

# The Need to Vaccinate Against COVID-19



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## ABSTRACT

Globally, now in the third year of the pandemic, COVID-19 deaths have exceeded more than 6 million. As new subvariants emerge and spread, vaccines work to limit the worst of COVID-19 and continue to be important. Restraints are lifted, and COVID-19 may be seen as done for some, but COVID-19 is not yet done with others, no matter how badly everyone wants it to end. The SARS-CoV-2 pandemic has caused considerable morbidity and mortality worldwide. The protection provided by vaccines and booster doses offer a method of mitigating severe clinical outcomes and mortality. As debates over additional booster shots for COVID-19 intensify, many researchers are looking to the universal coronavirus vaccine model as a guide for managing future variants of SARS-CoV-2 and preempt the next COVID-19 surge.

**Key words:** Pandemic, COVID-19, Vaccination, Health Inequity, Pregnancy, Booster, Universal Vaccines

## THE CRISIS

The COVID-19 outbreak caused by SARS-CoV-2, first reported in Wuhan, China in December 2019, exploded into a pandemic producing a global health emergency within weeks.[1] Now in the middle of a third pandemic year, we have not reached the

end. More than one million people have died in the U.S. and many more millions around the world. The losses are almost incalculable and sadly, many could have been avoided. One thing we have learned is the value and importance of good information that we can trust. All that information can be daunting, especially as science learns more about the virus and the virus also “learns more” about changing. As “pandemic fatigue” pushes many to put aside preventive measures, progress is evident, and vaccines have saved many lives.

## THE WARP SPEED DEVELOPMENT OF VACCINES

Despite the record speed at which the COVID-19 vaccines have been developed, they have still been subject to the same checks, balances, and scientific and regulatory rigors as any other vaccine, and shown to be generally safe. An unprecedented combination of political will, global collaboration, and funding has enabled the rapid development of COVID-19 vaccines without compromising vaccine safety.[2] However, continuing misinformation and false claims have threatened to undermine the success of vaccines and put people’s lives at risk.

## THE PANDEMIC IS NOT OVER YET

The suspension of COVID-19 precautions and deliberate misinformation about the pandemic imply that COVID-19 is nearing the end. On the contrary, the World Health Organization (WHO) warned that these factors, combined with the more transmissible Omicron BA.4 and BA.5 variants, followed by other emerging subvariants, have caused another increase in COVID-19 cases globally. While the pandemic may seem to be over for some, it is not over for many.

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Even as more than 266 million people have received the first shot of vaccine in the U.S. and as states and countries remove restrictions, the pandemic persists in the face of conflict in Ukraine and the threats posed by more extreme weather events and natural disasters – in much the same way that the deadly Spanish Flu of 1918 raged while the world was at war. Such crises actually increase the threat of a resurgence of COVID-19 in those affected and nearby regions. Although more than 80% of the total U.S. population has received at least the first dose of vaccine, the rate of vaccine hesitancy in some areas severely hampered preventive efforts.[3] In a world weary of the pandemic, the reimplementation of safety measures has met significant resistance. The new SARS-CoV-2 variants have proven to be more easily transmissible than measles, which had previously been the most contagious of all viruses.

Vaccines, however, offer the most hopeful view of the pandemic. The booster shot becomes more important with the spread of Omicron BA.4, BA.5 and their subvariants while the updated bivalent vaccines now provide an even more effective booster. Worldwide, almost 20 million lives were saved by COVID-19 vaccines during their first year of implementation, according to a new study. [4] The researchers concluded that 600,000 more deaths could have been prevented if international immunization targets of 40% had been met by the end of 2021. From the start of the U.S. vaccination campaign through the end of November 2021, COVID-19 vaccines prevented about 1.1 million deaths and 10.3 million hospitalizations in the U.S., according to estimates by the health care foundation, The Commonwealth Fund. Those who had previously been infected by COVID-19 showed higher rates of developing medical complications (ie, pulmonary embolism, myocarditis and cardiomyopathy, thromboembolic event, renal failure, type 1 diabetes, and autoimmune disorder). Hence, COVID-19 vaccination can be critical in reducing the impact of post-COVID-19 medical conditions.

Masking, handwashing, and avoiding large gatherings continue to be important in combating COVID-19. While the Center for Disease Control (CDC) relaxed and removed mask-wearing requirements indoors by those who are fully vaccinated with the primary series (currently 68% of the U.S. population – only 20% of the eligible

population are vaccinated with boosters), it is more important than ever for those who are not yet vaccinated to stay vigilant, continue to observe basic safety measures, and get vaccinated.

## GLOBAL COVID-19 SNAPSHOT

World deaths from COVID-19 have reached more than 6 million (with WHO estimating a much higher toll – three times higher than reported). Resistance to vaccine and mask mandates continues to challenge progress in defeating this highly contagious virus. Compounding the catastrophic death toll, more than 10.5 million children have lost one or both of their parents during the coronavirus pandemic, according to a research article published in *JAMA Pediatrics*. [5] Southeast Asia and Africa suffered the greatest rate of losses, with one out of every 50 children affected. In the Americas, this number dropped to one out of 150 children. Children in countries with lower vaccination rates and higher numbers of children per mother were more likely to be affected.

## U.S. COVID-19 STATUS AS DEATHS SURPASS 1 MILLION

The U.S. has averaged more than 39,000 new infections every day in the past week, according to the CDC COVID-19 data tracker. The latest Omicron subvariants – with BA.5 and BA.4 being the most dominant – are highly transmissible but less severe for those who have been vaccinated. As infection rates in many states rose, the mortality rate was recording more than 370 deaths per day; more than one million people in the U.S. have died from COVID-19 (near equivalent of the entire population of Jacksonville, Florida), making COVID-19 the deadliest pandemic in American history.

Although three successfully evaluated, safe and free vaccines are in widespread use in the U.S., and a fourth has been given authorization and CDC approval recently, the rate of vaccination has slowed considerably. Seventeen states still report that less than 60% of their population are fully vaccinated. Health authorities address vaccine hesitancy as a significant barrier to community immunization. They are hopeful that the approval of a fourth more conventional (using a non-mRNA platform) vaccine will encourage those people who

are hesitant to get vaccinated. Sadly, the early arrival of flu season has added another variable in the need for vaccinations to guard against the worst of both subvariant viruses.

## HEALTH INEQUITY

Global health inequity retains its deadly potential in developing countries with poor health care access as vaccine distribution lagged dangerously behind better-resourced nations. As an example of significant disparities in vaccination rates, 80% of people in high-income countries have been vaccinated, but just 16% of people in low-income countries.[6] In poor countries, the virus exposes and exploits every weak point in their health infrastructure. Vaccine hesitancy was also playing a significant role where in the past the public health system has failed the people leading to a historic mistrust of authorities. This lack of trust also highlights the importance of robust information and public education campaigns to promote the benefit and safety of vaccination. The COVID-19 pandemic has brought new attention to the health equity crisis on a global scale and complexity of building solutions. Unequal access to COVID-19 treatments threatens global recovery. Fortunately, the disparity for COVID-19 response has diminished due to recent significant health system efforts to address the issue, but many of the basic causes of health inequity still remain.

## PREGNANCY AND COVID-19

Misinformation has hindered vaccine uptake among pregnant women. With CDC estimates showing about five in ten pregnant women remaining unvaccinated, the latest COVID-19 vaccine monitor finds that a majority of women who are pregnant or planning to become pregnant say they are “not too confident” or “not at all confident” that the vaccine is safe.[7]

A recent study funded by the National Institutes of Health suggested that pregnant women with COVID-19 appear to have three times greater risk for common pregnancy complications, in addition to health risks from the virus, than pregnant women without COVID-19.[8] This finding underscores the need for women of child-bearing age and pregnant individuals to be vaccinated and take other precautions against becoming infected with

COVID-19. Recent reports have shown that women who have received COVID-19 vaccines during pregnancy have passed antibodies to their babies, which could help protect them after birth.[9] Likewise, studies have shown that breastfeeding mothers who have received COVID-19 vaccines have antibodies in their breast milk, which could help protect their babies.

## URGING VACCINATIONS FOR CHILDREN

Like adults and teens who contracted COVID-19, children can spread the disease when they are asymptomatic. In addition, although children may have milder symptoms when infected with COVID-19, there are still many cases of children getting severe lung infections and requiring hospitalization. Other complications, such as multisystem inflammatory syndrome in children (MIS-C), may require intensive care or result in long-lasting symptoms. While young children are less likely to have severe illness initially, they are still susceptible to long COVID-19 symptoms long after recovering from their illness.[10]

Vaccination not only reduces the risk of short- and long-term health complications from COVID-19, but it also slows the spread of disease by preventing it from being passed on to others that are at high-risk for severe COVID-19 illness, like grandparents or daycare/school staff with underlying medical conditions.

## POWER OF THE BOOSTER

Three studies published by the CDC show that COVID-19 booster shots provide the best protection against the Omicron variant and new subvariants.[11] One of the studies found that the booster shot was 90% effective at preventing COVID-19 associated emergency department or urgent care visits and hospitalizations during both the Delta and Omicron surges.[12] All three studies found that unvaccinated people faced the highest risks of becoming sick with COVID-19. The findings of a new study show that not only are vaccinations and boosting important for lowering the individual risk of infection, but they also aid in controlling COVID-19 within a larger population.[13] The vaccines and booster shots at both the individual and population levels are critically important to limiting virus transmission.

Recently, several studies reported that previously available monovalent booster vaccines have only modest effectiveness against mild infection and transmission of the newly emerging Omicron subvariants.[14] On August 31, 2022, the U.S. Food and Drug Administration amended the emergency use authorizations of both Moderna and Pfizer-BioNTech COVID-19 vaccines to authorize bivalent formulations of the vaccines for use as single booster doses. The bivalent or updated vaccines contain two messenger RNA components, one of the original strain of SARS-CoV-2 and the other one in common between the BA.4 and BA.5 lineages of the Omicron variant of the virus.

The new bivalent Omicron-containing vaccine when administered as a booster dose had a safety and reactogenicity profile that was similar to that of previous booster vaccines.[15] Of interest, the bivalent booster vaccine elicited neutralizing antibody responses against Omicron that were superior to those with monovalent original COVID-19 vaccines. Neutralizing antibody responses were also higher against Omicron subvariants BA.4 and BA.5.

According to new U.S. data, only about 11.5 million people (less than 5% of eligible Americans) have received their updated bivalent COVID-19 booster shots since they became widely available at the start of September 2022.[16] The CDC recommends that everyone over 12 years of age get an updated booster if at least two months have passed since their last COVID-19 shot. People who recently got COVID-19 should wait at least until their acute illness ends, but the CDC says they can also delay their boosters until three months after their symptoms started or they first tested positive. The best thing to do right now was to arm up against newer strains of the virus and just keep the immune system as primed and ready as possible.

## CONCLUSION: UNIVERSAL CORONAVIRUS VACCINES IN THE HORIZON

Despite the emergence of new variants of concern, vaccination remains one of the most important and cost-effective tools to control the current pandemic. To slow down the circulation of the virus and limit the speed at which further variants emerge, new vaccines that have a substantial effect on reducing infection and transmission are needed, even as the world attempts to learn how to live with SARS-CoV-2.[17]

The current COVID-19 vaccines used may not be the best long-term solution. The next generation of COVID-19 vaccines will need to have broader epitope (part of a viral protein antigen that is recognized by the immune system, specifically by antibodies, B cells, or T cells) coverage to provide universal or cross-immunity against SARS-CoV-2 variants, confer a longer duration of protection, and be easy to update in a timely manner for protection against any new variants.[18,19]

All approved vaccines and most of the vaccine candidates use the spike protein of the virus as a target antigen to induce protective immune responses. Several variants of the virus present key mutations in this protein which render the virus, at different rates, the ability to evade the neutralizing antibody response induced by current vaccines. New studies should perform bioinformatic analysis of new B and T cell epitopes within SARS-CoV-2 Spike (S), Membrane (M), and Nucleocapsid (N) proteins and possibly be able to identify which are highly conserved (tendency to be free from mutational changes) among them. In this way, a universal or more durable vaccine will be produced and reliably, it will have a huge breadth of coverage. *"Can we get there? I honestly believe we can."*

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