

# Objectives of vaccination strategies against COVID-19

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## Scope of this document

This document provides an overview of the possible goals of vaccination against COVID-19 and reflects on potential implications.

## Target audience

Public health authorities in European Union/European Economic Area (EU/EEA) countries, EU/EEA National Immunisation Technical Advisory Groups (NITAGs).

## Summary

Rapid deployment of vaccines against COVID-19 may enable non-pharmaceutical interventions to be eased in the coming months. Efficient and effective vaccination strategies should be directed by explicit objectives. Therefore, the setting and prioritisation of clear and measurable goals for COVID-19 vaccination strategies is of crucial importance. In this document we discuss the following four potential goals of COVID-19 vaccination: reduction of pressure on the healthcare system; reduction of overall COVID-19 severity and mortality; re-opening of society and disease elimination.

## Background

As of 22 April 2021, the COVID-19 pandemic has caused 141 805 956 cases and 3 026 902 deaths worldwide, with 29 441 874 cases and 662 622 deaths in the EU.

In December 2020, an unprecedented vaccination campaign against COVID-19 began in the EU and globally. Member States identified priority groups for vaccination among those at increased medical risk of severe COVID-19 and those with high exposure to infection. Tier systems were put in place to facilitate the orderly roll-out of the vaccine in many countries. However, challenges in vaccine production, supply and logistics have caused delays in the deployment of the vaccines among the target groups.

In December 2020, ECDC produced a report comparing the relative effectiveness and efficiency of targeting different groups for vaccination [1]. The report concluded that, while it was clear that in an initial phase maximum health gains would be obtained by vaccinating groups at highest risk of severe COVID-19, any vaccination strategy could only be assessed against its objectives, and would therefore need to be adapted to the evolving circumstances. A subsequent report in February 2021 described the importance of integrating vaccination strategies with non-pharmaceutical interventions to reduce hospitalisations and deaths due to COVID-19 [2].

## Current situation

The current situation is dynamic and there are still a number of important uncertainties. Due to limited supply, some countries are adopting strategies to maximise population immunity by postponing the second dose of vaccines. For the same reason, new vaccine trials are assessing mix and match schedules which administer different vaccine products to the same individual. In the coming months, new vaccine products, some of which are built on different technological platforms, are anticipated to reach the EU market and supply is expected to increase substantially.

Since November 2020, several variants of concern have been identified, increasing unease about higher transmissibility and a potential reduction in the effectiveness of the vaccines currently available. Some of these variants are expected to replace the variants previously circulating and new variants of concern may emerge in the coming months. Manufacturers and regulators are investigating potential solutions, including the development of new updated vaccines, either for primary vaccination or to be used as boosters for those already vaccinated. Evidence of vaccine effectiveness against onward transmission of SARS-CoV-2 is currently limited, however positive signals are being observed from vaccine trials and population-based studies [3-6]. Nevertheless, the extent and duration of indirect protection remains unclear, particularly in the context of current and future variants of concern.

## Vaccination strategies by objective

The list below indicates a number of potential public health goals to be achieved, possibly sequentially, as part of the vaccination campaign against COVID-19. The vaccination strategy required to efficiently achieve each goal is then described in detail.

- Reduction of pressure on the healthcare system;
- Reduction of overall COVID-19 severity and mortality;
- Re-opening of society;
- Disease elimination.

### Reduction of pressure on the healthcare system

SARS-CoV-2 has caused a worldwide health and social crisis, primarily because of the large number of deaths and the heavy pressure on healthcare systems due to so many individuals being hospitalised and in need of intensive care. Surveillance data shows that up to 90% of deaths and 80% of hospitalisations have occurred in older adults and persons with underlying conditions [7]. From a societal perspective, if these groups were to be effectively protected against severe COVID-19, there would be a substantial decrease in bed occupancy and deaths and the pressure on the healthcare system would be significantly reduced.

If the initial objective of the vaccination strategy is to exit emergency status, the vaccination of all older adults is the most efficient and effective approach [1,8]. Societal and health problems caused by COVID-19 would be far from over but the instigating factor for the unprecedented global hiatus would be removed. As this vaccination approach is implemented, effective non-pharmaceutical interventions should be maintained, since transmission and disease will continue and other vulnerable groups will still be at risk. The identification and characterisation of emerging variants of concern remains important.

### Reduction of overall COVID-19 severity and mortality

Prioritising vaccination on the basis of age alone is simple and efficient, given the steep increase in the risk of severity and death in the case of COVID-19 [1,8]. However, it is worth bearing in mind that some individuals are also at higher risk of severe disease due to known underlying health conditions, irrespective of age. Furthermore, with the spread of more transmissible, and possibly more aggressive SARS-CoV-2 variants of concern, there is a risk that absolute numbers of hospitalisations and deaths due to COVID-19 may increase in younger and healthier groups as well. These groups are the most active occupationally and socially and may perceive their individual risk of contracting severe COVID-19 as low. Additionally, due to living and social conditions, other groups may be more strongly exposed to SARS-CoV-2, irrespective of the individual risk of developing severe COVID-19. All these groups may also contribute to the overall number of COVID-19 hospitalisations and deaths.

If the goal of the vaccination strategy is the reduction of overall COVID-19 mortality and hospitalisation rates, a staggered age deployment is probably the most effective and efficient approach, starting from older age groups and gradually moving to younger ages, as this would maximise the impact of the vaccination during roll-out. Younger individuals with underlying conditions and other vulnerable groups could be optionally prioritised ahead of their age cohorts. For as long as the majority of younger, healthy adults remain unvaccinated, non-pharmaceutical interventions should remain in place to reduce viral circulation in the community. Some measures could be gradually eased over time as the situation improves.

## Re-opening of society

Once vaccine supplies are readily available, the goal of re-opening society by lifting non-pharmaceutical interventions will become realistic. The vaccination strategies employed to achieve this goal will need to facilitate a substantial reduction, not only in COVID-19 hospitalisations and mortality, but also in the overall morbidity caused by COVID-19. During the pandemic, millions of people have lost many days of healthy life and work due to the disease and numerous individuals have been affected by the long-term consequences of COVID-19, known as 'long COVID'. In addition, people in many occupations that require frequent contact with other individuals (e.g. tourism, teaching, retail, restaurants and bars) are at higher risk of infection.

If the goal is to fully re-open society in a phase where vaccine supply is still limited, there should be discussion about whether some occupational groups should be prioritised, in parallel with those prioritised for health reasons. If vaccines prove to be highly effective against SARS-CoV-2 infection and onward transmission, such an approach could contribute to the reduction of viral circulation in the community and enable activities and businesses to reopen more quickly. Although there is a strong drive to return to 'normal life', this option could be highly controversial, in terms of both communication and implementation, if not all vulnerable groups have had the opportunity to receive a vaccine.

## Disease elimination

A disease elimination goal is the most appealing, but also the most costly objective for any vaccination programme and COVID-19 is no exception. If this route is chosen, a clear elimination threshold should be well defined and quantified, as for other diseases (e.g. measles, cervical cancer). In a COVID-19 vaccination elimination strategy, the main focus would shift from protection of the most vulnerable groups to the targeting of the groups that have the highest level of contact with others, including young people and children. The strategy is dependent on the vaccines offering a high level of efficacy against onward transmission. The role of children in the spread of SARS-CoV-2 is as yet still unclear and no vaccine product has been authorised for people younger than 16 years of age. There are also many uncertainties concerning the duration of protection and the effectiveness of COVID-19 vaccine products against SARS-CoV-2 onward transmission, particularly given the new variants emerging and continuous escape mutations. It is, in fact, plausible that the virus will continue to escape natural and vaccine-induced immunity over time due to selective pressure. Therefore, to achieve and maintain elimination, however this is defined, it is likely that repeated boosters with updated vaccine formulations will be needed for a very high proportion of the population. Very high vaccine coverage would need to be sustained on an ongoing basis, since full eradication of SARS-CoV-2 is considered unachievable, given the animal reservoirs. This would be the most ambitious vaccination programme in history. Alternatively, vaccination could also lead to an acceptable scenario of mild disease endemicity that would negate the need for a costly sustained elimination campaign [9].

## Conclusions

It is of paramount importance to define clear and measurable goals for vaccination against COVID-19 and to adapt strategies accordingly. In times of extreme uncertainty and high expectation, it is essential to clarify the steps required to reach the final objective, notwithstanding the need to adapt to unexpected changes. Post-marketing studies monitoring vaccine effectiveness and impact are of particular importance in proving the benefits of vaccination for all target groups. Each of the vaccination goals outlined may require a culturally-adapted approach and contextual implications should be considered. Vaccination goals could be seen as sequential milestones on the long journey that will eventually lead to a sustainable solution to the COVID-19 pandemic.

## Contributing ECDC experts (in alphabetical order)

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