We Have the Technology to Stop Superspreading Without Masks

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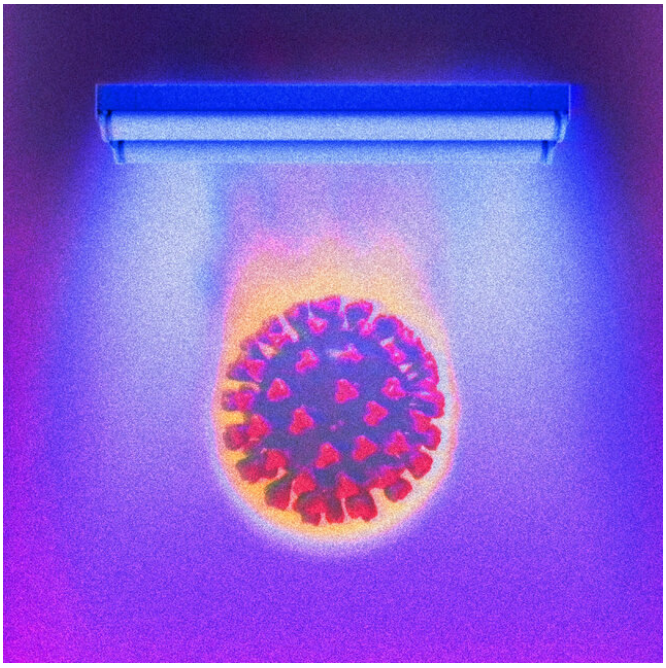

At every stage of the pandemic, a disproportionate number of coronavirus infections have been traced to a relatively small number of gatherings, also known as superspreader events. The recent Gridiron dinner, after which over 70 people tested positive, including members of the Biden administration, is just the latest example.

Some public health experts argue that tolerating these events is what living with Covid looks like. As far as we know, no one who tested positive after the Gridiron dinner became severely ill, but we don't know if these cases also spread to workers and beyond. There's little reason to accept this as a new normal.

There's a better way to hold indoor events without masks, and it doesn't rely on vaccines and rapid tests. Vaccinations can prevent the worst possible outcomes of Covid-19 but cannot always prevent infections. Pre-event testing is imperfect, and for it to be most effective, people need to test right before entering an event.

Putting this much of the onus of infection control on individuals is unlikely to work well to prevent superspreading and lets hosts of large events off the hook for keeping their attendees, workers and others safe. Instead, there are ways that building owners can make indoor environments safer by disinfecting indoor air. One of the best technologies to do so — germicidal ultraviolet light — has been studied for decades and can now be used safely.

The White House recently embraced improving indoor air quality as critical to stemming the pandemic. This includes three methods that can bring clean air into rooms or clean the air already in them: ventilation, air filtration and air disinfection. Of these three, the last may be the most powerful, even as it's the least utilized.

The risk of catching diseases transmitted through the air like Covid, measles, tuberculosis and likely many other respiratory infections, including the flu, depends in large part on the amount of infectious viruses — or bacteria in the case of TB — in the air we breathe. The number of these germs in indoor air is controlled by two things: the rate at which infected people in a room exhale germs and the rate at which infectious germs are removed from the air.

Ventilation and filtration can remove germs floating indoors either by blowing them out of the building and replacing the air with fresh outdoor air or by capturing them while moving the indoor air through a filter. At two air changes per hour, which is commonly provided in large buildings, a little more than half of the existing germs are removed every 30 minutes. At six air changes per hour, which is common in hospital rooms and classrooms with multiple portable HEPA air filters, a little more than half of the germs are removed every 10 minutes.

That's good, but there are a couple of challenges. Methods that move air through rooms can be energy intensive, expensive and noisy. A highly infectious person with the coronavirus could add enough germs to the air to infect over 16 people every minute, or over 900 people per hour, although in practice some of those viral doses would not find a person to infect. Omicron may now be approaching the infectiousness of the measles virus, the most contagious respiratory virus known; one highly infectious person can exhale enough measles virus to infect 93 people per minute, or over 5,500 per hour. Removing half that amount of virus every 10 minutes may make superspreading events smaller, but it's not enough to prevent them in large indoor gatherings. That's where air disinfection with germicidal ultraviolet light, or GUV, comes in.

GUV can easily and silently kill half of the germs floating in indoor air every two minutes or less. It was developed and tested beginning in the 1930s using some of the same technology in fluorescent light fixtures. It is still commonly used in TB wards, as well as some major hospital systems and homeless shelters.

There are three types of ultraviolet light rays: UVA, UVB and UVC. GUV uses UVC, which, unlike the UVA and UVB in sunlight, doesn't cause skin cancer because it cannot sufficiently penetrate the skin. The conventional GUV technology could cause temporary eye irritation and therefore is mounted above people's heads in rooms with ceilings around nine feet or higher. It is also best used alongside ceiling fans to make sure germs in a room are blown up into the zone where the GUV can render them harmless.

Newer, commercially available GUV technologies are even safer for skin and do not irritate the eyes. They can be used safely at lower areas of a room and can directly disinfect the air between people sitting at a dinner table.

A major barrier to wider use is that GUV technologies need to be expertly installed and require a set of technical skills different from what's needed to improve a building's ventilation and filtration systems (both of which are still critically important). The initial costs for equipment and installation of a highly effective GUV system can often be lower than upgrading or replacing ventilation systems. GUV also disinfects the air faster and with far less electricity than ventilation and filtration, which means it's a climate-friendly solution for high-risk environments.

As experts who study the ways viruses can spread indoors, we believe that air disinfection using GUV could have prevented the Gridiron superspreader event. The technology should become the norm for large indoor gatherings where meals are served and masks cannot be worn. The Covid pandemic has made it clear that removing germs from indoor air needs to be a top priority for preventing coronavirus infections and other pandemics. Increased ventilation has been known to be associated with reduced work absence and fewer airborne viruses in workplace air.

Americans have long been able to turn on the tap with confidence that drinking the water will not give us cholera or another illness. Like drinking clean water, breathing sanitary indoor air, especially in crowded public places, will prevent respiratory epidemics. Outbreaks will become much easier to control without economic disruption and politicization. Ventilation and filtration will make important contributions to reducing transmission in homes and offices. Disinfecting the air can make higher-risk settings for superspreading — like conference rooms, restaurants, meat- and poultry-packing plants, nursing homes, prisons and more — safer.

GUV is commercially available right now, and building owners and operators should be encouraged to adopt it through subsidies and tax incentives. We can end superspreader events and make public events and dining safer for everyone. What are we waiting for?

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