

# Can AC protect against wildfire smoke?

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As climate change increases the severity and frequency of wildfires in North America, experts say many Americans are at risk of experiencing one in their lifetime. But even more may be affected by the unhealthy air quality from the smoke the fires produce.

Chicagoans have lived it in the last few months: days with hazy skylines, a smoky breeze that burns the eyes and endless air quality alerts. On the worst days, many are wearing masks again—but outdoors, not indoors.

To complicate matters further, experts say staying indoors with the windows closed is only the first step.

Here are answers to common questions about how Chicagoans can protect themselves next time the [air quality index](#) ticks up.

## **How does the air cause harm indoors?**

Smoke from Canadian wildfires travels thousands of miles and contains the pollutant PM2.5. This [fine particulate matter](#) is smaller than or equal to 2.5 micrometers, about 30 times smaller than the width of a human hair. PM2.5 is produced by sources such as vehicle exhaust and industry emissions as well as forest fires.

Once in the deepest portions of the lungs, this particulate matter can cross into the bloodstream, disrupting blood chemistry and causing heart stoppages. Fine particulate matter has also been linked to premature births, diabetes and dementia.

But being inside doesn't mean you're safe.

Fine particles from wildfire smoke can make their way indoors in many ways. Most obviously, they can travel inside through open windows and doors by natural ventilation. Another way is by mechanical ventilation through kitchen and bathroom fans that vent to the outdoors or heating, ventilation and air conditioning systems that take in fresh air.

Less noticeably, they can travel through "crevices, cracks, little tortuous routes, through the mortar joints and around windows" in a process

called infiltration, said Elliott Horner, indoor air quality expert and lead scientist at Northbrook-based UL Solutions.

"If the wind is blowing wildfire smoke in the direction of your building, that upwind side of the building is probably going to have some smoke particles filtering through it," Horner said.

To protect yourself during an air quality event, the U.S. Environmental Protection Agency suggests creating a clean room that is comfortable to spend long periods of time in, with all windows and doors closed.

Keep the room clean by refraining from smoking cigarettes, using gas, propane or wood-burning stoves, spraying aerosol products, frying food and burning candles or incense. Seal the room by putting a rolled up towel at the base of the door.

## **Should I run my AC unit?**

Instead of taking outside air in, recirculate indoor air, said Manish Sharma, vice president and chief product officer of Connected Buildings at Honeywell.

"I think that is the first thing we should start thinking about. Limit, as much as possible, [outdoor air](#) inside the building," Sharma said.

Those who have an HVAC system with a fresh air intake option should set it to recirculate mode or close the outdoor intake damper, according to the EPA. Dampers are components, like valves, that control the system's airflow.

Those who have window AC units should also close the outdoor air damper, which Horner said is often built in to save energy by recirculating air, since the appliance doesn't have to work to cool air

coming from outside.

"If you've got an outdoor episodic air pollution event, you would certainly want to close off the outdoor air supply—if that feature is available," Sharma said.

If the window unit doesn't have an outdoor air damper, Horner said, it should not be turned on when the air quality index indicates unhealthy levels of particulate matter outside.

## **What kind of air purifier should I get?**

A [clean room](#) requires running an air purifier as often as possible on the highest fan speed. Make sure to buy one that doesn't produce ozone.

Chicagoans should purchase an air purifier with HEPA filters, said Ravi Kalhan, a pulmonologist at Northwestern Medicine.

According to the EPA, high efficiency particulate air filters are a type of pleated mechanical air filter that can remove at least 99.97% of dust, pollen, mold, bacteria and airborne particles with a size of 0.3 microns—the most penetrating particle size. HEPA filters trap larger or smaller particles with even higher efficiency.

"You could think of these filters like putting a giant N95 mask on your room, and having all the air pass through it," Kalhan said.

Other kinds of air purifiers—such as those that rely on ultraviolet light or ionizers—won't help with pollution caused by wildfire smoke, Kalhan said. And air purifiers with ionizers can be dangerous for people with lung conditions, he said.

The biggest mistake people make when purchasing an air purifier is

buying one that is too small for the area they plan to use it in, said Lou Manfredini, resident home expert with Ace Hardware. Most manufacturers rate their air purifiers based on square footage, he said, and buyers should purchase an air purifier rated for the space.

Though a good option, experts note that commercially available portable air cleaners can often sell out during air quality events.

## **How can I make my own purifier?**

If you can't find an air purifier on the shelves of any hardware or big-box stores, you could make one at home. This DIY project consists of duct-taping a pleated filter rated Minimum Efficiency Reporting Value 13 or higher to a box fan. MERVs indicate a filter's ability to capture particles between 0.3 and 10 microns, and a higher MERV rating corresponds to greater filtering ability, according to the EPA.

"Get some good duct tape and just make sure you seal those together, with the filter on the backside where the air is being sucked in," said Marilyn Black, vice president and senior technical adviser at the nonprofit research organization Underwriters Laboratories. "It's not hard to do if you can put duct tape on straight."

The EPA offers a guide with DIY instructions at [epa.gov/air-research](http://epa.gov/air-research). The University of Washington's Department of Environmental and Occupational Health Sciences also has an infographic at [deohs.washington.edu/edge/blog](http://deohs.washington.edu/edge/blog).

A similar DIY alternative is the Corsi-Rosenthal box, said Brian Urbaszewski, director of environmental health programs for the Respiratory Health Association. The box is made up of four MERV 13 filters and a cardboard base, which is then sealed by tape and topped by a fan.



"It can be noisy, and it's big and bulky. And it's not as good as a HEPA filter in terms of efficiency," he said. "But with the big fan, it circulates more air through the filters and so it can capture about the same amount as a more efficient HEPA filter does."

## **Are DIY air purifiers safe?**

Experts warn against using just any box fan for homemade air cleaners. The EPA recommends opting for a box fan built in 2012 or later, which will have a fused plug. The fan should also adhere to the market fire safety standard for electric fans (UL507), according to a 2021 report by the EPA and the UL Chemical Insights Research Institute that evaluated the safety of DIY air cleaners.

The study was meant to evaluate concerns that overloaded filters in DIY air cleaners could cause the box fan to overheat and catch fire. The EPA did not want to recommend them if they turned out to be fire hazards or posed a burn risk, according to Black, who is also one of the report's co-authors and leader of the research institute.

None of the DIY air cleaners tested in the study ignited, even when the filters were loaded with particulate matter. But the researchers caution users to keep an eye on their DIY purifiers, and to replace the filters frequently when they accumulate too much grime or begin to smell like smoke.

The next phase of the joint research between EPA and UL Chemical Insights scientists will evaluate the efficacy of homemade air cleaners, Black said.

## **When should I use an air purifier?**

There isn't necessarily a downside to running an air purifier all the time apart from cost, said Kalhan. The air quality index in Chicago, he said, is seldom very low.

But for healthy adults who aren't at higher risk for smoke-related health issues, they might choose to start running an air purifier when the air quality index is between 150 to 200, Kalhan said. "Two hundred for sure is unhealthy," he said.

Manfredini said people should start running their air purifiers before air quality deteriorates, if possible, because air purifiers need time to start filtering dirty air.

"If you're watching the news or reading the Tribune and it says 'Tomorrow's gonna be a bad air day,' you gotta crank that baby up," he said. "Because it's going to take at least 24 to 36 hours for it to really do its job," he said. Similarly, people should keep their air purifiers running for at least a day after air quality improves.

Running an air purifier shouldn't increase your electric bill more than a few dollars a month, Manfredini said. Replacing HEPA filters, which can run \$40 or \$50 apiece, does add to the cost. People who run their air purifiers 24/7 need to replace the HEPA filter at least four times a year, he said.

## **What if I can't afford one?**

Air purifiers can be pricey, often running upward of \$100 depending on their size, and replacing HEPA filters adds costs. People without air purifiers should keep their windows closed and could wear masks—N95s or similar—inside, Kalhan said.

"There's not great solutions for cleaning indoor air," he said. "This is

why we need true public health and climate strategies. Because for people who lack resources, once again, they'll be on the short end of the stick in terms of risk for long-term health complications."

ComEd offers \$50 rebates for air purifiers as part of its Energy Star rebate program for efficient appliances, which can help cover the cost of room-sized models that average \$60 to \$80, Urbaszewski said.

Can I upgrade my central AC?

Most Chicago-area homes are heated and cooled using forced air systems, which have filters, Manfredini said.

"Upgrading the furnace filters that you use in your system in a combination with a room [air purifier](#) to me is really kind of the one-two punch to having cleaner air in your home," he said.

Homeowners can purchase pleated air filters for their home air systems for less than \$10 apiece at hardware stores, Manfredini said. They should look for filters that have a MERV rating of at least 11, he said.

People with central air should keep it on during bad air days even if they haven't upgraded their filters, Manfredini said. "Even a poor filter is better than nothing," he said.

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