on AUTO, HVAC system will be off for extended periods
- Continuous operation required under [DIR §5142](#)



Benefits of Running Continuously

If thermostat is on “Auto”

- Inconsistent outside air
- Inconsistent filtration of recirculated air

If thermostat is on “ON”

- Continuous outside air
- Continuous filtration of recirculated air



Return Air Flow

Tip #2: Inspect Dampers and Vents



Tip #2: Inspect Dampers and Vents



Tip #2: Inspect Dampers and Vents



Tip #2: Inspect Dampers and Vents



Tip #2: Inspect Dampers and Vents

- Full “audit” of air supplies and returns
 - Utilize facilities staff
 - *****Check every supply, return, and outside air damper*****
- Regularly check inlets/outlets
 - Integrate into other scheduled maintenance (filter change-out)
 - Annual inspection required under [DIR §5142](#)



Tip #3: Standardize Portable Air Cleaner Use

- Observation of highly inconsistent PAC use in classrooms
 - Different settings, turned off
 - Teachers lacking guidance
 - Anecdotal noise complaints
- Communicate to all teachers about standardized PAC use
 - Why they are important
 - Run continuously during school hours
 - Run at highest setting acceptable for noise level



Portable Air Cleaners – Tips and Tricks

- Purchase portable air cleaners with HEPA filters (>99.97% filtration)
 - Ionizers, UV lights, etc will only add \$\$\$, not effectiveness
- Size based on classroom size
 - Don't trust “square footage” recommendations – not standardized across companies!
 - Use the 2/3rd rule to size – CADR 2/3rd sqft of room size
 - 98% reduction of airborne hazard in an hour in classroom w/ 10ft high ceilings

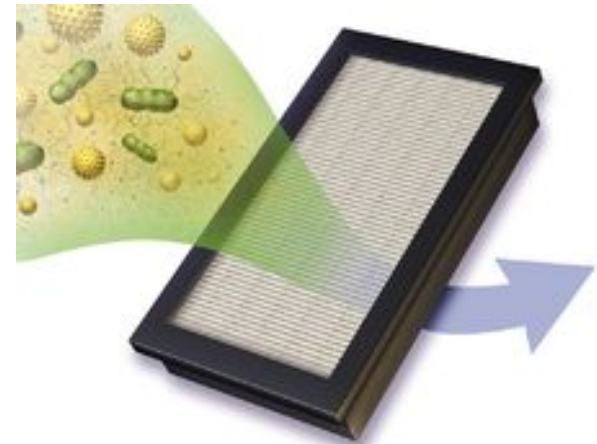


Image Credit: Wikimedia Commons

Portable Air Cleaners – Tips and Tricks

If noise is an issue, use multiple PACS!

- 2+ smaller PACs

Increased air mixing

=

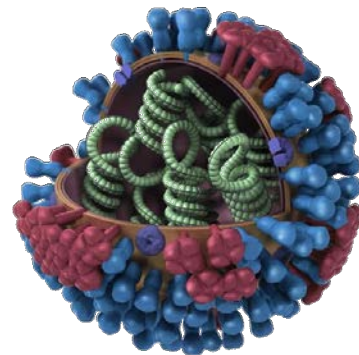
Increased effectiveness!



Image Credit: CDC

An Investment Beyond COVID: Good IAQ Protects Students from Other Hazards

- Good IAQ will reduce many diseases in schools!
 - Flu
 - RSV
- Investing in better filtration and PACs will protect students from wildfire smoke as well!
 - Virus particles and unhealthy particulate matter in smoke are similar size, and thus both are filtered out by filters such as MERV-13



Beyond COVID: Economic and Student Benefits of Good IAQ

- Increased student performance associated with improved ventilation in research
- Lower CO2 concentrations (happens with fresh outdoor air) correlated with better math, grammar, and reading comprehension results
- Shown to reduce student absenteeism
- Greater economic benefit!

Cal/OSHA Requirements: Ventilation & IAQ

- Cal/OSHA Non-Emergency COVID Standard has been in effect since February 2023, it has several ventilation/IAQ provisions:
 - Employers shall review CDPH & Cal/OSHA [ventilation guidance](#)
 - Employers shall attempt to maximize outdoor air supply to the extent feasible
 - Employers shall use MERV-13 filtration (or highest feasible)
 - Employers shall use PACs in work areas where outdoor air or greater filtration cannot be introduced
- Employers shall run HVAC systems continuously during business hours
- Employers shall inspect their HVAC system annually



Take-Aways

- Run HVAC systems continuously during school days
 - Disease can spread when system is off -> super spreader events
- Have staff ensure outside air dampers open and supply/returns vents not blocked
- Work with teachers to standardize portable air cleaner use

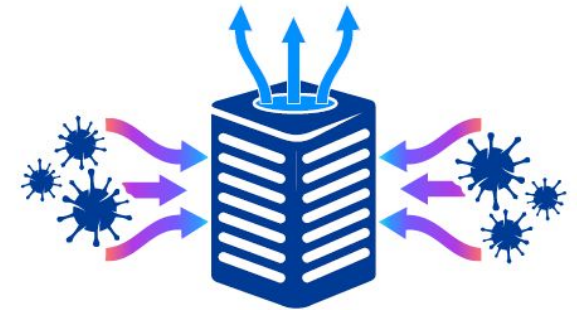
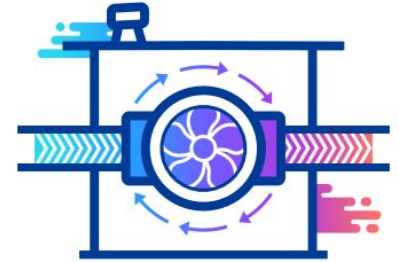


Image Credit: EPA

Decision-Making Framework

- If your site has a functioning HVAC system, focus on...
 - System running continuously
 - Regularly inspect dampers and vents are open/clean/not blocked
 - Highest filtration possible (protects against wildfire as well)

- If your site has classrooms without HVAC, focus on...
 - Standardized PAC use
 - Opening windows/doors when safe/appropriate





FISCAL RESOURCES



HVAC Costs: Investment in the Future

- Increased attendance/student performance
- Economic/attendance benefits offset energy costs
- Expensive HVAC retrofits often not necessary – let's optimize what we have!

Cost	Intervention
\$0.35 - \$0.60 / sq. ft	HVAC System Assessment
\$5 - \$10 / sq. ft	HVAC Upgrade
\$0.50 / ft ²	Filter Upgrade

Cost of Using PACs

HEPA @ CADR = 300 cfm in 700 ft² classroom w/ 25 students

- Capital cost: < \$250 (one time)
- Recurring costs:
 - Filters ≈ \$75/yr
 - Electricity ≈ \$20/yr
- Total cost over 3 yrs: < \$535
- 50 classrooms: < \$9,000/yr

Educating child in US = \$13k/yr

HEPA in every classroom < **\$7.13/student/yr**

< 2 Venti Café Americanos / student / yr

< 0.055% cost of educating child in US

Inflation Reduction Act Funding: IAQ

- **US Green Building Council Center for Green Schools** has many resources and information on how schools can apply for hundred of millions of dollars in grants/tax incentivizes for IAQ upgrades
- [Informational Webinar Series](#)
- [Additional Funding Information](#)

Center for Green Schools

New webcast series helps schools access federal funding




Image credit: @LPAA.

Anisa Heming 3 minute read

Jul 11, 2023

The series kicked off with an information-packed session on June 29.

California Schools Healthy Air, Plumbing, and Efficiency Program - CalSHAPE

- The CalSHAPE Ventilation and Plumbing Programs will begin accepting applications for Funding Round Five at 10:00 a.m. on July 18, 2023. The application deadline for both programs is 5:00 p.m. on March 31, 2024.
- Applications are submitted electronically using the CalSHAPE Online System. An access link, instructions, and a video training can be found under the “Online System” expandable menu.

[FREQUENTLY ASKED QUESTIONS](#)

Respond to environmental hazards, wildfire smoke, excessive heat, and respiratory diseases that include COVID-19



Wildfire Smoke

Wildfires produce large amounts of particles and gases, including fine and coarse particles, greenhouse gases (carbon dioxide, methane, nitrous oxide), photochemically reactive compounds (e.g., carbon monoxide), non-methane hydrocarbon, and nitrogen oxides.

Wildfires contribute to air pollution through the emission of primary pollutants and the production of secondary pollutants, e.g., ozone, during photochemical processing.

The impact of wildfires on air quality depends on weather patterns (including temperature, humidity, and wind speed), fire plume dynamics, amount and chemical composition of the emissions, and atmosphere into which the emissions are dispersed.

Geography also plays a role; mountains and other features may contribute to inversion layers that can keep smoke contained in certain areas (or keep smoke out).

Wildfire smoke exposure hurts learning outcomes

The new analysis, published Sept. 29 in *Nature Sustainability*, draws on eight years of standardized test scores from nearly 11,700 public school districts across six grades, as well as estimates of daily smoke exposure derived from satellite measurements

The researchers found test scores in English language arts and math dropped significantly during school years even at low levels of smoke exposure, and that test-score impacts grew as students' smoke exposure worsened.

The impact on test scores nearly doubled when students were exposed to heavy smoke during the school day compared to the weekend. Underscoring previous studies suggesting that air pollution impacts are particularly harmful for younger students, the study also revealed greater impacts for third to fifth graders compared to sixth to eighth graders.





The relationships between classroom air quality and children's performance in school

Pawel Wargocki^a, Jose Ali Porras-Salazar^b, Sergio Contreras-Espinoza^c, William Bahnfleth^d



Introduction

Classrooms are places where children spend a large part of their waking hours to gain new knowledge and develop various skills and abilities. Research has documented that the indoor environmental quality in elementary school classrooms is often inadequate [[1], [2], [3]].

This has been demonstrated to have negative consequences for the learning process [4,5]. In previous work by Wargocki et al. it was shown that the temperature in classrooms has a strong impact on learning [6]. The present work examined how the performance of schoolwork is affected by poor classroom air quality.

The relationships between classroom air quality & children's performance in school

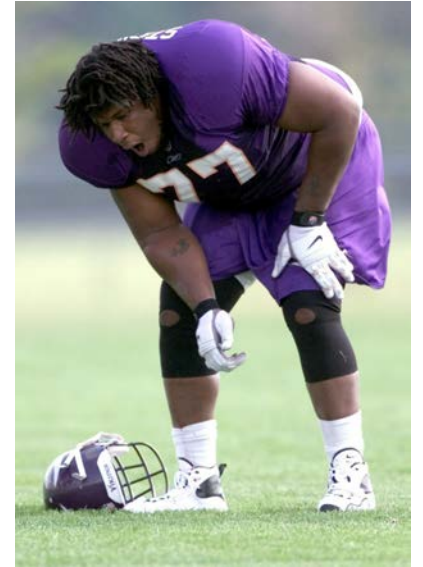
- Several studies have shown that classroom air quality may compromise the cognitive skills and abilities of pupils, as they cannot concentrate or are distracted from the work that they are supposed to do [[7], [8], [9], [10], [11]].
- These effects have significant socioeconomic consequences [4] and impact their quality of life, e.g. by increasing stress on parents, who must take the day off when children must stay at home due to sickness [4,12].

The relationships between classroom air quality & children's performance in school

- Moreover, when classroom air quality is poor, the working conditions for teachers are degraded. This can result in reduced learning performance because the teachers' ability to teach effectively is reduced.
- This may also increase the sick-leave taken by teachers. As a result, further economic losses are to be expected.

PREVENT HEAT-RELATED DEATHS AND ILLNESSES

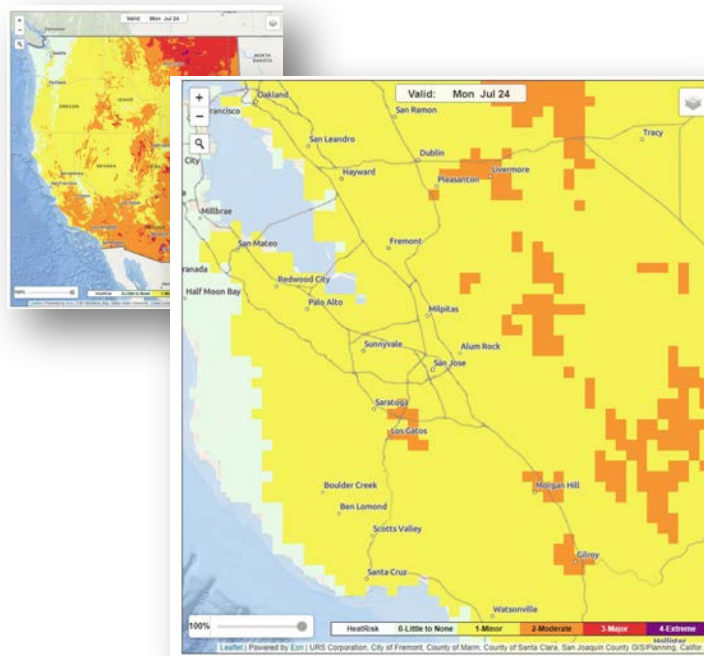
High temperatures can kill



Health Guidance in Extreme Heat

•Know your location's "HeatRisk" level to determine who is at risk and what actions to take.

Value	Risk of Heat-Related Impacts
0 (Green)	Little to no risk from expected heat.
1 (Yellow)	Minor - This level of heat affects primarily those individuals extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration.
2 (Orange)	Moderate - This level of heat affects most individuals sensitive to heat, especially those without effective cooling and/or adequate hydration.
3 (Red)	Major - This level of heat affects anyone without effective cooling and/or adequate hydration.
4 (Magenta)	Extreme - This level of rare and/or long-duration extreme heat with little to no overnight relief affects anyone without effective cooling and/or adequate hydration.



www.wrh.noaa.gov/wrh/heatrisk/

CDPH Extreme Heat Guidance for Schools (ca.gov)

Multiple days of extreme high temperatures will make students and athletes more vulnerable to heat illness.

Always monitor for exertional heat illness, which is life threatening.

- Air temperature, humidity, direct sunlight, and other factors can increase risk of heat illness.
- Exertional heat stroke can occur within the first 60 minutes of exertion.
- Can be triggered without exposure to high temperatures.

Heat Exhaustion Santa Clara County PUBLIC HEALTH

Act Fast

- Dizziness
- Headache
- Muscles cramps
- Weakness
- Heavy sweating
- Cold, pale, clammy skin

• Move to a cooler area

• Loosen clothing

• Sip cool water

Get medical help if symptoms don't improve

Heat Exhaustion can lead to Heat Stroke!

Heat Stroke

Act Fast

- Confusion
- Unconsciousness
- Rapid heart rate
- Very high body temperature
- Hot, red, dry skin

Call 9-1-1

- Move to a cooler area
- Loosen clothing
- Cool skin with ice or water

Heat Stroke can cause death or permanent disability if emergency treatment is not given. 42

Protect students through heat acclimatization

- *Acclimatization* is a complex series of changes or adaptations that occur in response to heat stress in a controlled environment over the course of 7 to 14 days.
- These changes can improve a student athlete's ability to handle heat stress during practice or exercise.

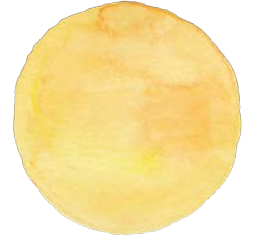
Korey Stringer Institute's Heat Acclimatization Guidelines

Preseason Heat-Acclimatization Guidelines

Area of Practice Modification	Practices 1-5		Practices 6-14
	Days 1-2	Days 3-5	
# of Practices Permitted Per Day	1		2, only every other day
Equipment	Helmets only	Helmets & Shoulder Pads	Full Equipment
Maximum Duration of Single Practice Session	3 hours		3 hours (a total maximum of 5 hours on double session days)
Permitted Walk Through Time	1 hour (but must be separated from practice for 3 continuous hours)		
Contact	No Contact	Contact only with blocking sleds/dummies	Full, 100% live contact drills

NOTE: warm-up, stretching, cool-down, walk-through, conditioning, and weight-room activities are included as part of practice time

CDPH Health Guidance for Schools on Sports and Strenuous Activities During Extreme Heat



What Is the Risk of Exercising During Extreme Heat?

To help prevent exertional heat illness:

- Have athletes undergo a period of heat acclimatization.
- HYDRATION: Encourage athletes to arrive hydrated and allow unlimited access to hydration.
- Modify practice when environmental conditions become extreme.
- Use weather forecasting for heat stress preparation.
- Allow regular rest and hydration breaks.
- Reduce the intensity of practice, time of practice, and equipment worn.
- Consider holding practices before sunrise and after sunset.



When to Cancel Sports and Other Strenuous Activities

When the HeatRisk level is forecast to be "Extreme" (Magenta / Level 4):

Cancel all outdoor and unconditioned indoor activities

AND

(if feasible)

Reschedule all outdoor activities and unconditioned indoor activities to a different day when the HeatRisk level is no longer "Extreme" (Magenta / Level 4) or "Major" (Red / Level 3)

OR

Move to alternative activities in an air-conditioned or cooled indoor environment

When the HeatRisk level is forecast to be "Major" (Red / Level 3):

Cancel all outdoor and unconditioned indoor activities *during the heat of the day (usually 10 a.m. to 5 p.m.)*

AND

(if feasible)

Reschedule all outdoor activities and unconditioned indoor activities to a cool time of the day if there is one *(for example, very early morning)*

OR

Reschedule all outdoor activities and unconditioned indoor activities to a different day when the HeatRisk level is no longer "Extreme" (Magenta / Level 4) or "Major" (Red / Level 3)

OR

Move to alternative activities in an air-conditioned or cooled indoor environment

What Can Be Done to Protect School Communities from Extreme Heat?

CDPH Heat Risk Grid: Understanding “HeatRisk” Level, Who is At Risk, and What Actions to Take

Revised June 30, 2023. Adapted from the National Weather Service (NWS) HeatRisk tool. Learn more and find your HeatRisk level on the [NWS website](#).

Value	Risk	What does this mean?	Who / What is at risk?	What actions can be taken?
0 (Green)	Little to None	<ul style="list-style-type: none"> This level of heat poses little to no risk from expected heat 	<ul style="list-style-type: none"> No elevated risk 	<ul style="list-style-type: none"> No preventative actions necessary
1 (Yellow)	Minor	<ul style="list-style-type: none"> Heat of this type is tolerated by most; however, there is a minor risk for extremely heat-sensitive groups to experience negative heat-related health effects 	<ul style="list-style-type: none"> Primarily those who are extremely sensitive to heat, especially when outdoors without effective cooling and/or adequate hydration 	<ul style="list-style-type: none"> Increase hydration Reduce time spent outdoors or stay in the shade when the sun is strongest Open windows at night and use fans to bring cooler air inside buildings
2 (Orange)	Moderate	<ul style="list-style-type: none"> Heat of this type is tolerated by many; however there is a moderate risk for members of heat-sensitive groups to experience negative heat-related health effects, including heat illness Some risk for the general population who are exposed to the sun for longer periods of time Living spaces without air conditioning can become uncomfortable during the afternoon and evening, but fans and leaving windows open at night will help 	<ul style="list-style-type: none"> Primarily heat-sensitive or vulnerable groups, especially those without effective cooling or hydration Those not acclimatized to this level of heat (i.e. visitors) Otherwise healthy individuals exposed to longer duration heat, without effective cooling or hydration, such as in the sun at an outdoor venue Some transportation and utilities sectors Some health systems will see increased demand, with increases in emergency room visits 	<ul style="list-style-type: none"> Reduce time in the sun during the warmest part of the day Stay hydrated Stay in a cool place during the heat of the day (usually 10 a.m. to 5 p.m.) Move outdoor activities to cooler times of the day For those without air conditioning, use fans to keep air moving and open windows at night
3 (Red)	Major	<ul style="list-style-type: none"> Heat of this type represents a major risk to all individuals who are 1) exposed to the sun and active or 2) are in a heat-sensitive group Dangerous to anyone without proper hydration or adequate cooling Living spaces without air conditioning can become deadly during the afternoon and evening. Fans and open windows will not be as effective. Poor air quality is possible Power interruptions may occur as electrical demands increase 	<ul style="list-style-type: none"> Much of the population, especially anyone without effective cooling or hydration Those exposed to the heat/sun at outdoor venues Health systems likely to see increased demand with significant increases in emergency room visits Most transportation and utilities sectors 	<ul style="list-style-type: none"> Cancel outdoor activities during the heat of the day (usually 10 a.m. to 5 p.m.), and move activities to the coolest parts of the day* Stay hydrated Stay in a cool place especially during the heat of the day and evening If you have access to air conditioning, use it, or find a location that does. Even a few hours in a cool location can lower risk. Fans may not be adequate.
4 (Magenta)	Extreme	<ul style="list-style-type: none"> This is a rare level of heat leading to an extreme risk for the entire population Very dangerous to anyone without proper hydration or adequate cooling This is a multi-day excessive heat event. A prolonged period of heat is dangerous for everyone not prepared Poor air quality is likely Power outages are increasingly likely as electrical demands may reach critical levels 	<ul style="list-style-type: none"> Entire population exposed to the heat is at risk For people without effective cooling, especially heat-sensitive groups, this level of heat can be deadly Health systems highly likely to see increased demand with significant increases in emergency room visits Most transportation and utilities sectors 	<ul style="list-style-type: none"> Cancel outdoor activities* Stay hydrated Stay in a cool place, including overnight If you have access to air conditioning, use it, or find a location that does. Even a few hours in a cool location can lower risk. Fans will not be adequate. Check on your neighbors

*For Magenta / Level 4 and Red / Level 3, CDPH recommends more caution and therefore guides canceling outdoor activities based on these scenarios.

Are you Heat Ready, California?

Heat is deadlier than any other weather hazard. Be prepared for extreme heat events and find resources to help you stay safe.

What is Extreme Heat?

An extreme heat event is two or more days and nights of unusually high heat for your region. California is experiencing more frequent episodes of extreme heat, creating a greater danger to Californians from heat-related illness.

How to Stay Informed

Check the local news and resources for weather forecasts, extreme heat alerts, and cooling centers.

Find additional resources to help handle the heat.

Scroll down to resources

About the AirNow Fire and Smoke Map

The AirNow Fire and Smoke Map provides information that you can use to help protect your health from wildfire smoke. Use this map to see:

- Current particle pollution air quality information for your location;
- Fire locations and smoke plumes;
- Smoke Forecast Outlooks, where available; and,
- Recommendations for actions to take to protect yourself from smoke. These recommendations were developed by EPA scientists who are experts in air quality and health.

The Map is a collaborative effort between the U.S. Forest Service (USFS)-led Interagency Wildland Fire Air Quality Response Program and the U.S. Environmental Protection Agency (EPA).

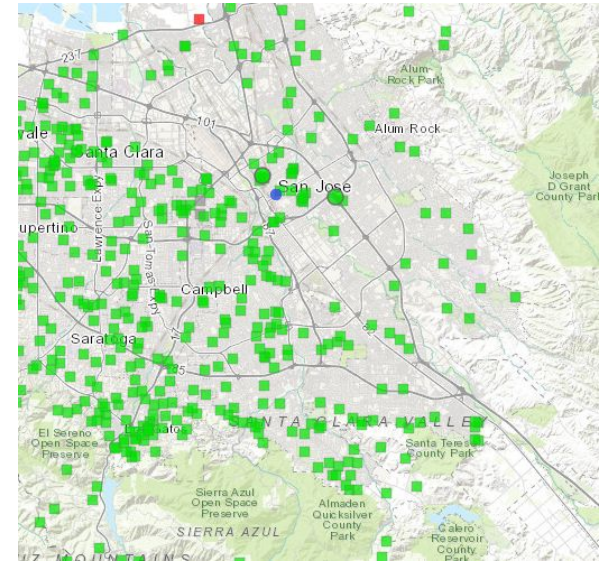


Search Location

[Return to Geolocation](#)

Search for Current Fire and Smoke Conditions in a city, state or area.
(e.g. "Seattle, WA"; "Washington State"; "Smith River, CA")

[Or search for conditions near your current location](#)



Air Quality Guidelines

SCCOE School Air Quality Guidance

- Provides districts with a decision making matrix
- Based on data
- Clear and concise

Recommendations:

1. Each school district shall check www.AirNow.gov and/or BAAQMD and make necessary adjustments to HVAC and current ventilation protocols
2. If the Air Quality Index (AQI) is listed at 275 or above, school districts may consider canceling classes. The Superintendent will notify the County Superintendent, their district staff and families.
3. Depending on the AQI Index number for your area, ensure that the recommended actions are being followed on the table below.
4. District/site staff must be informed of any and all restrictions that are in place based on the AQI.

AQI Index	Recommended Actions				
	School in Session?	Recess / Lunch	Physical Education	Athletic Practice & Training	Schedule Sporting Events
GOOD (0-50)	Yes	No Restrictions	No Restrictions	No Restrictions	No Restrictions
MODERATE (51-100) Unusually sensitive people should consider reducing prolonged or heavy outdoor exertion	Yes	Ensure unusually sensitive individuals are medically managing their condition.	Ensure unusually sensitive individuals are medically managing their condition.	Ensure unusually sensitive individuals are medically managing their condition.	Ensure unusually sensitive individuals are medically managing their condition.
UNHEALTHY FOR SENSITIVE GROUPS (101-150)¹ Everyone should limit prolonged or heavy outdoor activities, especially children, older adults, and people with heart or lung disease. All doors and windows must remain closed throughout the day.	Yes	On campus/indoor lunch strongly recommended for all high school students; Mandatory for Elem/Middle.	Reduce vigorous exercise to 30 min per hour. May move indoors or modify activity as necessary.	Reduce vigorous exercise to 30 min per hour of practice time with increased rest breaks and substitutions. May move indoors or modify activity as necessary.	Increase rest breaks and substitutions per CIF guidelines for extreme heat. May move indoors or modify activity as necessary.
UNHEALTHY (151-200) The following groups should avoid all physical outdoor activity: People with heart or lung disease, children and older adults. Everyone else should avoid prolonged or heavy exertion.	Yes	All activities should be moved indoors as much as reasonably possible.	All activities should be moved indoors as much as reasonably possible.	All activities should be moved indoors as much as reasonably possible.	Event should be rescheduled or relocated.
VERY UNHEALTHY (201-300) Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.	Yes (< 275)	No outdoor activity. All activities should be moved indoors.	No outdoor activity. All activities should be moved indoors.	No outdoor activity. All activities should be moved indoors.	Event must be rescheduled or relocated.
	No (> 275) Classes cancelled at district's discretion				
HAZARDOUS (301-500) Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.	No	No outdoor activity. Avoid any prolonged, moderate, or vigorous indoor activity.	No outdoor activity. Avoid any prolonged, moderate, or vigorous indoor activity.	No outdoor activity. Avoid any prolonged, moderate, or vigorous indoor activity.	No outdoor activity. Avoid any prolonged, moderate, or vigorous indoor activity.

¹) Sensitive Groups include all children under age 18 and adults with asthma or other heart/lung conditions.



EMERGENCY ADVISORY

ADVISORY



Q & A

Links, Resources, and Tools



Case Studies for Effective IAQ Management in Schools

The following case studies are snapshots of school districts that have implemented the IAQ Tools for Schools guidance successfully — detailing how they have worked to achieve this success. Each profile demonstrates strategies from the [Framework for Effective School IAQ Management](#) that schools have applied to create effective and enduring IAQ programs.

Read the profiles below to learn how school districts from across the country have overcome barriers to launch and develop accomplished programs — regardless of location, size, budget or facility conditions.

CASE STUDY



- [Baltimore County: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [Blue Valley: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [Broward County: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [Charlotte-Mecklenburg: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)

CASE STUDY



- [Hartford: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [Katy Independent: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [Newark: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [North East Independent: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)
- [West Carrollton: Envisioning Excellence: Lessons from Effective School Indoor Air Quality Programs - A Snapshot of Profiles in Excellence \(PDF\)](#)



Increase Ventilation Rate



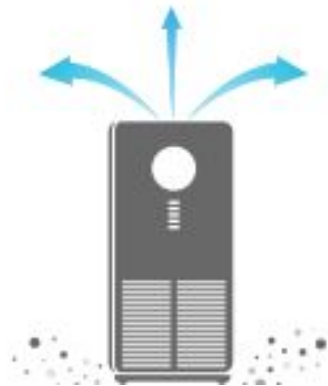
- Conduct an HVAC assessment to evaluate the condition of the existing HVAC system components and unit ventilation equipment.
- Ensure a scheduled inspection and maintenance program for HVAC systems is in place to allow for repair, modification or replacement of equipment.¹
- Assess and service your ventilation system to ensure it continues to perform as designed.
- Adjust the HVAC system to bring in more outdoor air.
- When HVAC adjustments are not possible, consider other means of bringing in outdoor air, such as opening windows and using window fans, if weather and outdoor air quality permit.
- Keep unit ventilators clear of books, papers and other items that could reduce airflow.

Increase HVAC Filter Efficiency



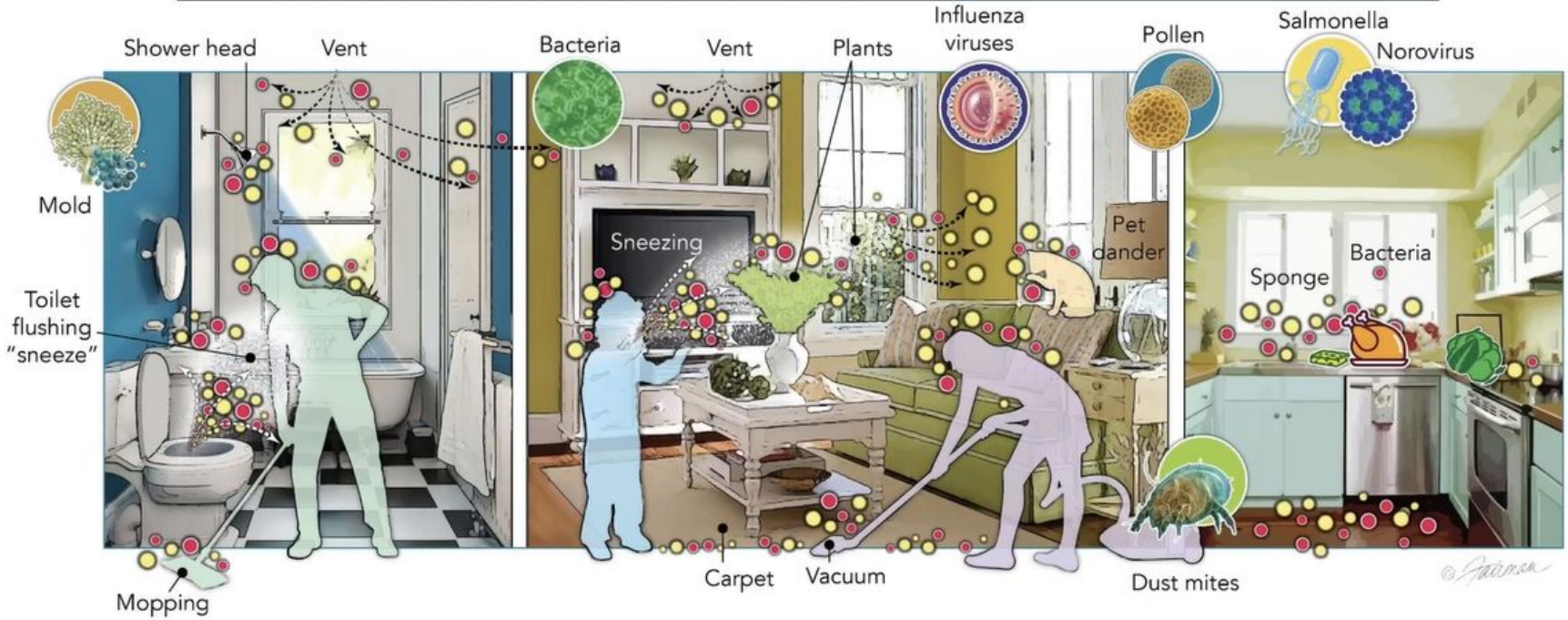
- Increase filter efficiency in existing HVAC systems by using filters with the highest Minimum Efficiency Reporting Value (MERV) rating possible (per equipment specifications). If possible, increase the level of the air filter to MERV 13 or higher.
- Make sure the filters are sized, installed and replaced according to the manufacturer's instructions.

Supplement with Portable Air Cleaners



- Consider using portable air cleaners as a supplemental filtration strategy. Choose portable air cleaners that use proven technology and are appropriately sized for the spaces they will service. Replace filters according to the manufacturer's instructions.
- Do not use air cleaners that intentionally generate ozone in occupied spaces or that do not meet state regulations or industry standards for ozone generation.
- If air cleaners are used, they should be placed so that air is not blown directly from one person to another, as this could potentially facilitate the spread of viruses and bacteria to others. Air flow to and from air cleaners should not be obstructed.

Where there is human activity, there are resuspended particles



From Scott E, Bruning E, Ijaz MK. Targeted Decontamination of Environmental Surfaces in Everyday Settings. IN: McDonnell G and Hansen J, eds. Block's Disinfection, Sterilization, and Preservation, 6th edition. Wolters Kluwer: Philadelphia, 2020.

Framework for Effective School IAQ Management

How can your school or district make a healthy indoor environment a priority? One way is through the development of an indoor air quality (IAQ) management program — which, through simple, low-cost actions, can save money, improve health, and decrease student and staff absenteeism.

The IAQ Tools for Schools guidance documents and resources help schools develop and sustain effective and comprehensive IAQ management programs, or other overall health and safety initiatives. The IAQ Tools for Schools guidance has been implemented successfully in tens of thousands of schools nationwide.

**Download the
Framework for Effective
School IAQ Management**

Framework for Effective School IAQ Management

Download the
Framework for Effective
School IAQ Management

Use the below resources to develop your own program for indoor air quality in schools.

- [Technical Solutions to Common IAQ Issues in Schools](#)
- [Key Drivers for Effective IAQ Management in Schools](#)
- [Case Studies for Effective IAQ Management in Schools](#)
- [Take Stock of Your IAQ Management Program](#)

The Framework for Effective School IAQ Management: Six Key Drivers



Building Ventilation Resources

- [ASHRAE](#)
- [ASHRAE COVID-19 Interactive Infographic](#)
- [CDC COVID-19 Ventilation in Buildings](#)
- [CDC/NIOSH Recommendations for the Cleaning and Remediation of Flood-Contaminated HVAC Systems: A Guide for Building Owners and Managers](#)
- [Environmental Law Institute \(ELI\)](#)
- [International Code Council \(ICC\)](#)
- [Occupational Safety and Health Administration](#)
- [Sheet Metal and Air Conditioning Contractor's National Association](#)

Extreme Heat Preparedness

EXTREME HEAT

- [Weather Conditions](#)
- [Hot Weather Safety](#)
- [CDC Extreme Heat Resources](#)
- [Extreme Heat Resources](#)
- [Extreme Heat Information Sheet](#)
- California ISO Issues [Flex Alert](#)
- PG&E Issues [Flex Alert](#)
- For the nearest [Cooling Centers in Santa Clara County](#)

Air Quality Index (AQI) Resources



- [Air Quality – School Disaster and Emergency Management \(CA Dept of Education\)](#): California Department of Education Air Quality Index info & resources
- Air Quality Index (AQI) Info
 - [AirNow.gov](#): Current Air Quality Data and Fire & Smoke Map
 - [Bay Area Air Quality Management District](#)
- [Spare the Air](#)

Public Safety Power Shutoff (PSPS) Information & Resources

For the latest status in your area, [enter an address](#) .

- [PSPS Events](#)
- [Community Resource Centers](#)
- [Keeping Food Safe During an Emergency](#)
- [Prepare for a Public Safety Power Shutoff](#)
- [Power Outage Information Sheet](#)
- [Public Safety Power Shutoff Fact-Sheet](#)
- [PSPS Emergency Contact Form](#)

Guidance and General Questions

David Putney, Ed.D.

Director, Special Projects
Santa Clara County Office of Education
1290 Ridder Park Drive MC 213
San Jose, CA 95131-2304

(408) 453-6721 (office)

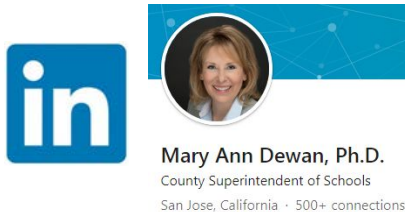
(707) 292-3162 (cell)

David_putney@sccoe.org

Strategic - Achiever - Competition - Futuristic – Ideation

Thank you!

Mary Ann Dewan, Ph.D.
County Superintendent
MDewan@sccoe.org



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