

# COVID-19 pandemic: the beginning, the end and the path to recovery

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**Abstract:** The coronavirus disease 2019 or COVID-19 pandemic is the nastiest public health, economic, and societal crisis of our lifetime. When this global emergency hit, our entire institution quickly pivoted to deliver the actionable science that decision-makers need in times of crisis. The steps taken at the beginning of this crisis to solve the immediate, day-to-day challenges posed by the pandemic and eventually rebuild a healthier, more robust and resilient nation and world. Ensuring strong demand for and endorsing acceptance of the COVID-19 vaccines is crucial to accomplishing herd immunity, shielding the most vulnerable populations, and reopening social and economic life. This perspective article highlights the importance of equitable vaccine allocation and public engagement, and message delivery strategies to ensure demand and promote acceptance.

**Keywords:** coronavirus disease; COVID-19 pandemic; equitable vaccine allocation; herd immunity; vaccine

## Background

Coronaviruses were perceived as innocuous for humans until the first report of human coronaviruses 229E and OC43 emerged in the late 1960s [1]. In 2002, the severe acute respiratory syndrome (SARS) coronavirus (SARS-CoV) epidemic outbreak in southern China took the death rate toll to 10% of the infected patients [2, 3]. The virus rapidly spread across the continents, particularly in Asia, and was controlled after July 2003 [4]. The SARS virus outbreak was analysed and found that bats are the primary natural reservoirs for SARS-CoVs, with civet cats and raccoon dogs being the transitional hosts [5, 6]. In 2012, a new extremely infective Middle East Respiratory Syndrome coronavirus (MERS-CoV) was identified in humans, indicating that the coronaviruses exhibit zoonotic transmission, *i.e.*, transmitted from animals to humans, with unanticipated outcomes for public health [7]. Being the slow-transmitting virus, MERS-CoV has infected around 1700 people with a fatality rate of approximately 36% [8]. The Severe Acute Respiratory Syndrome-related Coronavirus-2 or SARS CoV-2 virus causes COVID-19 to emerge as an epidemic in the Wuhan province of China in late 2019 and later spread and persisted in raging globally, claiming more than 2.3 million lives till date [9]. The animal sources of SARS CoV-2 infections are

bats [10], and SARS CoV-2 can be transmitted to cats, pangolins, and dogs [11]. The SARS CoV-2 infection readily spread to almost all continents leading to the declaration of a Public Health Emergency of International Concern (PHEIC) on 30th January 2020 by the World Health Organisation (WHO) [12].

As early as late January last year, the very first case of COVID-19 emerged, and soon the whole world realised that it had the potential to cause a massive pandemic. As a result, the scientific and social agencies began to quickly mobilise expertise so that rapid responses on critical issues related to COVID-19 would be provided along with the best available possibilities. The global scientific community has been working at a record pace to develop new and effective vaccines and therapeutics. From the beginning of this crisis, the World Health Organisation (WHO), Centre for Disease Control and Prevention (CDC), Indian Council of Medical Research (ICMR) and several other medical authorities have been phenomenal to mobilise expertise across disciplines to help the respective nation and the world respond and recover. Science, engineering, and medicine have been foundational to finding solutions to this crisis. The world is now embarking on an extraordinary effort to scale up vaccine manufacturing, production, allocation, and distribution. Simultaneously, vaccinating enough population to attain herd immunity and providing test kits and therapeutics poses intimidating global manufacturing, supply chain, and distribution challenges. As the pandemic continues, the Federal governments and state and local decision-makers must make difficult choices about balancing public health priorities with other critical societal functions.



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## Equitable vaccine allocation and reopening society

The world is amid a COVID-19 pandemic, and the focus of the governments had been on the practical and impartial distribution of vaccines, especially to begin with inadequate doses. Developing an effective vaccine against COVID-19, its equitable access, and deployment is the most pressing challenge of our time. The introduction of a vaccine and its global equitable access, mainly to protect health care workers and population most-at-risk is the only way to mitigate the public health and economic impact of the pandemic; reducing the tragic loss of life and getting the pandemic under control, and it will also thwart the loss of US\$ 375 billion to the world's economy per month [13]. WHO, Coalition for Epidemic Preparedness Innovations (CEPI), CDC, and several other medical authorities worldwide have collaborated with scientists to develop numerous potential vaccine candidates against the COVID-19 virus. These vaccines are intended to train the body's immune system to recognise and combat the virus that causes COVID-19. Several different kinds of probable vaccines for COVID-19 are in pre-clinical and clinical stages of development [14, 15]. Over 60 COVID-19 vaccine candidates are in the clinical development stage, and more than 170 in the pre-clinical development phase [15]. Robust global cooperation is essential among governments and pharmaceutical companies for the research, manufacturing, and sharing of the costs of SARS CoV-2 vaccines to be available [16].

To help national, state, and local administrations with these difficult decisions, suggestions from various scientific and academic institutions across the globe outlined a four-phased framework to vaccine allocation guided by evidence on reducing deaths, prioritising vulnerable populations, and maximising societal benefits. The information has helped many countries in making critical decisions as they develop their allocation plans. As vaccines become more widely available, their acceptance and use will depend upon whether the public trusts their safety and utility or not. The scientists and health workers have been working tirelessly to examine data about potential adverse effects from vaccines and rapidly determine whether they are statistically significant to address the safety concerns and efficacy of the vaccines.

To effectively inform its upcoming guidance on vaccines, several governments enlist expert knowledge in the behavioural and social sciences to advise on pandemic-related issues. To make the public informed about the types of vaccines available, the allocation of vaccines, the stages of vaccination, and analysing the current state of public trust in vaccines and reasons for hesitancy, emphasising building confidence in underserved and vulnerable communities. Federal and state governments worldwide are launching communication initiatives to help their citizens make informed decisions about vaccines through many advertising media, public displays and other information-sharing platforms, which will draw upon the institution's extensive body of work on vaccine safety. Vaccines are an essential tool for ending the pandemic. However, for at least the next several months, other public health measures will still be needed to prevent the spread of COVID-19, and

policy decisions must be made about how to reopen society and protect health and safety. To direct significant resources to districts to aid the market, schools and other premises to cover the cost of COVID-19 precautions, including masks, facility upgrades and reconfigured classrooms, markets, etc. As many states and localities continue to struggle with obtaining adequate supplies of equipment for health care workers and other essential employees, a question arises how the nation can be better prepared to ensure the continuity of critical medical devices and drugs. Science has provided rapid, actionable guidance on pressing problems throughout the pandemic.

## Policies for building confidence in the COVID-19 vaccines

Decision-makers leading COVID-19 vaccine rollouts need to showcase public support, leverage endorsements, focus on hesitant individuals, and engage communities to ensure demand and promote uptake [17, 18]. Attitudes are hard to change once formed, so immunisation programs need to develop their communication strategy immediately to impact while people are still forming their opinions about the vaccine.

Special efforts to reach the most vulnerable communities that have experienced far higher COVID-19 mortality rates are critical. Community engagement is key to overcoming mistrust and building confidence through actions like using many communication channels, engaging trusted messengers with roots in the community, and working toward racial equity.

Advancing those who are hesitant or sceptical will be most effective in increasing uptake, rather than reaching the small minority of people already adamantly opposed to the vaccine. Reasons for vaccine hesitancy vary widely. While some want to wait and see how others respond to being vaccinated, others are mistrustful of medicine or government. Some mistrust is rooted in experiences of systemic racism and discrimination. Conflicting information from multiple sources can also undermine confidence and trust in vaccine authorities.

## Toward a strong and sustained recovery

While the global focus is on preventing the spread of COVID-19 and ending the pandemic, the governments must now start to take actions toward a sustained and robust recovery.

Every crisis also brings new opportunities, and as we build back from this pandemic, we need to apply lessons learned to strengthen fundamental research and development in bio/pharma, improve supply-chain management, coordinate the efforts of private and public sectors for rapid scale-up of manufacturing vaccines and therapeutics, and develop fast and accurate diagnostics for quick response to the next pandemic.

Crises such as the pandemic lead to cascading impacts on the economy, personal income, supply chains, and other aspects of modern society that must be addressed and also to provide rapid, scenario-based analyses to protect critical

societal functions, avoid worst outcomes, and leverage opportunities, a new strategic science initiative is needed. The initiative will identify actions to prevent worst-case outcomes and steer the nation toward a more robust recovery. The strategic science initiative adds to the portfolio of activities that provide actionable guidance to decision-makers when they need it most. In this way, we can help end this pandemic and lay the foundation for a smoother, more robust recovery.

### Fostering international engagement

This unprecedented global crisis has already indicated the need for international cooperation to solve the COVID-19 pandemic and to better prepare for future global threats to public health. President Biden signing an executive order on his first day in office to halt the United States' departure from the World Health Organization presents new opportunities for the nation to renew its collaboration in global public health efforts [19]. International collaborations in science, engineering, and medicine are essential in advancing international efforts to develop and execute a shared strategy that is the only way to end this pandemic and improve global preparedness for future health emergencies. This pandemic will not be eliminated in any country until it is crushed all over the world. We are privileged to have a robust global network of academics, research institutions, and multilateral organisations that actively collaborates and regularly shares expertise and ideas contributing to worldwide response and recovery efforts.

### Conclusion

UN Secretary-General Antonio Guterres, in September 2020, called the COVID-19 pandemic to be the worst crisis to hit the world since World War II [20]. To put things in perspective, between 1945 and the current year, we have had: multitudes of wars; collapsing democracies; economic recessions; terror attacks; multiple diseases lethal diseases like Ebola, AIDS; melting glaciers; and all within the times in which nuclear annihilation of the world was imminent. Yet, the current pandemic has put the head of the world's future on a chopping block and very nearly ensured that it was off. It is so because this single crisis has the potential to trigger all the previously mentioned conflicts: geopolitical, economic and medical, all at once.

The beauty and tragedy, both of life on earth, are that we live entangled lives irrespective of our differences. None of us exists on an isolated plane of existence in which a change to one ecosystem would not affect another. This we have seen in the past year and a few months of living in the pandemic. There have been, as of 14<sup>th</sup> February 2020, approximately 108 million confirmed cases with 2.38 million reported deaths, according to the WHO Coronavirus Disease Dashboard [21]. Apart from these, there have been much broader indirect impacts on life and the environment as a whole. Yet, as they say, life finds a way, which we are discovering. Through the persistent, stubborn efforts of the frontline workers, which include: healthcare, sanitation, law and order, administrative, etc., we have managed to flatten the curve, and the biggest crisis of the past three-quarters of a century seems to be coming under control. However, the credit should also be delivered majorly to academia, and the

scientists are working at a marvellous rate to study, analyse, and manufacture vaccines in a record time that the world had never seen before.

As the rate of spread of infection decreases and the world transcends towards a sense of normalcy through vaccines or an acquired group immunity, we hope that we have learned our lessons thoroughly enough so that we can prevent not only such events in the future but also be ready and robust, if and when needed. Coronavirus exposed the gaping holes in our healthcare and research infrastructures of the best countries, mainly due to underfunding and inefficient government expenditure, which were forced to redirect funds towards them to counter the virus. However, not the first time, but administrative forces worldwide realised that this one could only be solved through total cooperation and exchange of ideas. Only if the world as a whole works together can we overcome such herculean and unknown obstacles. We can dream that we have seen and known enough not to let things do not fall back to how they were. Finally, through the cleaner air and the fresh environment that we experienced during the lockdowns, we may understand what we are losing as a price of our inane quest for growth and not push nature beyond its limits. The poetry of earth, our nature, has endured us; let us ensure that it does not have to, anymore.

### Declarations

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