

# The invisible Covid-19 mitigation measure is finally getting the attention it deserves

By Amanda Sealy, CNN

🕒 Updated 12:50 PM ET, Sun April 10, 2022

**(CNN)** — Two-plus years into the Covid-19 pandemic, you probably know the basics of protection: vaccines, boosters, proper handwashing and masks. But one of the most powerful tools against the coronavirus is one that experts believe is just starting to get the attention it deserves: ventilation.

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## Respiratory backwash

"The challenge for organizations that improve air quality is that it's invisible," said Joseph Allen, director of the Healthy Buildings Program at the Harvard T.H. Chan School of Public Health.

It's true: Other Covid tools are more tangible. But visualizing how the virus might behave in poorly ventilated spaces can help people better understand this mitigation measure.

Allen likens it to cigarette smoke. "If I'm smoking in the corner of a classroom and you have low ventilation/filtration, that room is going to fill up with smoke, and everyone is breathing that same air."



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microbiomes with each other. But if someone's sick and infectious ... those aerosols can carry the virus. That's a problem."

## It's airborne

"We've known for decades how to keep people safe in buildings from infection, from airborne infectious diseases like this one," Allen said.

From the beginning of the pandemic, Allen and other experts have waved red flags, saying that the way we were thinking about transmission of Covid-19 -- surfaces, large respiratory droplets -- was missing the point.

"Hand washing and social distancing are appropriate but, in our view, insufficient to provide protection from virus-carrying respiratory microdroplets released into the air by infected people. This problem is especially acute in indoor or enclosed environments, particularly those that are crowded and have inadequate ventilation," hundreds of scientists [stated in an open letter](#) in July 2020.

Eventually, the World Health Organization and the US Centers for Disease Control and Prevention [acknowledged](#) what the experts had been saying all along: that Covid-19 could also spread by small aerosolized particles that can travel more than 6 feet.

"If you could be smoking a cigarette, you could be a couple of feet from me, depending which way the wind was blowing, you may not even know I'm smoking."

If you're indoors, you could be breathing in less fresh air than you think.

"Everybody in a room together is constantly breathing air that just came out of the lungs of other people in that room. And depending on the ventilation rate, it could be as much as 3% or 4% of the air you're breathing just came out of the lungs of other people in that room," Allen said.

He describes this as respiratory backwash.

"Normally, that's not a problem, right? We do this all the time. We're always exchanging our respiratory

"The size of the virus itself doesn't matter because, as we say, the virus is never naked in air. In other words, the virus is always traveling in respiratory particles that develop in our lungs. And those are all different sizes," Allen said.

Singing or coughing can emit particles as large as 100 microns (almost the width of a human hair), he said, but the virus tends to travel in smaller particles -- between 1 and 5 microns.

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The size of these particles affects not only how far it can travel but how deeply we can breathe it into our lungs, and how we should approach protecting ourselves from this virus.

"When you're talking about an airborne disease, there's the what's right around you, you know, the sort of the people who you know can cough in your face, the 6 feet thing, and then there's the broader indoor air, because indoor air is recirculated," said Max Sherman, a leader on the Epidemic Task Force for the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

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## Dilute and clean

"Outdoors is safer than indoors" has become an accepted mantra with Covid-19. Allen points out that protecting ourselves indoors is where our focus should always be, even beyond the pandemic.

"We're [an] indoors species. We spend 90% of our time indoors. The air we breathe indoors has a massive impact on our health, whether you think about infectious disease or anything else, but it just has escaped the public consciousness for a long time," he said.

Making sure our indoor air is healthy is not that complicated, Sherman said. "You just want to reduce the number of particles that might be carrying Covid or any other nasty [virus]."

The way you do that is through ventilation and filtration.

Filtration -- just like it sounds -- is filtering or cleaning the air, removing the infected particles. But think of ventilation as diluting the air. You're bringing more fresh air in to reduce the concentration of those particles.

Dilution is exactly why we haven't seen superspreader events outdoors, Allen says.

"We have hardly any transmission outdoors. Why is that? Unlimited dilution, because you have unlimited ventilation. And so, even in crowded protests or outdoor sporting events like the Super Bowl, we just don't see superspreading happening. But if we did, we'd have the signal be loud and clear. We just don't see it. It's all indoors in these underperforming, unhealthy spaces."

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## Healthy spaces

The 1901 Tenement Housing Act of New York required every tenement building -- a building with multiple households -- to have ventilation, running water and gas light.

Builders added ventilation to many of these buildings with a shaft in the middle that runs from the roof to the ground, allowing more airflow.

"In the late 19th century, people are finally starting to understand how disease spreads. So airshafts and the accompanying ventilation were seen as a solution to the public health crises that were happening in tenement buildings," said Katheryn Lloyd, director of programming at the Tenement Museum. "There were high cases of tuberculosis, diphtheria and other diseases that spread. Now we know that spread sort of through the air."

Today, we're facing the same challenge.

"Getting basic ventilation in your home is important, full stop," Sherman said.

One of the easiest, cheapest ways to do that is to open your windows.

Open doors or windows at opposite ends of your home to create cross-ventilation, the Environmental Protection Agency advises. Opening the highest and lowest windows -- especially if on different floors -- of a home can also increase ventilation. Adding an indoor fan can take it even further.

"If a single fan is used, it should be facing (and blowing air) in the same direction the air is naturally moving. You can determine the direction the air is naturally moving by observing the movement of drapes or by holding a light fabric or dropping paper clippings and noting which direction they move," [the EPA says](#).

Just cracking a window can help a lot, Allen says: "Even propping a window open a couple inches to really facilitate higher air changes, especially if you do it in multiple places in the house, so you can create some pressure differentials."

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It's important to note that if you have an HVAC system, it must be running to actually circulate or filter the air. The EPA says that these systems run less than 25% of the time during heating and cooling seasons.

"Most of the controls these days have a setting where you can run the fan on low all the time. And that's usually the best thing to do because that makes sure you're getting you're pushing air through the filter all the time and mixing the air up in your in your home," Sherman advised.

This could be something to keep in mind if you're going to have visitors or if someone in the household is at higher risk for severe illness.

Choose the most efficient filter your HVAC system can handle, and make sure you routinely change the filters.

Filters have a minimum efficiency reporting value, or MERV, rating that indicates how well they capture small particles. The American Society of Heating, Refrigerating and Air-Conditioning Engineers recommends using at least a MERV-13 filter, which it says is at least 85% efficient at capturing particles from 1 to 3 microns.

If that's not an option, [portable air filters](#) can also work well, but the EPA says to use one that is made for the intended room size and meets at least one of these criteria:

- Manufacturer says the device will remove most particles below 1 micron

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## Finding a safe space

When you walk into a space, there's no good rule of thumb to look around and gauge how well-ventilated it might be, and that can be a challenge when people have been tasked with assessing their own risk.

Allen suggests starting with the basics: Make sure you're up to date with vaccinations and aware of where Covid-19 numbers stand in your community.

But then it gets harder. Even the number of people in a space isn't a giveaway of a higher-risk situation.

"The more people in there could be higher-risk because you're more likely to have someone who's infectious, but if the ventilation is good, it really doesn't matter."

Ventilation standards are based on "an amount of fresh air per person, plus the amount of fresh air per square foot," Allen explained. "So if you have a good system, the more people that enter the room, the more ventilation is brought in to the room."

One tool that can help you assess ventilation in a room is a CO2 monitor, something Allen wishes he saw more in public spaces. He likes to carry a portable one, which you can order online for between \$100 and \$200.

"If you see under 1,000 parts per million, generally, you're hitting the ventilation targets that are the design standard. But remember, these are not health-based standards. So we want to see higher ventilation rates."

Allen prefers to see CO2 at or under 800 parts per million. He also notes that just because a space has low CO2 levels, it might not be unsafe if filtration is high, like on an airplane.

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## A gamechanger for schools

Atlanta Public Schools Superintendent Lisa Herring says the installation of 5,000 air filtration units -- enough for every classroom -- in her school district is "a gamechanger."

The district had begun upgrading HVAC systems in several schools even before the pandemic, but federal funding allowed it to add filtration units during a crucial time when masks have become optional.

"It gives a greater level of confidence for us as a system to know that our air filtration systems are in place," Herring said.

School districts all over the country have been jumping at the opportunity for ventilation upgrades made possible by an influx of federal funding.

An analysis in February by FutureEd, a think tank at Georgetown University's McCourt School of Public Policy, found that public schools had [earmarked \\$4.4 billion](#) for HVAC projects, which could grow to almost \$10 billion if trends continued.

interim Superintendent Jennifer Gillis says federal funding is "absolutely key."

"You think about a district of our size with all the competing demands and the need to be fiscally responsible, a \$35 million project, that's a large project to introduce to our budget. Having those funds available to us lets us do 19 projects -- and 19 projects in a very short span of time."

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that's safe for all of them.' "

Good ventilation isn't only about keeping students safe from Covid-19, Sherman says. It can also improve their performance in school.

"They're going to learn better; they're going to be awake more; they're going to be more receptive. They're going to be healthier if they've got good indoor air quality," he said.

For Gillis, ventilation has been an important mitigation strategy and an unobtrusive way to keep people safe.

"It's something that most in the building don't think about, but it's a very passive way for us to create safety within the schools. Since the beginning, the goal was always 'let's get our kids in, let's get our staff in, but let's do it in a way

## Finally front and center

Helping solidify ventilation's role in the Covid-19 battle, the Biden administration announced a [Clean Air in Buildings Challenge](#) last month.

The challenge calls on building operators and owners to improve ventilation by following guidelines laid out by the EPA.

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The main actions include creating a clean indoor air action plan, optimizing fresh air ventilation, enhancing air filtration and cleaning, and engaging the building community by communicating with occupants to increase awareness, commitment and participation.

The message may seem overdue, but it's one that Allen enthusiastically welcomed.

"The White House used its pulpit to say unequivocally that clean air and buildings matter. That's massive. Regardless of what you think about what will happen next with implementation or what happens with the funding. That is a crystal-clear message that is already being heard by businesses, nonprofits, universities and state leaders. I see these changes happening already."