

**Preliminary Data Findings:** Levels of volatile organic compounds (VOCs) in indoor and outdoor air before, during, and after fires in Palisades and Altadena.

**Date Released:** 4/4/2025

## Key Takeaways:

- Outdoor VOC levels during the Eaton and Palisades fires were elevated, but generally remained well below CA and EPA thresholds for exposure.
- Staying indoors during active wildfires can help to protect people from increases in outdoor VOCs.
- Indoor VOC levels remained higher than outdoors in the days and weeks after the fires, likely due to smoke-impacted soft materials (fabrics, furniture, etc. that absorbed smoke during the fires) off-gassing VOCs.
- We recommend ventilating homes and using HEPA and activated charcoal air purifiers before reoccupying fire-affected residences.

## What we did

We measured the amount of volatile organic compounds (VOCs) in indoor and outdoor air at 16 locations near the Palisades fire and 9 locations near the Eaton fire. The measurements were taken over the course of 7-day periods, in 3 different phases:

- Phase 1 (January 8-15) Active Burning
- Phase 2 (January 24-31) Smoldering
- Phase 3 (February 11-18) Off-gassing

The study measured the presence and concentration of 4 key VOCs: benzene, toluene, ethylbenzene, and xylenes (BTEX) some of which are carcinogenic and harmful to human health. VOCs are released in burning wildfires, but also can be found in many household products, including cleaning and personal care products, and emissions from gas appliances.

## What did we find?

As expected, outdoor levels of VOCs were highest during Phases 1 and 2, with one area south of the Palisades showing a 192% increase in benzene during Phase 1. However, even these elevated levels remained below health standards set by the California EPA's Office of Environmental Health Hazard Assessment (OEHHA). Outdoor VOCs then decreased significantly in Phase 3.

Indoor VOC levels, while low during Phase 1, were higher than outdoor levels in Phases 2 and 3, likely due to off-gassing from debris and smoke-impacted materials. These elevated VOC levels were observed in empty homes within the burn zones, particularly near the Eaton fire, so they are not the result of human activity in the homes.

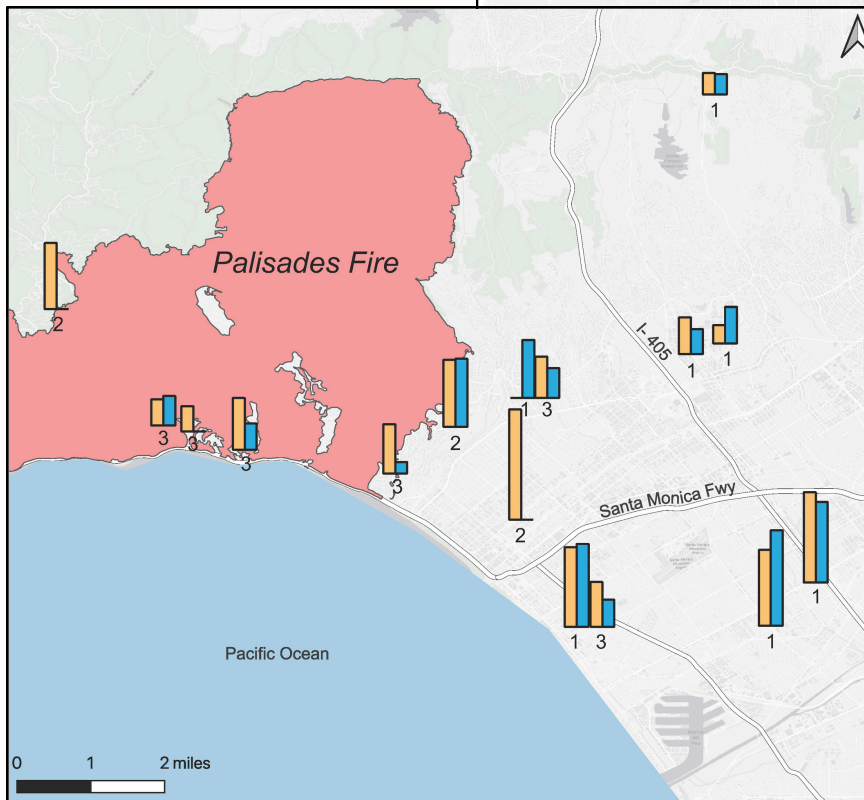
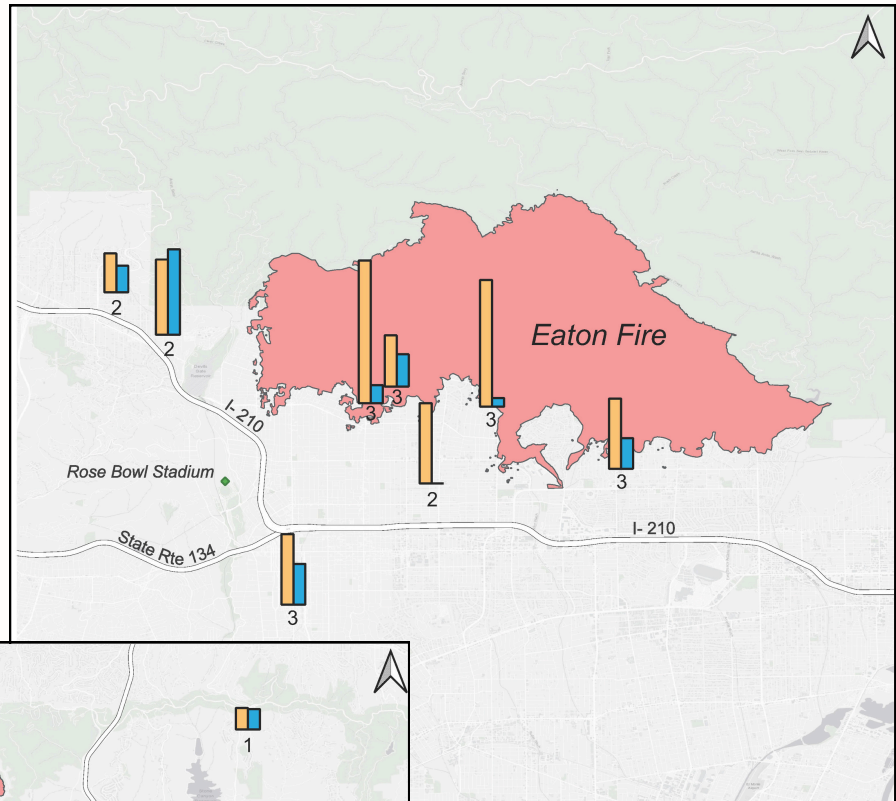
**Preliminary Data Findings:** Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) During Different Phases of the LA Fires.

**Data Type:** Air Quality

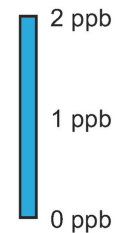
**Location:** Palisades and Altadena

## Key Takeaways:

- Outdoor VOC levels during the Eaton and Palisades fires were elevated, but generally remained well below CA and EPA thresholds for exposure.
- Indoor levels were highest during Phase 2, in the weeks after the fires.



## BTEX concentration (ppb)



Yellow bar: Indoor BTEX

Blue bar: Outdoor BTEX

Red area: Fire perimeter

1 Active burning (Jan 8–15, 2025)

2 Smoldering (Jan 24–31, 2025)

3 Off-gassing (Feb 11–18, 2025)



# DATA SET 3: AVERAGE VOC & BENZENE LEVELS

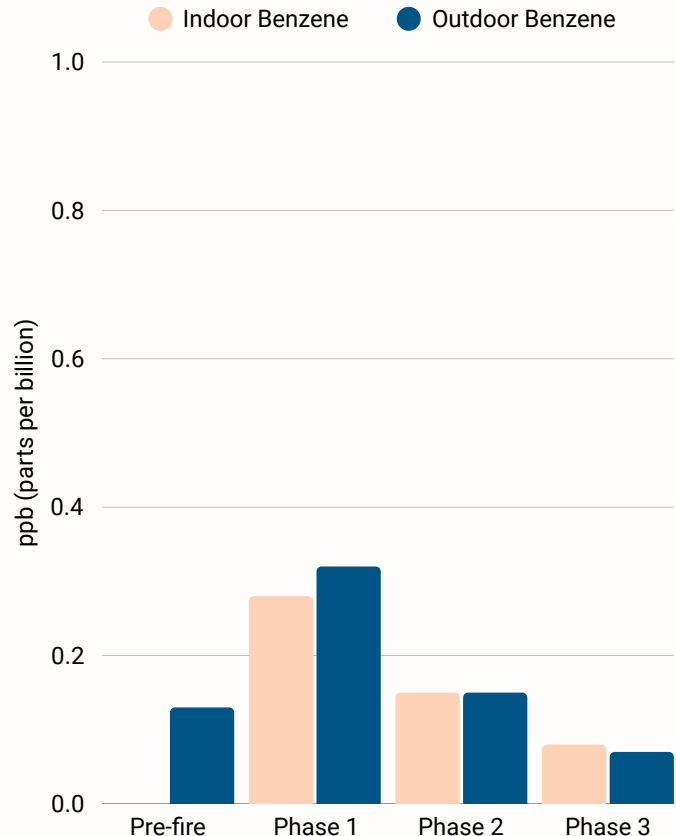
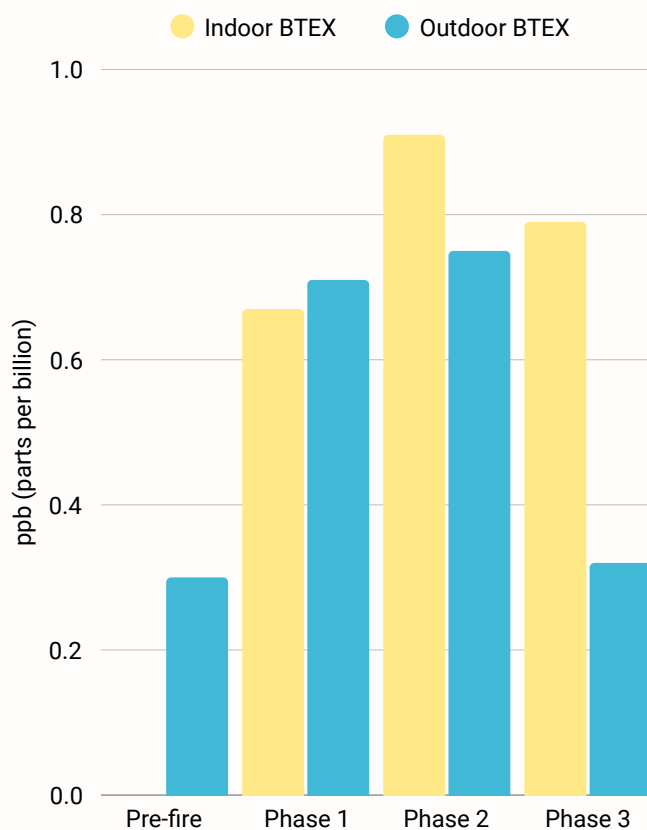
**Preliminary Data Findings:** Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) During Different Phases of the LA Fires.

**Data Type:** Air Quality

**Location:** Los Angeles Area

## Key Takeaways:

- Outdoor VOC levels during the Eaton and Palisades fires were elevated, but generally remained well below CA and EPA thresholds for exposure.
- Outdoor benzene concentrations peaked during active burning but remained well below the 8 ppb (parts per billion) limit for exposure set by the California Office of Environmental Health Hazards.
- Indoor VOC levels remain higher than outdoors in the days and weeks after the fires, likely due to smoke-impacted soft materials (fabrics, furniture, etc. that absorbed smoke during the fires) off-gassing VOCs.



This is preliminary data that has been submitted for publication, but has not yet been peer-reviewed. Access the preprint of the findings at: <https://www.medrxiv.org/content/10.1101/2025.03.31.25324857v1>

# FREQUENTLY ASKED QUESTIONS ABOUT VOCs

## What are VOCs?

VOC stands for volatile organic compound. VOCs are invisible gases and vapors that are released into the air from solids. This can happen after structures burn during wildfires, but VOCs are also commonly emitted in homes from an array of everyday sources like cleaning products, air fresheners, paint, new furniture, etc. Some of these VOCs are harmful to human health.



## What is off-gassing?

Off-gassing is the production of gases from the chemical deterioration of a substance over time, and the release of gases from materials into the air. Source: EPA Indoor Air Glossary

For example, when you light a scented candle, the heat from the fire melts and releases chemicals from the wax to help freshen the smell in your home. This is a similar process to the off-gassing that happens over time as chemicals are released from solids inside your home.

After a fire, this off-gassing can include more hazardous compounds due to the chemicals that are likely present in ash and debris from the fire. As the ash and debris get stirred up and moved (by cleaning activities, turning on the HVAC system, etc.), they can begin to emit fine particles and VOCs into the air.

This is why it is important to air out your home frequently in the days after a fire. This allows the VOCs to dissipate from your indoor environment.

This is also why it is advised to wear a protective mask and take other precautions when entering a home that was affected by the fire, or is located in a burn zone, even if the home itself was not damaged.

## How do I get VOCs and other potentially toxic substances out of the air inside my house?

If you still see soot and ash in your home or smell chemicals, you should ventilate to help these materials off gas:

- Open windows
- Run A/C (make sure you have a MERV-13+ filter on your HVAC system)
- Run air purifiers if possible – we recommend HEPA for filtration of particles and of VOCs.

However, make sure not to ventilate or air out your home when there are outdoor conditions that may bring more harmful materials inside.

## For example:

- **DON'T** ventilate when there are debris removal activities on neighboring properties.
- **DON'T** ventilate on days with high winds that may stir up debris.
- **DO** ventilate the day after it rains (when the air is typically cleaner) and when there is no cleanup or debris removal happening nearby.

If you see clean-up or debris removal happening nearby, that is when you should try to prevent outside contaminants in the air from coming inside:

- Close windows
- Turn off HVAC systems
- Run air purifiers in your homes
- Avoid working outside while this cleanup work is happening.

For more recommendations, please visit:

[lafirehealth.org/FAQ](https://lafirehealth.org/FAQ)

# FREQUENTLY ASKED QUESTIONS ABOUT VOCs

## What is “BTEX”?

BTEX is the term used for the 4 VOCs (benzene, toluene, ethylbenzene, and xylenes) that were measured by this team, one of which is carcinogenic (known to cause cancer).

**Benzene** is a carcinogenic VOC that is associated with the burning of fuels, and is commonly present after fires. Benzene can have many sources, including car exhaust (from internal combustion engines) and household products such as detergents, dyes, and pesticides. It is also used to make plastics, nylon, and synthetic fibers. California sets limits of benzene exposure to no more than 8 ppb for short-term (8-hour) exposures. It is important to note that the World Health Organization states that because benzene is carcinogenic to humans, no safe threshold of exposure exists.

**Toluene** is a VOC that is found in gasoline, and as a solvent in many household products including paints, fragrances, adhesives, inks, and cleaning agents. While toluene has NOT been found to be carcinogenic, exposure to toluene can cause irritated eyes, nose, and throat; dry or cracked skin; headache, dizziness, feeling of being drunk, confusion, and anxiety.

**Ethylbenzene** is another solvent that can be found in household cleaning products, and is used in the manufacturing of styrene, is found in asphalt and fuels. Exposure to ethylbenzene occurs from the use of consumer products, gasoline, pesticides, solvents, carpet glues, varnishes, paints, and tobacco smoke. Ethylbenzene has not been found to cause cancer, but respiratory effects, such as throat irritation and chest constriction, irritation of the

eyes, and neurological effects such as dizziness, have been noted from acute inhalation exposure (inhaling large amounts of ethylbenzene in a short period of time) in humans.

**Xylene** occurs naturally in petroleum and tar, and is used in the manufacturing process of polyester fibers, dyes, paints, rubber, and other materials. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. Small amounts of xylene are commonly found in indoor air. Xylene is not a carcinogen, but exposure can cause intoxication-like symptoms at higher concentrations and impaired performance on tests of short-term memory, reaction time, and equilibrium at lower concentrations. People have also reported signs of nose, eye, and throat irritation during exposure to xylene vapors.

## What should I do if I think I have been exposed to toxic levels of VOCs?

Symptoms from exposure to many of these compounds will typically go away once you leave the area and get fresh air. You should also wash your clothes and exposed skin to avoid being re-exposed to any residues.

However, exposure to higher amounts of benzene can cause long-term health effects, including cancer. The data shared in this data brief is for informational use only and should not replace the advice of a medical professional. Contact your physician if you have concerns and questions about benzene exposure.



# WHAT CAN YOU DO?

## 3 WAYS TO REDUCE RISK FROM WILDFIRE SMOKE AT HOME

### 1 **FILTER INDOOR AIR**

- ✓ Upgrade to MERV13 filters or higher in central systems
- ✓ Use portable air cleaners with HEPA filters
- ✓ Consider air cleaner with HEPA + activated carbon if near to burn area and wear a mask while cleaning

### 2 **CONTROL DUST**

- ✓ Kick shoes off at the door to prevent tracking in soot/ash
- ✓ Damp wipe surfaces
- ✓ Use a vacuum that is air-sealed with a HEPA filter

### 3 **MONITOR AIR QUALITY**

- ✓ Install an indoor air quality monitor
- ✓ Track PM<sub>2.5</sub> (airborne particles)
- ✓ Track TVOCs (airborne chemicals)

## IF YOU HAVE QUESTIONS:

- Email us: [info@lafirehealth.org](mailto:info@lafirehealth.org)
- Visit the website: [www.LAFireHEALTH.org](http://www.LAFireHEALTH.org)

The Los Angeles Fire Human Exposure and Long-Term Health Study is a 10-year study of the Los Angeles fires to evaluate which pollutants are present, at what levels, and where, and to assess the respiratory, neurological, cardiovascular, reproductive, and immune system impacts of the wildfires.

The data shared in this brief are preliminary in nature and are being made available to the public in an effort to provide data as soon as possible. Research is a process and results can change over time based on new data input. The data shared on this site is for informational use only and should not replace the advice of a medical professional. This is a study run by a consortium and as such, no one university or institution is responsible or liable for the data or recommendations presented.