Health, Housing & Community Services Department
Public Health Officer

Wildfire Smoke and COVID-19: Guidance for Schools, Child Care and Youth Programs

This document is intended to assist the schools, child care and youth programs in the City of Berkeley with planning and responding to wildfire smoke during the COVID-19 pandemic. This document was adapted from guidance created by the Alameda County Public Health Department.

During wildfire season, smoke may pollute the air. Children are particularly at risk for health effects from exposure to wildfire smoke and ash, mostly because their lungs are still growing[1]. Hazardous air pollutants, such as acetaldehyde, acrolein, formaldehyde, and benzene contribute to the cumulative irritant properties of smoke. These air pollutants are of concern because of their differential impact on infants and children compared to adults[2]. Outdoor air pollution, such as wildfire smoke, must be addressed in school buildings alongside implementation of the indoor air quality improvements recommended to reduce potential airborne exposure to coronavirus SARS-CoV-2, the virus that causes COVID-19. For indoor spaces, ventilation and filtration should be optimized, which can be done by following the California Department of Public Health (CDPH) Guidance on Ventilation of Indoor Environments and Ventilation and Filtration to Reduce Long-Range Airborne Transmission of COVID-19 and Other Respiratory Infections: Considerations for Reopened Schools.[3]

Air Quality Index (AQI) Recommendations

When there are wildfires nearby, visit www.airnow.gov for current air quality information. A U.S. Air Quality Index (AQI) value of 100 corresponds to the level of the short-term National Ambient Air Quality Standard for a given pollutant including those most relevant to wildfire smoke: particulate matter (PM2.5 or PM10) and ozone[2]. The Standard is established at a level that will protect public health, including the health of at-risk groups. Children, including teenagers, are considered an at-risk or sensitive group because their respiratory systems are still developing, and they breathe more air (and air pollution) per pound of body weight than adults. These at-risk populations are more likely to be active outdoors, and they are more likely to have asthma. When AQI values exceed 100, air quality is considered unhealthy at first for members of at-risk groups (in the Air Quality Index, the term "sensitive groups" is used). As the AQI increases, air quality becomes unhealthy for everyone.

On days where the AQI is unhealthy, modify school children's outdoor physical activity based on School Air Quality Activity Recommendations set forth by the Bay Area Air Quality Management District

[1] USEPA. Wildfire Smoke Factsheet: Protecting Children from Wildfire Smoke and Ash. Available online at https://www.epa.gov/sites/default/files/2018-11/documents/protecting-children-from-wildfire-smoke-and-ash.pdf
[2] USEPA. Wildfire Smoke: A Guide for Public Health Officials. EPA-452/R-19-901. August 2019. Available online at https://www.airnow.gov/sites/default/files/2021-05/wildfire-smoke-guide-revised-2019.pdf
[3] California Department of Public Health. Ventilation And Filtration To Reduce Long-Range Airborne Transmission Of Covid-19 And Other Respiratory Infections: Considerations For Reopened Schools (ca.gov). Available online at https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Airborne-Diseases.aspx

(BAAQMD). BAAQMD guidance is adopted from the U.S. Environmental Protection Agency (USEPA)'s Air Quality and Outdoor Activity Guidance for Schools[4].

School Air Quality Activity Recommendations

Activity	Air Quality Level				
	LEVEL 1 **AQI 0-50** $PM_{2.5}$ 0-12 µg/m3	**LEVEL 2** **AQI 51-100** $PM_{2.5}$ 13-35 µg/m3	**LEVEL 3** **AQI 101-150** $PM_{2.5}$ 36-55 µg/m3	**LEVEL 4** **AQI 151-200** $PM_{2.5}$ 56-150 µg/m3	**LEVEL 5** **AQI 201 or higher** $PM_{2.5}$ 151-500 µg/m3 *School districts may consider closures based on site-by-site concerns.*
Recess (15min)	No restrictions	Ensure that sensitive individuals are medically managing their condition.*	Sensitive individuals should exercise indoors or avoid vigorous outdoor activities.*	Exercise indoors or avoid vigorous outdoor activities. Sensitive individuals should remain indoors.*	No outdoor activity. All activities should be moved indoors.
P.E. (1hr)	No restrictions	Ensure that sensitive individuals are medically managing their condition.*	Sensitive individuals should exercise indoors or avoid vigorous outdoor activities.*	Exercise indoors or limit vigorous outdoor activities to a maximum of 15 minutes. Sensitive individuals should remain indoors.*	No outdoor activity. All activities should be moved indoors.
Athletic Practice & Training (2-4hrs)	No restrictions	Ensure that sensitive individuals are medically managing their condition.*	Reduce vigorous exercise to 30 minutes per hour of practice time with increased rest breaks and substitutions. Ensure that sensitive individuals are medically managing their condition.*	Exercise indoors or reduce vigorous exercise to 30 minutes of practice time with increased rest breaks and substitutions. Sensitive individuals should remain indoors.*	No outdoor activity. All activities should be moved indoors.
Scheduled Sporting Events	No restrictions	Ensure that sensitive individuals are medically managing their condition.*	Increase rest breaks and substitutions per CIF guidelines for extreme heat.** Ensure that sensitive individuals are medically managing their condition.*	Increase rest breaks and substitutions per CIF guidelines for extreme heat.** Ensure that sensitive individuals are medically managing their condition.*	Event should be rescheduled or relocated.

* Sensitive Individuals include all those with asthma or other heart/lung conditions ** California Interscholastic Federation

Table from: Bay Area Air Quality Management District[5]

- When AQI values exceed 100 at a school location, limit smoke or outdoor air intrusion into indoor air while maintaining ventilation and filtration recommendations for COVID-19. Weatherize the building envelope.
- Adjust the heating, ventilation, and air conditioning (HVAC) outdoor intake.
- Keep doors and windows closed.
- Limit door use to entrances with a vestibule or airlock or on an opposite side of the building from prevailing winds.

Any changes to the building configuration, such as partitions, occupancy, HVAC system and supplemental equipment (e.g., exhaust fans or portable air cleaners) must be checked and implemented by a qualified HVAC or indoor air quality professional.

[4] USEPA. Air Quality and Outdoor Activity Guidance for Schools. EPA-456/F-14-003. August 2014. Available online at https://www.airnow.gov/sites/default/files/2021-03/school-outdoor%20activity%20guidance.pdf

[5] BAAQMD. School Air Quality Activity Recommendations https://www.baaqmd.gov/~/media/files/communications-and-outreach/wildfire-materials/aq-levels-school-guidelines-pdf.pdf?la=en

Additional HVAC System Recommendations

For buildings with HVAC systems:

- Install MERV 13 or higher filtration level so that the HVAC units will allow in recirculated air and at intake air vents[6,7]. Pressure gauges may be installed across the filter to indicate when the filter needs replacing, especially in very smoky or dusty areas[2].
- Monitor the HVAC system to replace the filters as often as necessary.
- Determine an outdoor air intake level that controls odor, temperature, carbon dioxide (CO_2) levels and maintain a positive building pressure consistent with building and HVAC system design.
- HVAC systems should be operated continuously in occupied mode, if possible, 24 hours a day, 7 days a week to maximize ventilation and filtration.

High Efficiency Particulate Air (HEPA) Filter Recommendations

- Use portable air cleaners with high efficiency particulate air (HEPA) filters and a clean air delivery rate (CADR) that can achieve an air exchange rate (in air changes per hour [ACH]) of at least 5 using 2/3 of the room volume[7,8].
- Place portable air cleaners with HEPA filters where air intake and discharge are not impeded, for example away from walls, furniture, or curtains.
- Direct the airflow of the air cleaner so it does not blow directly from one person to another. Run portable air cleaners continuously at high setting.
- Replace the HEPA filters as often as necessary.
- Portable air cleaners must be certified by the California Air Resources Board (CARB) to meet electrical safety and ozone emissions. For a list of air cleaning devices that comply with California's ozone emissions limits, refer to the CARB's list of California-Certified Air Cleaning Devices[9].

[6] California Environmental Protection Agency (CalEPA). Guidance for Schools During Wildfire Smoke Events. Available online at https://oehha.ca.gov/media/downloads/air/fact-sheet/wildfiresmokeguideschoolsada.pdf

[7] ASHRAE. Planning Framework for Protecting Commercial Building Occupants from Smoke During Wildfire Events. Available online at https://www.ashrae.org/file%20library/technical%20resources/covid-19/planning-framework-for-protecting-commercial-building-occupants-from-smoke-during-wildfire-events.pdf

[8] Environment International. How can airborne transmission of COVID-19 indoors be minimized? Volume 142, September 2020, 105832. Available online at https://www.sciencedirect.com/science/article/pii/S0160412020317876

[9] Centers for Disease Control and Prevention (CDC). COVID-19 Considerations for Cleaner Air Shelters and Cleaner Air Spaces to Protect the Public from Wildfire Smoke. Available online at https://www.cdc.gov/coronavirus/2019-ncov/php/cleaner-air-shelters.html

Additional Measures to Maintain Indoor Air Quality

- Maintain indoor air quality by avoiding activities that create smoke or other particles indoors, including:
    - using gas, propane or wood-burning stoves and furnaces;
    - spraying aerosol products;
    - frying or broiling food;
    - burning candles or incense;
    - vacuuming (unless you use a vacuum with a HEPA filter)[10];
    - and using printers and copy machines[11].
- Dust or mop surfaces with a damp cloth as needed to keep settled particles from getting back into indoor air.
- Install air monitors with a PM2.5 sensor to help determine intervention. For example, upward trends in PM2.5 levels can indicate that doors or windows are open, air filters need replacement or portable air cleaners should be turned on or adjusted[5].

Carbon Dioxide Measurement

Carbon dioxide measurement is a useful screening method for determining whether the building has adequate ventilation. Carbon dioxide measurements should be conducted by an indoor air quality or environmental professional qualified to perform this evaluation according to Occupational Safety and Health Administration (OSHA), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and USEPA guidance.

COVID-19 Safety When AQI Exceeds 100

Layers of protection are important to COVID-19 prevention. Ventilation and filtration together are one of the layers of protection to limit the spread of COVID-19 in schools and other indoor settings. During periods of unhealthy air quality due to wildfire smoke, ventilation and filtration modifications, and outdoor activity reductions at schools, should be considered alongside other factors that impact COVID-19 risk in school settings, including:

- COVID-19 community transmission level. When community transmission is at substantial or high levels, the risk of COVID-19 spread is elevated. The CDC provides daily updates on community transmission levels by county: CDC COVID Data Tracker.
- COVID-19 cases in a school. Even if community transmission levels are low, any active COVID-19 transmission in a school should be considered when addressing wildfire smoke.
- Vaccination rates in a school community. Higher vaccination rates lower the risk of COVID-19 for students and other members of a school community.

[10] CARB. California Certified Air Cleaning Devices. Available online at https://ww2.arb.ca.gov/our-work/programs/air-cleaners-ozone-products/california-certified-air-cleaning-devices

[11] USEPA. Create a Clean Room to Protect Indoor Air Quality During a Wildfire. Available online at https://www.epa.gov/indoor-air-quality-iaq/create-clean-room-protect-indoor-air-quality-during-wildfire

- Ability to move outdoor meals into indoor settings. Mealtimes are higher risk due to removal of masks for eating. If meals that normally happen outside must be moved inside, consider using alternate spaces for lunch, such as classrooms, to allow greater spacing between students when masks are removed for eating. Limit the time masks are removed for eating.
- Testing program. Frequent testing of school community members may provide additional information about COVID-19 risk during periods when AQI>100.
- Mask use. Masks are currently required for indoor K-12 school settings in California. Widespread mask use in a school setting can help limit the spread of COVID-19 when school activities move indoors due to wildfire smoke.
- Numbers of students. In general, more people in an indoor space increase the risk of COVID-19, especially during periods of substantial or high community transmission.

When to Close Schools

School closure due to wildfire smoke events is an individual district and/or school decision. Any decision to close for student health concerns must be weighed against the potential for worse smoke exposures outside of school settings for those students. If COVID-19 risk is mitigated with layers of protection, poor air quality days do not necessarily require closure from a COVID-19 safety standpoint. Closure due to the combination of wildfire smoke and COVID-19 risk may be considered if the recommended ventilation and filtration standards for COVID-19 are not achieved and if other factors may be contributing to elevated COVID-19 transmission risk in a school setting.