

# Covid-19 vaccines: Priorities, processes and practicalities

As vaccines become available, new challenges await, including managing delivery systems, tracking outcomes, and winning over those still hesitant about the benefits of vaccination

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With Covid-19 flaring up again in many countries, and safe, effective vaccines likely to become available over the next few months, how do we deploy them wisely and well?

Globally, the Covid-19 Vaccine Global Access (Covax) Facility is working on vaccine access for all who need it, including low- and medium-income countries. This international collaboration aims to enable equitable distribution of Covid-19 vaccines through global risk-sharing and pooled procurement strategies.

Although there are over 70 vaccines currently in human trials, the history of vaccine development is fraught with candidates that perform well in phase one and two studies, but stumble at phase three, the final stage prior to regulatory approval.

Risk-sharing and pooled procurement protect countries from backing the wrong horse and winding up empty-handed with no vaccines for their people, and allow poorer countries a chance to get access to vaccines.

## SAFETY AND EFFICACY

Each country will have its own considerations regarding when and how to vaccinate its population based upon its circumstances. So, when should Covid-19 vaccines be used within Singapore, and how should we prioritise who gets the vaccines first when they become available here?

Safety and efficacy are our highest priorities, so Covid-19 vaccines should be recommended for use only after they have passed rigorous scrutiny by the health authorities and medical experts. This requires that the risk-benefit be favourable.

The goals of vaccination are to protect people from Covid-19 infections and its severe complications, to protect our communities from the public health impact of outbreaks, and to facilitate the safe reopening of our economy, society and borders.

The highest priority would generally be to protect healthcare



Researchers in a laboratory under Yisheng Biopharma, one of the firms developing a Covid-19 vaccine, in Shenyang, China. Initial supplies of vaccines will be limited because of strong global demand and urgent needs in countries facing Covid-19 surges, but as vaccine production ramps up worldwide, supplies should eventually be sufficient for everyone living in Singapore to get vaccinated, say the writers. PHOTO: AGENCE FRANCE-PRESSE

staff and front-line workers, a sensible objective as it ensures that we can keep our essential operations functioning. These goals shape the formulation of our Covid-19 vaccination strategy: who should be vaccinated, when vaccination should occur and how vaccines are administered.

Initial supplies of Covid-19 vaccines will be limited because of strong global demand and urgent needs in countries facing Covid-19 surges. As vaccine production ramps up worldwide, and other vaccine candidates complete phase three trials successfully, vaccine supplies should eventually be sufficient for everyone living in Singapore to get vaccinated.

To this end, the World Health Organisation and other countries have articulated frameworks for which groups should get priority access to vaccines. Our prioritisation framework should be consistent with published international plans, as it is similarly anchored on two major dimensions of risk: the risk of getting infected with Covid-19, and the risk of severe complications or death from the virus.

Since healthcare staff and essential front-line workers have high risk exposure, giving them priority conserves our healthcare and essential services capacity. We know as well which segments of our community are at highest risk of serious infection, making them the most vulnerable, should they get infected.

Therefore, such vulnerable individuals, especially older adults

and persons with medical conditions, should also be given priority as vaccine supplies become available. Our ultimate goal should be to enable everyone residing in Singapore to have the opportunity for vaccination.

With the pandemic raging around the world, we are likely to be able to analyse Covid-19 vaccine data for their efficacy and safety in specific segments of the population which are less well studied, particularly children and pregnant women.

While such data may take time to accrue, the large number of Covid-19 cases globally will likely give us much-needed data more quickly than in the case of other vaccines. Of note, vaccine manufacturers have made efforts to broaden the diversity of participants in research trials, specifically different ethnicities and older adults.

To date, early data has indicated that vaccine efficacy is high in adults over the age of 65, and that this seems consistent across age, gender and ethnicity.

## MANAGING THE VACCINATION PROCESS

As we will be aiming to vaccinate large numbers of Singaporeans over a relatively short space of time, managing the process will be a challenge.

Some of the issues that will be actively worked on include tracking who has been vaccinated, managing the cold chain because the mRNA Covid-19 vaccines will require storage at low

temperatures of up to minus 70 deg C (colder than Antarctica!), and organising the flow of people coming for vaccination.

We will also need to be able to monitor vaccinated people for side effects possibly linked to the vaccine, and develop a process to assist the very few who do experience rare vaccine side effects.

There are some important unknowns that remain with vaccination. The first is how long immunity lasts after vaccination or infection. We refer to this as the durability of immunity. We already know that some recovered cases can have a persistent positive test for a while, but these are generally not considered reinfections. So far, we have not been able to culture live virus from such individuals locally.

Rare, true reinfections have been reported. But we should also see this in light of the fact that over 63 million have been infected, 43 million have recovered, and many countries are experiencing repeated waves of Covid-19 transmission. Therefore, if reinfections were truly common, we would expect to have seen more cases by now.

While only time will tell regarding the durability of immunity after a Covid-19 vaccination, it is at least as good as the immunity following infection by the virus. Moreover, decades of experience with other vaccines tell us that some vaccines provide long-lasting protection such as hepatitis A or polio, and others require boosters such as

tetanus or pertussis.

The second unknown that we will gain knowledge about only with time is whether vaccinated persons can still transmit Covid-19 to others should they get infected and develop a mild illness.

In other words, apart from protective immunity that shields the individual from getting a symptomatic disease, is there sterilising immunity that prevents the individual from becoming infected at all and, therefore, unable to transmit the virus? Because we cannot guarantee this, we will still need to adopt safe distancing measures. We will still need masks, maintain our ability to detect cases early, and manage their care safely.

But we have now gained a very powerful capability. Apart from minimising severe infections, if vaccines can help us reduce the actual reproductive number for infection to fewer than one, outbreaks will fizzle out.

Here, we need only look to the example of measles, which has an intrinsic reproductive number of 15, among the highest of any infectious disease. This means one measles case in a totally susceptible population can infect 15 persons, and each of those secondary cases could infect a further 15 cases each, so that within two transmission cycles, one case could result in 225 cases.

For centuries, we were completely helpless against this virus, with thousands of children worldwide dying or going blind from measles complications every year. In 1984, the year before

measles vaccination became mandatory in Singapore, there were 2,417 cases with seven deaths from measles here. Vaccination allowed us to eventually control measles outbreaks, and Singapore finally achieved measles elimination in 2018. This does not mean that there are no measles cases in Singapore, but rather, that there are no large outbreaks, nor multiple chains of transmissions.

## VACCINE HESITANCY

It is understandable that there may be some vaccine hesitancy. One must acknowledge that there are some valid concerns, setting aside the wildly unscientific claims being made by anti-vaccine movements.

But we need to also appreciate why there is a pressing need for mass vaccination. Consider these figures – despite over 63 million infected globally, and more than 1.4 million dead from Covid-19 over a mere 11 months, studies using blood tests for Covid-19 antibodies indicate that less than 10 per cent of the population got infected, even in the hardest-hit countries in the first wave. That translates to at least 90 per cent of the population still at risk for catching Covid-19.

To achieve herd immunity, at least 60 per cent to 70 per cent of the population would have to get infected. If even the wealthiest nations of the world have experienced serious impact with only 5 per cent to 10 per cent of their population infected, consider the devastation and the cost in terms of human suffering which would occur by allowing the virus to burn unchecked through the population.

Vaccination provides a different path forward for humanity. But for it to succeed, we need the courage to step out, to enable Covid-19 vaccination for all who need it, and to engage patiently those who hesitate, addressing their reasonable concerns.

The world will continue to be at risk of Covid-19 resurgences, as long as the virus smoulders in any country. As our economy, society and borders are carefully reopened, vaccination serves as a protective buffer for our population.

If enough of our people are vaccinated, imported infections from visitors and returning travellers will be less likely to spark new Covid-19 outbreaks or cause serious illness. Through vaccination, we can minimise the risk of explosive spread in group settings.

Vaccines have proved successful in fighting other infectious scourges in human history. Along with other measures, Covid-19 vaccines provide hope that we will now have a powerful tool to facilitate recovery from the tremendous disruptions of this pandemic.

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