LA FIRE HEALTH STUDY

DATA BRIEF

LA Fire HEALTH Study: Data Brief # 8

Date Released: May 26, 2026

Preliminary data findings: Levels of volatile organic compounds (VOCs) in outdoor and indoor air and from soft goods collected from LA fire impacted homes.

Key Takeaways:

- The majority of measured VOCs were below health-based risk limits both indoors and outdoors. Although outdoor benzene stayed below non-cancer reference exposure levels, indoor benzene had potential concern relative to more stringent cancer-risk screening levels.*
- Indoor VOC concentrations were often 10X higher than outdoor levels in postfire homes, indicating prominent indoor emission sources.
- Off-gassing from smoke-impacted materials is a potential driver of prolonged indoor exposure for certain VOCs, such as furan, phenol, and hexane.
- Items stored in cabinets and dressers showed less contamination than items that were out in the open in homes.
- A possible association between indoor naphthalene and wildfire smoke infiltration was suggested, although this finding is limited by the low detection frequency of naphthalene and should be validated in future studies with larger sample sizes.
- Household product use (e.g., cleaning agents) was also associated with certain types of VOCs, such as trichloroethylene and perchloroethylene.
- Recommendations include using professional remediation and abatement companies to clean** soft goods (carpets, furnishings, clothing, etc.) after the fires and using indoor air cleaners (with HEPA plus charcoal filters), and well-timed ventilation to air out homes and let items off-gas.

*The U.S. Environmental Protection Agency (EPA) and the California Department of Toxic Substances Control (DTSC) develop screening levels for volatile organic compounds (VOCs) in air as part of the risk assessment process. These screening levels help determine whether concentrations of VOCs in ambient or indoor air at a site may pose a risk to human health. If measured levels exceed the screening levels, further investigation or remediation may be warranted.

**We hope to offer more guidance about how best to clean affected items soon, pending further research on different cleaning methods.

What we did:

- We conducted indoor and outdoor sampling of 22 VOCs in 22 homes near the Palisades and Eaton Fires across three phases: active burning with less than 50% containment (Jan. 8−15), active burning period with more than 50% containment (Jan. 24−31), and postfire (Feb. 11−18).
- We further measured indoor and outdoor levels of 24 VOCs in 50 homes across LA County from Feb. 10 to Apr. 1, 2025
- We also collected and tested more than 200 “soft” items from 20 different homes impacted by the Eaton and Palisades Fires as well as from 5 control homes not impacted by the fires, including clothing, blankets, pillows, and plush toys.

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What we found:

1. Indoor/outdoor concentration ratios shifted upward after the fires. Indoor levels of most measured VOCs were often 10 times higher than outdoors in postfire homes, indicating that indoor sources dominated postfire residential VOC exposure.
2. The majority of detected VOCs remained within health-based guidelines in both indoor and outdoor environments. Although benzene concentrations generally fell below non-cancer risk thresholds, they raised potential concern when evaluated against more stringent cancer-risk screening benchmarks.
3. Outdoor benzene was significantly elevated during active burning relative to both the postfire period and pre-fire background levels, supporting its use as a short-lived marker of wildfire-related air pollution.
4. Off-gassing from smoke-contaminated indoor surfaces and materials is a potential pathway for prolonged indoor exposure of certain VOCs, such as furan, phenol, and hexane.
5. A potential link between indoor naphthalene and wildfire smoke infiltration was identified, though this result should be interpreted cautiously given naphthalene's low detection frequency and warrants confirmation in future studies with larger sample sizes.
6. Household products (e.g., cleaning agents) are associated with increased levels of indoor VOCs including acetone, ethyl acetate, ethylbenzene, heptane, N-hexane, toluene, xylenes, ethyl alcohol, N-butyl acetate, perchloroethylene, and trichloroethylene.
7. Compared to items from the control home, household items from fire-impacted homes showed elevated levels of VOCs—including alkanes, BTEX compounds (benzene, toluene, ethylbenzene, and xylenes), carbonyls, and other oxygenated compounds.
8. VOC levels varied substantially across different homes and among items collected within the same home, influenced by factors such as the extent of fire smoke exposure, material type, and item location and how well the house was ventilated post-fire.
9. Furan, phenol, and hexane consistently showed elevated levels across the fire-impacted items, suggesting they may serve as tracers of fire smoke impact. In contrast, formaldehyde, while also associated with fire emissions, can originate from a wide range of indoor sources—including building materials, furniture, and household products—which were also present in the control home.

DATA SET 1: Outdoor levels of 22 VOCs in 22 homes across LA County during and after the fires

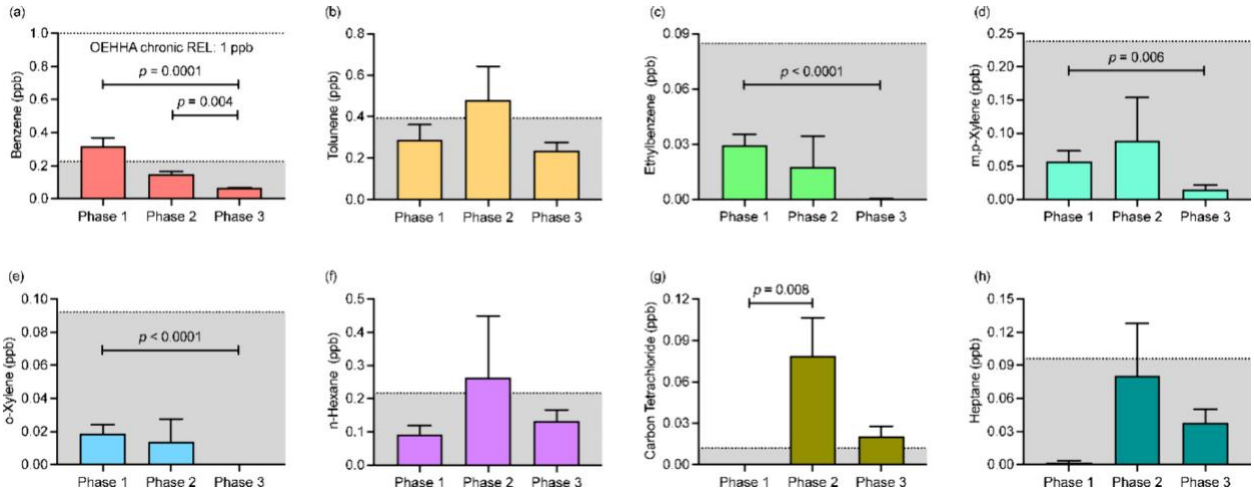


Figure 1. Outdoor VOC concentrations during different phases: Phase 1 (January 8−15, 2025), Phase 2 (January 24−31, 2025), and Phase 3 (February 11−18, 2025). OEHHA: California Office of Environmental

Health Hazard Assessment. REL: Reference Exposure Level. The gray area represents the range of two-week average outdoor VOC concentrations before the fires (October and November 2024).

DATA SET 2: Indoor and outdoor levels of 24 VOCs in 50 homes across LA County within two months after the fires

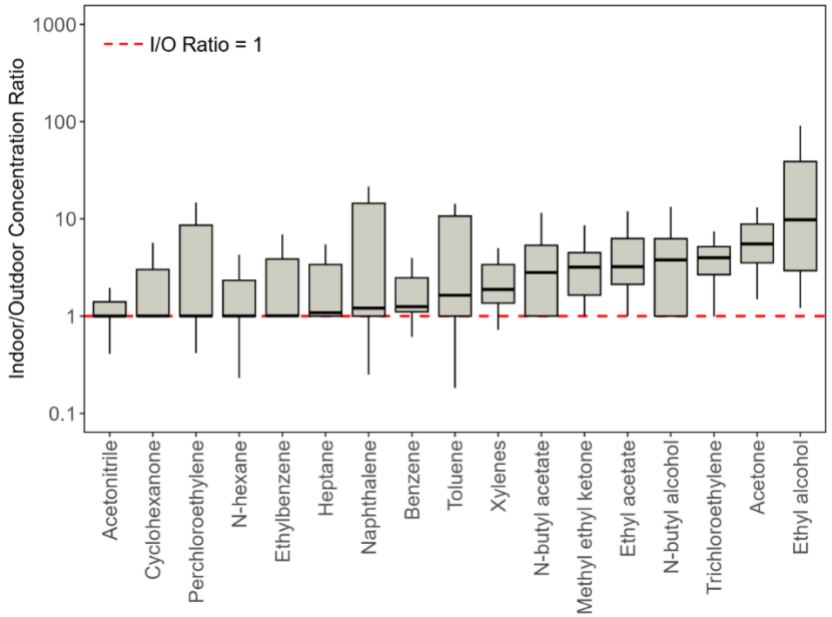
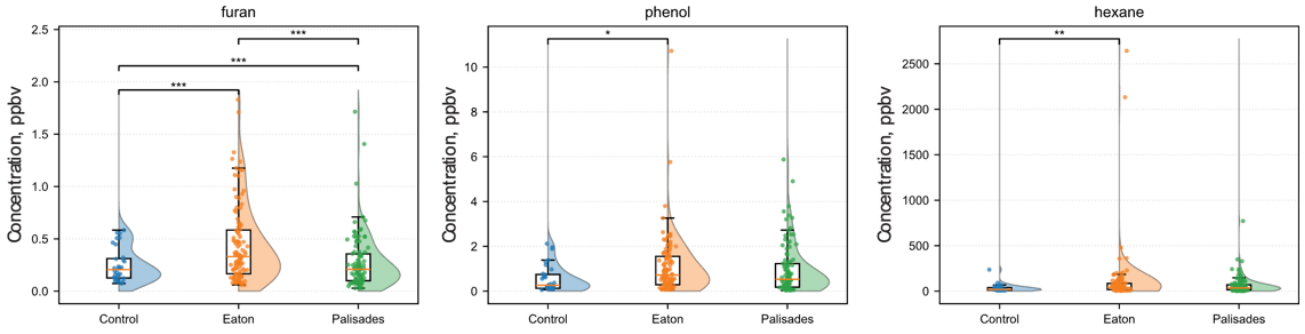


Figure 2. Indoor/outdoor concentration ratios of VOCs across 50 homes.

DATA SET 3: VOC levels in soft goods



Furan: Probable human **carcinogen** and a marker of wildfire emissions, commonly detected in fresh smoke

Phenol: Airborne **irritant** from burning wood and synthetic materials that can persist indoors post-wildfire

Hexane: Neurotoxic VOC indicative of burned vehicles, fuels, and building materials

Figure 3. Background corrected concentrations (ppbv) of volatile organic compounds (VOCs) emitted from household items during 2-hour chamber tests.

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Frequently Asked Questions:

What Are VOCs and Off-Gassing?
Volatile organic compounds (VOCs) are a group of chemicals that easily evaporate into the air. They can originate from wildfire smoke, cleaning products, building materials, and even fabrics. Some VOCs are harmful to human health, for example, benzene is a known carcinogen linked to certain cancers. Porous materials, such as soft goods (like fabric, cushions, or stuffed animals), can absorb smoke during fires and later release VOCs into the air through a process called off-gassing. This can degrade indoor air quality and pose health risks, even after the fire has ended.

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 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.

What is BTEX and benzene?

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 that 8 ppb for short-term (1-hour) exposures of benzene in the air. 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 is naphthalene?

Naphthalene is a VOC made of two benzene rings that evaporates into the air at room temperature. It is naturally found in coal tar and can be formed during the burning of fuel (including from car exhaust), wood, or other organic matter. It is also found in industrial emissions, mothballs, plastics, pesticides, cigarette smoke, and some deodorizing products like toilet deodorizers. It is classified as a possible human carcinogen and is regulated as a hazardous air pollutant by the EPA. It can cause headaches, nausea, and respiratory irritation, and may damage red blood cells, especially in people with an existing condition called G6PD deficiency.

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 filters with activated carbon prefilters 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***