Even now, Covid-19 kills over a hundred thousand annually
Here's how to lower the risk

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The New York Times Opinion writer David Wallace-Wells sounded the alarm, "probably half of all Covid infections have happened this calendar year — and it's only July." He quotes Trevor Bedford, a computational virologist at the Fred Hutchinson Cancer Center in Seattle, "As a ballpark estimate…we can expect that every year, around 50 percent of Americans will be infected and more than 100,000 will die."

Most COVID-19 infections (Sometimes the CDC website can't be linked, so visit https://covid.cdc.gov/covid-data-tracker/#variant-proportions) are caused by the Omicron subvariant dubbed BA.5 and by subvariant BA.4.6. But the percentages of several other Omicron subvariants with a variety of ancestors is on the rise.

The large number of infections is clearly due to the highly contagious subvariants of Omicron, mainly BA.5. Trevor Bedford, a computational virologist at the Fred Hutchinson Cancer Center in Seattle, is an expert whose opinion Wallace-Wells highly respects, estimates that

> "Right now…around 5 percent of the country is getting infected with the coronavirus each month and…that pattern to largely continue…that as a ballpark estimate…going forward we can expect that every year, around 50 percent of Americans will be infected and more than 100,000 will die."

It is straightforward to calculate the expected high number of deaths. From the October CDC U.S. data (Visit https://covid.cdc.gov/covid-data-tracker/#datatracker-home), the weekly number deaths were 2,566 reported to or identified by the CDC. Cases are trending downward significantly, percent hospitalizations and deaths are leveling off or increasing slightly, but in a background of significantly lower cases.

Assuming the weekly averages of deaths holds for the whole year. The number of deaths in 2022 would be 52 weeks per year x 2,566 deaths per week = 133,432 deaths per year. In comparison, there were 45,222 firearm deaths in the United States in 2020, more than 32,000 people were killed in 2013 in auto accidents, and there were 12,000 to 52,000 deaths annually in recent years from seasonal influenza. Every one of these causes of death is less than the predicted yearly 133,432 deaths caused by the Omicron subvariants.

More recently, Dr. Shira Doron, an infectious disease specialist and professor at Tufts University School of Medicine suggests that "the odds of a person dying if they get a COVID infection — what's called the

case fatality rate — would be about the same as the flu now, which is estimated to be around 0.1%, or perhaps even lower." Others quoted in the article disagree with Doron saying percent deaths may be higher than 0.1%.

Assuming the daily averages of deaths holds for the whole year. The number of deaths in 2022 would be 365 days per year x 332 deaths per day = 121,180 deaths per year. In comparison, there were 45,222 firearm deaths in the United States in 2020, more than 32,000 people were killed in 2013 in auto accidents, and there were 12,000 to 52,000 deaths annually in recent years from seasonal influenza. Every one of these causes of death is less than the predicted yearly 121,180 deaths caused by the Omicron subvariants.

What can be done to reduce the unacceptable number of hospitalizations and deaths?

It seems to me that this is a three-pronged problem: the obvious public-health prong, a therapy prong, and an economic prong. For the public-health part, I analyze others' strategies to keep us safe from infection. For therapy, I analyze the promise of new vaccines and medicines; and for economics, I calculate the dollar cost of sickness and death, which might better get the attention of government. My goal is to make recommendations on how we might eliminate the risk of COVID-19, particularly Omicron subvariants, in the United States. Much of what I will say depends on the careful research or creative ideas of others.

One important strategy is nasal vaccines that elicit mucosal immunity. We all are familiar with the vaccines from Moderna, Pfizer, and a number of other vaccine providers elicit systemic immunity against COVID-19 throughout our body with so-called immunoglobulin G (IgG) antibodies. There is another, independent immune system called mucosal immunity that protects us from the many pathogens we continually encounter in our nose, mouth, lungs, and other parts our body that are lined with mucous membranes. In response to pathogens, our mucosal immune system protects us by making antibodies known as immunoglobulin A (IgA).

As reported in Scientific American by Marla Broadfoot on May 3, 2022, The Yale University immunologist Akiko Iwasaki argues "If we want to contain the spread of the virus, the only way to do that is through mucosal immunity" using nasal vaccines. She compares mucosal vaccines to systemic vaccines with a good analogy: "mucosal vaccines [are like]…putting a guard at the front door, as opposed to waiting until the invader is already inside to attack."

On September 6, 2002 the journal Nature published an article by Emily Waltz on Nasal Vaccines. The one new thing the Nature article tells me is that there are "more than 100 oral or nasal vaccines in development around the world" and that "roughly 20 have reached trials in humans." The Nature article does not go anywhere near the depth of my analysis; but published so recently, it is current compared to the May 3, 2022 Scientific American article and my other sources.

I agree that maybe in two to four years nasal vaccines against Omicron subvariants will be an important part of the strategies for preventing the spread of Omicron and its subvariants, but many strategies may be necessary to eliminate the virus or make it harmless. There are four nasal vaccines that are in Phase III clinical trials according to the Journal Science Immunology and eight others in earlier stages of

development. The four are from the companies Bharat Biotech (India), Codagenix (United States), Beijing Wantal Biological (China), and Razi Vaccine and Serum Research Institute (RVSRI) (Iran).

A detailed technical description of these vaccines, their properties, promise and problems may be found in a 14-page detailed analysis on the Center for Arms Control and Non-Proliferation (CACNP) website. The section of the website where you may find these documents is titled "Recent Papers and Important Archived Documents." Also, a copy of the linked version of this document may be found there.

Are nasal vaccines intended to replace systemic vaccines or will they be used in parallel with them? My guess is that they would be used in parallel, since systemic vaccines have a history of success.

Another important strategy creating safety in public venues was put forth by Dr. Ezekiel J. Emanuel, Vice Provost for Global Initiatives at the University of Pennsylvania. Even when high levels of virus transmission are occurring, he realizes that closing all public venues is not practicable. Not only will closing businesses hurt our recovering economy, but we also run the risk of political opposition.

Emanuel came up with a clever idea that he explains using the analogy of air bags in automobiles. "Public health policy makers need to adopt the air bag model for COVID — safety measures that work in the background without individuals needing to take initiative to get substantial benefit."

He suggests improving air quality in public venues. I propose that rapid air exchange of HEPA filtered air is one system for improving air quality, an example of the air bag model. Since students can pass infections to family members, improving the quality of school air should be tackled early on using President Biden's Infrastructure Investment and Jobs Act that Congress has now passed. The Act provides financing for improving air quality in public places, but it will likely take a year or two for the money to filter down to communities, so they can begin work.

How do we move forward activities with obvious public-health benefits?

Wearing face masks indoors and in outdoor crowds is one proven tool. There are two studies, one from Boston University and the other involving K-12 students that provide dramatic evidence for wearing face masks. At Boston University all students are required to be vaccinated and must wear masks when attending classes. In "more than 140,000 in-person class events and a total student population of 33,000 between graduate and undergraduate students, only 9 instances of potential in-class transmission were identified, accounting for 0.0045% of all classroom meetings." In charter schools, "1,102,039 students and staff attended in-person instruction. Students and staff had 7,865 primary infections, 386 secondary infections, and 48,313 quarantines. For every 20 community-acquired infections, there was 1 within-school transmission event." We should not mandate wearing masks, but we can provide compelling evidence for the safety that masking provides.

Universal mask wearing in this K-12 study is surprising to me because there are likely people in every U.S. community who adamantly oppose masking even for their kids; also, some states have enacted anti-masking legislation. Most parents know that their children won't wear masks in their classrooms unless forced to do so. Thus, K-12 students wearing masks are likely in the minority. Perhaps the masked and unmasked should be placed in different sections of the classroom, with at least six feet separating the two sections if possible.

Skeptics will point out that almost everybody everywhere in the U.S. is unmasked in public and will not change their behavior. It is likely true that behavior will not change much. Employing many of the strategies described here could eliminate the Omicron subvariants despite the behavior of our citizens.

In addition to vaccines, medicines are another strategy to help protect us in our fight to rid the United States of Omicron subvariants. There are medicines on the market and several in development.

Pfizer's PAXLOVID is the go-to drug for the treatment of mild-to-moderate Omicron subvariant infections. Pfizer announced on June 30, 2022 that it has submitted a New Drug Application to the U.S. FDA for PAXLOVID. Pfizer is seeking approval to replace its current interim authorization.

One big issue with PAXLOVID is that people who have taken a five-day course of PAXLOVID sometimes become reinfected "There isn't much data about the frequency of Paxlovid rebounds. The CDC issued a warning in late May about rebounds, but a Mayo Clinic study in June found them to be rare, with less than 1 percent of study participants experiencing a rebound." Experts say a longer Paxlovid course is needed to prevent rebounds. Pfizer is now studying Paxlovid rebounds.

There are several new medicines, of which only two are described:

On August 1 2022, AstraZeneca's antiviral monoclonal antibody, Evusheld, was granted an interim authorization for those for whom COVID-19 vaccination is not recommended, due to their moderate to severe immunocompromised state or their receipt of immunosuppressive treatments.

Announced via press release on August 15 2022 is a new monoclonal antibody that neutralizes all known SARS-CoV-2 variants. In addition, this antibody should be able to fight off any viral variant that might emerge. The findings were published in Science Immunology on August 11, 2022. This antibody, developed by researchers at Harvard Medical School and Boston Children's Hospital, works in a unique way, by blocking the fusion of the outer membrane of the virus with the membrane of our cells. The fusion site is highly conserved among different Omicron subvariants implying that fusion in future variants should also be blocked. Indeed, the antibody neutralized all Omicron subvariants in lab tests. So far, it has not been tested in humans. If successful in humans and eventually approved by the FDA, this could be the miracle medicine we have all been hoping for.

For the economics of infections, hospitalizations, and deaths, I calculated that it would cost the U.S. $18 billion per year. But most infections are not reported, as people quarantine at home, or may not quarantine at all, or may not know they are even infected with COVID-19. Thus, the yearly cost of treatment reported in this study, $18 billion, is likely a big underestimate. My calculation may be found in the 14-page version on the CACNP website.

I conclude from my analysis that it might take two years to see FDA approval, funding available, and so on to begin implementing many of the strategies identified here to rid ourselves of Omicron and its subvariants. I am guessing it might take an additional two to three years to implement them widely.

But we might get lucky. Many of the strategies documented in this study will contribute to nearing herd immunity. Also, behavior changes like remote working will contribute.

If Trevor Bedford is right, 50% of the U.S. population may be infected this year, and perhaps 90% could be infected by the end of next year, so nearly approaching herd immunity is possible. This near herd immunity may be enough for practical purposes; that is, it would be unusual for an uninfected person to encounter an infected person.

We will still look to public health and therapeutic strategies to mitigate risk. Even with those, we may not be out of the woods. In the future, we may see the rise of new deadly pathogens related to or not related to COVID; for instance, a new Coronavirus from bats or lab-created potential pandemic pathogens. We will then be starting all over again.