

Tips for better indoor air quality (IAQ) during the COVID-19 pandemic

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Disclaimer: Do not rely only on this factsheet in making decision about better indoor air quality (IAQ) for protection against COVID-19. If you have questions, please contact me at eileensenn@gmail.com. To be effective, better IAQ must be combined with physical distancing, barriers, wearing a mask, staying home when ill, rapid testing, contact tracing, and hand-washing. Email me for my factsheet on masks, if you don't have it.

Why better indoor air quality?

The vast majority of coronavirus transmissions occur indoors. Heading into the fall and winter, more people will be spending more time indoors in potentially risky environments. If an infected person is inside a building, car, or other vehicle, the virus spreads through the air when that person breathes, talks, laughs, sings, or shouts, releasing tiny free-floating particles with the virus - called "aerosols" by some – which linger for hours. If the person coughs or sneezes, larger droplets get into the air. The virus can enter a new person's body when these particles or droplets are breathed in or land in the eyes or nose. Exposure depends on how long you are in the space, how close you are to the infected person(s), and how much virus the person is shedding. Better indoor air quality (IAQ) can reduce the number of virus particles in the air, reducing the dose and risk of infection.

Smoke is an aerosol, so it might help to imagine sharing a home, office, or car with a smoker. If you were near the person while they were smoking or vaping, you would inhale a large amount of smoke. Replace the smoke with aerosols that contain viruses, which behave very similarly, and the impact would be the same: the closer you are to someone who exhales virus-bearing aerosols and the longer you are close, the more likely you are to breathe in enough virus to contract Covid-19. Imagine that others you encounter are all smoking and the goal is to breathe as little smoke as possible.

Once the virus is in the air, there are two options: bring in fresh air from the outside and/or remove the virus from the air inside the building. Here is how to do those things and add valuable tools to your anti-coronavirus toolkit.

More outdoor air helps

Ventilation is the process of providing outdoor air to a space by natural or mechanical means. Poor ventilation indoors means the air doesn't move or mix much, and there is little or no clean outdoor air coming from windows or a mechanical system. If present, virus particles build up quickly in these kinds of spaces. The goal in ventilation is to replace potentially virus-laden air indoors with virus-free air.

Windows and doors to the outside can be opened to allow clean outdoor air into the building to dilute the air already inside. To help this happen, use window, box, or pedestal fans to move outdoor air **in** and indoor air **out**. Place fans so they move air in the same direction, rather than undermining each other. For example, a box fan could be placed in a window on one side of a room. Ideally, it would push air towards a window on the other side of the room with a fan in it exhausting air to the outside. See **diagram** on page 6.

Airflow direction should be from cleaner air to less clean air. If a fan meant to increase ventilation ends up blowing virus across people's faces, it is self-defeating, so avoid having fans blow from one person to another.

Running bathroom and kitchen exhaust fans continuously will help bring in more outdoor air if these fans exhaust directly to the outside and there is a source of outdoor air, such as an open window. Use caution in polluted areas or near fires where opening a window or door may allow in toxic smoke, vehicle exhaust, or other pollutants.

Some buildings have mechanical ventilation systems such as central heat and air conditioning. If so, see if the thermostat has the option of keeping the fan ON as shown in the **photo**. The air is filtered only when the fan runs, so run it as much as possible.

In a car, bus, or other vehicle, the driver should open windows and turn the fan on, and not set it to "recirculate." However, in high traffic, outside air also brings in toxic exhaust, so windows should be kept shut there and the fan should be set to "recirculate". In any case, everyone should wear masks.



In buildings where facilities managers are in charge, ask them to confirm that all ventilation equipment is in operating order and that the amount of outdoor air being brought indoors is being maximized. Ask what the air exchange rate is. This is the number of times the air inside a building gets replaced with air from outside. It should be at least 6 air changes per hour. Ten to 12 exchanges per hour is ideal. Ask if the ventilation rate is constant - it should be. If they don't know the answers to these questions, be wary about the space. Finally, be aware that older buildings may not have mechanical ventilation or the system may be in disrepair. These buildings are very difficult to make safe. Give a copy of this factsheet to facilities staff and strongly suggest they read it and the technical references.

Limiting people and activities helps

Limiting the number of people in a room or vehicle helps because that potentially controls the virus at the source. The fewer people, the less chance someone is exhaling the virus. Limiting activities like loud talking, singing, laughing, shouting, and exercising also helps because those activities increase aerosol exhalation from 10 to 50 times.

Air cleaners help

If a building can't get enough outside air for dilution, standalone air cleaners can help. These machines remove particles from the air, usually using a filter made of tightly woven fibers. They can capture particles containing the coronavirus. Your best option is a cleaner that uses a high-efficiency particulate air (HEPA) filter, as these remove more than 99.97% of all particle sizes. These are widely available in hardware and home improvement stores and online. They come in a variety of models rated for the square feet of room size they are recommended for. Several are shown in the **photo**. Several units may be needed, spaced around. Ongoing maintenance and cleaning of these units is required. That usually means changing the pre-filter every three months and the HEPA filter once a year.



Humidity matters

The body's defenses against viral infection in the lungs are best in mid-range humidity levels. Dry air is associated with higher incidence of some viral infections such as the flu. Too much humidity can increase the presence of mites and lead to mold growth. Experts suggest that maintaining **relative humidity between 40% and 60% may help reduce COVID-19 infection rates**. Standalone humidifiers and dehumidifiers can be used to increase or decrease humidity as needed. They are widely available in hardware and home improvement stores and online and come in a variety of models for different sized rooms. Ongoing maintenance and cleaning of these units is required. This usually means thoroughly cleaning the unit weekly and replacing any wicking filters as recommended by the manufacturer.

Better air filters in the ventilation system help

Buildings with a mechanical ventilation system contain a filter in a wall-mounted air return vent or at the air handler, often near the furnace. Most systems use a 1-inch thick filter. Find the existing filter and check the size in inches, sometimes written on the side, for example, 16 x 25 x 1.

Filters are rated for how well they remove particles from the air. One rating system is MERV, with higher numbers indicating better filtration of smaller particles. Other rating systems are MPR and FPR. MPR 1900 is equivalent to MERV 13; FPR 9 and 10 to MERV 12.

MERV 1 to 4 filters only catch relatively large particles to keep them from clogging the heating/cooling coils and ductwork in the ventilation system. MERV 5 to 7 filters also remove midsize particles like pollen and mold spores.

MERV 8 to 13 filters are good to excellent at removing fine particulate, including smoke and bacteria and viruses attached to small particles. If these filters are electrostatically charged, they have a low enough pressure drop to be used in many home ventilation systems. It is important to ask the people who service your system if it is powerful enough for high MERV filters before using them. That way you avoid possible damage to your system. Use the highest MERV filter your system can accommodate. A 20 x 20 x 1 MERV 13 filter is shown in the **photo**.

Air filters must be properly installed, fit tightly so air doesn't go around instead of through them, and be replaced at least several times a year. High MERV filters must be replaced every 60 to 90 days. They are sold in hardware and home improvement stores and online.



For more information

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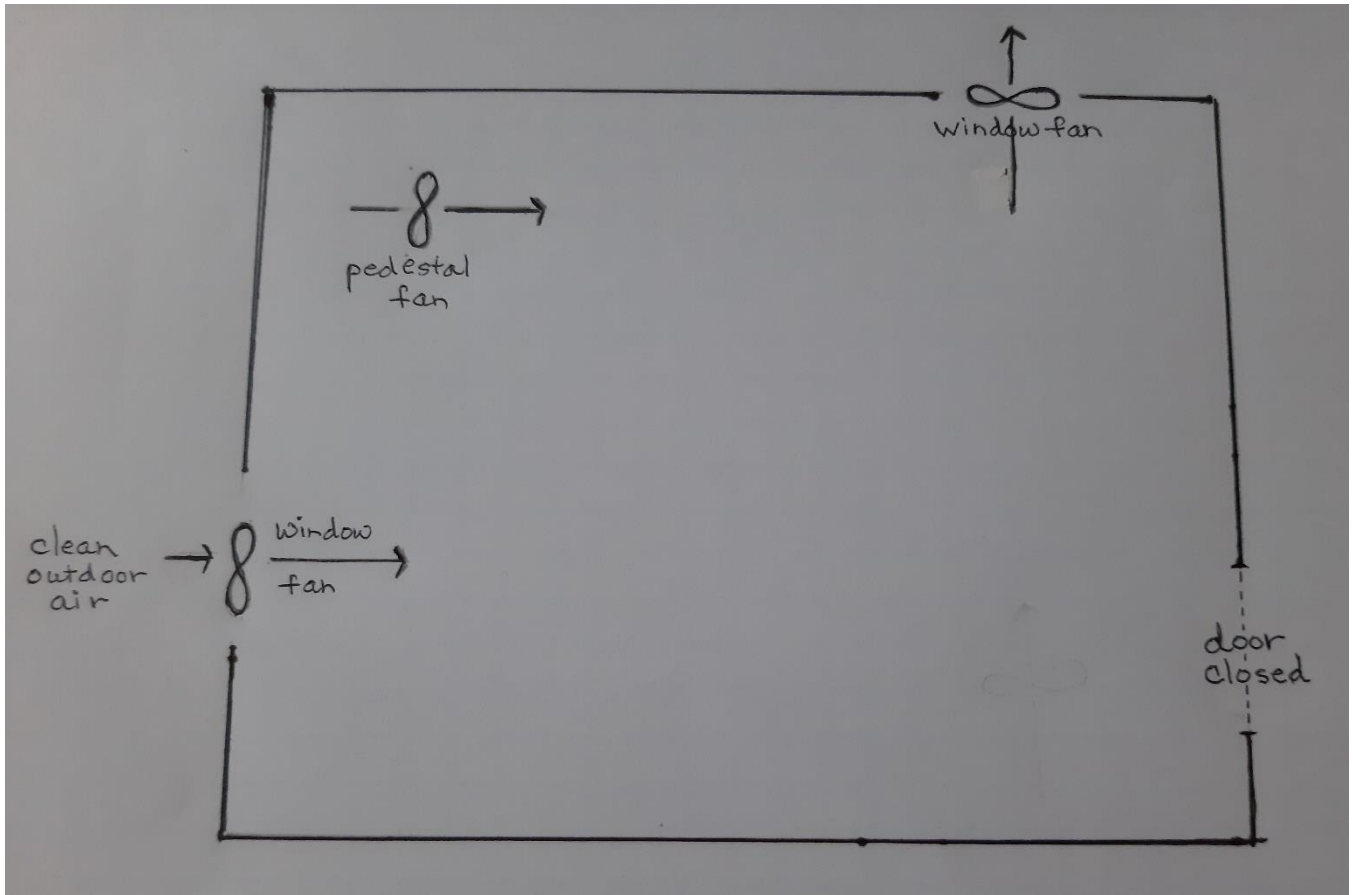
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Diagram

Use fans to move clean outdoor air **in** and indoor air **out**.