



## Improving Ventilation and Filtration for Public Health

The Global Virus Network recommends public health agencies update and standardize their guidance regarding indoor air quality so that people can more easily follow that guidance.

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Recently, the U.S. Centers for Disease Control and Prevention (CDC) updated its guidance regarding ventilation in buildings, calling for five air changes per hour (1). That represents an increase in the recommended air exchange rate. But that rate is difficult to compare with guidance from other U.S. agencies. For example, the U.S. Environmental Protection Agency (EPA) cites standards from ASHRAE (formerly called the American Society of Heating, Refrigerating and Air-Conditioning Engineers), which recommend 0.35 air changes per hour for homes, but not less than 15 cubic feet of air per minute per person (2).

Overall, Indoor Air Quality (IAQ) plays a crucial role in maintaining a healthy living and working environment. But beyond simply exchanging air, people also lack guidance on how to improve IAQ. With the SARS-CoV-2 pandemic, maintaining a high level of IAQ has become even more important.

In most places, people spend a significant part of their time indoors, where temperature and humidity are also factors affecting the spread of virus- and particulate-laden air (3-4), as well as the rate of air exchange itself (5). Exchanging air at any rate, however, presumes the exchanged air is clean. Frequently it is not. Pollution, wildfires, cooking, cleaning products, volatile organic compounds, bacteria, fungi, mold and viruses all affect air quality and so affect public health (6-8). In addition, fine airborne particles (such as dust) have been shown to bind to influenza virus, enabling it to gain access deep within the respiratory tract, increasing infection rates and spread to other organs (9). Although many governments set standards for the quality of air that is healthy to breathe, effectively communicating that information to the public is challenging. That challenge is compounded when government agencies use different metrics, such as those aforementioned from the U.S. CDC and EPA.

When used or performed properly, ventilation, filtration, and decontamination effectively improve IAQ, minimizing the infection risks from airborne pathogens and reducing the health risks of common indoor pollutants. For example, the correct placement of air purifiers makes a profound difference in their capacity to clean indoor air. Improper placement can be counterproductive (10). Modeling airflow in a room with computational fluid dynamics methods can help optimize the placement of people (e.g., patients in hospital beds), ventilation, and air purifiers (11) by identifying places where, for example, viral particles travel or accumulate. It is an expensive and time-consuming process, however, that also requires expertise to interpret the results.

So the GVN recommends public health agencies update and standardize their guidance regarding indoor air quality so that people can easily follow that guidance. The World Health Organization has a roadmap (12) regarding good indoor ventilation in the context of COVID-19. But it is only a beginning of comprehensive guidance. Specifically, public health agencies should:

- collaborate with researchers in air quality and infectious diseases to identify a common set of metrics, including standards for microbial and viral IAQ;



- update public health guidance with standardized and harmonized metrics as well as undertake efforts to deploy them, including into new building codes and commercial product testing standards, enabling the public to compare products;
- develop guidance for building managers, especially those managing hospitals and health care facilities, to undertake building- or room-specific computational fluid dynamics modeling as a part of other air-quality improvement strategies;
- highlight that no air-quality measure eliminates all risk, and so should be implemented in combination with other recommended practices, such as social distancing and wearing appropriate masks, especially regarding infected or vulnerable individuals;
- incorporate harmonized, standardized metrics into the curricula of occupational health studies (including continuing education requirements), and empower hygiene and occupational health departments to monitor IAQ in real time and enforce amelioration in case of non-compliance.

The GVN ([GVN.org](http://www.GVN.org)) is a worldwide network of virologists and physicians committed to solving viral challenges facing humanity.

The science is clear: there is no one-size-fits-all strategy for improving indoor air quality, which includes minimizing the spread of airborne viruses. But informing people with guidance using standardized metrics and practices can help people identify strategies and compare products to provide themselves with the best fit.

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