

Epidemiological and Economic Impact of COVID-19 Vaccine Roll-out Scenarios in Africa

POLICY BRIEF

KEY MESSAGES

1. A retrospective analysis of data from 27 countries in Africa yields evidence that, compared to a no vaccination scenario, rolling out of vaccines will likely be cost-effective, averting many cases, hospitalizations, and deaths due to COVID-19.
2. COVID-19 vaccination programmes with earlier start dates and faster rollout rates tend to yield greater health benefits and are more cost-effective. In countries that have delayed vaccination rollout or where a large proportion of the population remains unvaccinated, speeding up vaccine rollout, particularly in prioritizing vulnerable populations will likely improve cost-effectiveness.
3. COVID-19 vaccination is likely to offer the best value for money when targeted to the most vulnerable, possibly including the elderly, pregnant women, health workers and those with risk-increasing comorbidities. This is especially true in settings with overall low risks of severe disease and death (e.g. in younger populations) and high natural immunity due to previous exposure.
4. The effectiveness of most vaccines against severe illness does not vary significantly; but the price of the same vaccines varies considerably, and as a result has substantial effects on cost-effectiveness. To make vaccine programs as cost-effective as possible, countries should try and obtain vaccines at the lowest possible price.¹
5. Cost-effectiveness evidence remains one input for decision-making and will keep evolving as the COVID-19 pandemic progresses, new variants emerge, and new data become available. Countries should continue to seek and use the latest available evidence to adapt their strategies.

OBJECTIVES

This policy brief draws from the latest evidence on the impact of vaccination program start date and vaccine rollout rates on health benefits. The objective is to support policymakers on decisions to procure COVID-19 vaccines and roll out vaccination programmes in countries, especially those where large proportions of the population remain unvaccinated.

¹ *Guidance on product choice is available from the COVID-19 Vaccine Procurement Toolkit.

METHODS AND DATA

This policy brief summarises the evidence from epidemiological and cost-effectiveness analysis studies, mainly drawing from a regional analysis covering 27 African Union Member States² and supplemented by country-specific studies in Kenya³, Nigeria⁴, Ethiopia⁵ and South Africa⁶.

The primary study employed an age-stratified dynamic transmission model and cost-effectiveness model where health benefits (typically measured in terms of hospitalizations and deaths averted due to vaccination) accrue under different scenarios of vaccine rollout (by varying vaccine type, vaccination programme starting date, and vaccine rollout rates) are contrasted to the costs associated with the rollout (both the direct vaccination costs and wider health service costs for managing COVID-19 related illness). Direct vaccination costs include the procurement cost for the vaccines and associated delivery costs to vaccinate the population. Health service costs typically include health care unit costs in managing severe and critical COVID-19 cases. Health impacts are measured by disability-adjusted life years (DALYs), a widely used measure for health benefits that includes years of life lost and years lived with disability for symptomatic cases, hospital stays in a general or critical bed due to COVID-19.

The scope of the studies was limited to health benefits and costs. Wider societal costs due to the impact of COVID-19 (e.g., the result of lockdowns) were not included. The modelling was based on available data, including data on waves and variants of concern up to the Omicron variant.

FINDINGS

First, the cumulative health outcomes of vaccination differ by vaccination programme start dates (within 2021) and vaccine rollout rates. Vaccination programmes that start earlier and roll out faster tend to have larger health benefits. In South Africa, for example, a 40% vaccine coverage achieved through a fast rollout provides greater health benefits over a year than a 67% rollout attained slowly. In essence, vaccinating populations early and quickly is crucial.

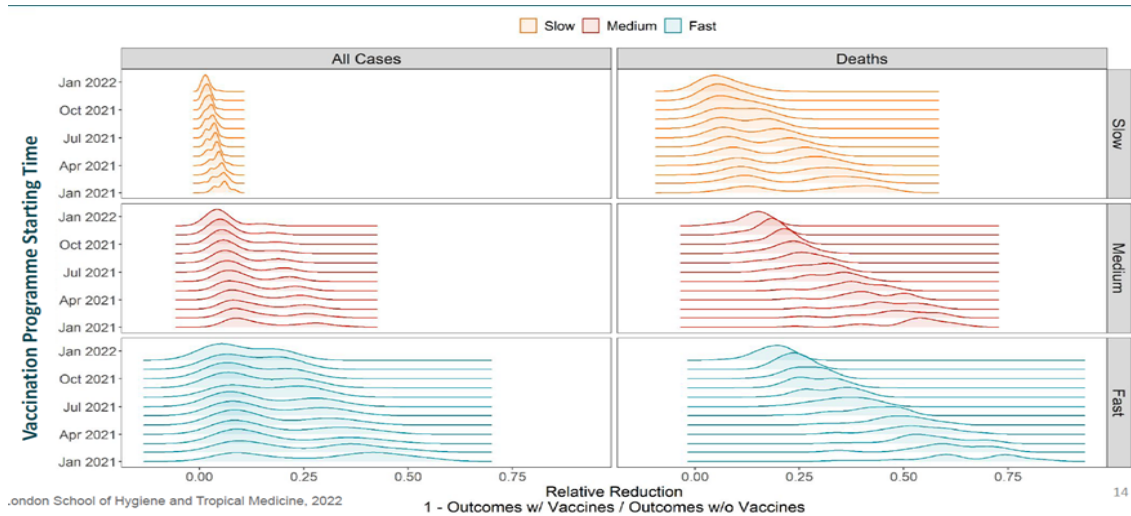


Figure 1. Programme start dates and relative reduction in COVID-19 cases and deaths

Vaccination programmes that began earlier in 2021 saw larger reductions in all health outcomes (cases, severe cases, critical cases and deaths, although only cases and deaths are shown in Figure 1) than those that began later in the year. Programmes categorized as having fast rollout also saw much larger reductions in both cases and deaths. Compared to the no vaccination scenario, programmes with late start dates and slow rollout curbed cases and reduced deaths at much lower rates.

2 London School of Hygiene and Tropical Medicine (LSHTM)
3 Kenya Medical Research Institute (KEMRI) & Health Economics Research Unit (HERU)
4 University of Nigeria, Enugu
5 CGD Europe, Ethiopia Public Health Institute, LSHTM
6 Reddy, K., Fitzmaurice, K., Scott, J., Harling, G., Lessells, R., Panella, C., Shebl, F., Freedberg, K., & Siedner, M. (2021). Clinical outcomes and cost effectiveness of COVID-19 vaccination in South Africa. *Nat Commun.* Oct 29;12(1):6238

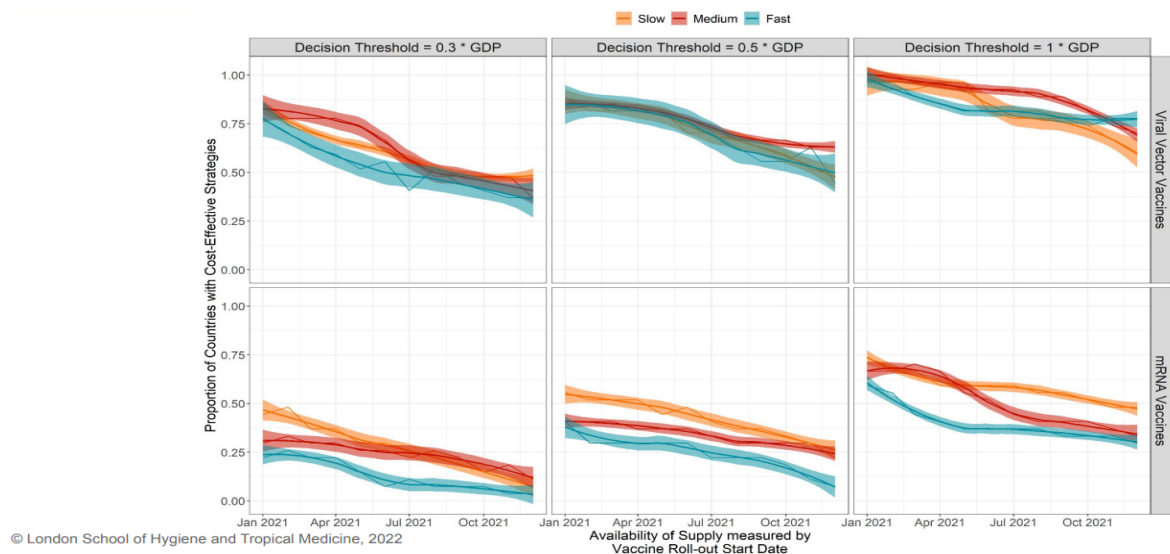


Figure 2. The proportions of countries with the cost-effectiveness of COVID-19 vaccination programmes by vaccine type and willingness-to-pay threshold

Second, as the start of vaccine rollout to unvaccinated populations delays, more and more countries may start to find generalized vaccine programmes (regardless of delivery rate) to be less cost-effective than before or not cost-effective at all. This trend was more evident among lower-middle-income countries and low-income countries. Targeting those most at risk of severe outcomes for vaccination (and potentially boosting) is a viable strategy to enhance cost-effectiveness, especially where some level of natural immunity has been observed.

Finally, while vaccine efficacies do not vary significantly between products, some vaccines (mRNA) tend to be significantly more expensive when accounting for vaccine procurement and delivery costs. For these, slower programme rollouts tend to be more affordable, though they do not provide the most cost-effective options. Thus, procuring vaccines at low costs is a pragmatic way to enhance value for money.

IMPLICATIONS FOR COUNTRIES

Investing in COVID-19 vaccines and vaccination will yield good value for money, and under many scenarios of rollout rates and start times, rolling out vaccines will likely improve health benefits and be cost-effective over a no-vaccination scenario.

Timing and targeting will be critical considerations for many African countries' vaccine programmes. Data from country case studies showed that a very fast rollout to the most vulnerable, even if it only covers between 25-40% of the population, has a massive effect on reducing deaths and containing costs across countries including South Africa, Kenya, and Nigeria. In Nigeria, targeted coverage for 25% of the population remained cost-effective; in Kenya, targeted coverage of 30% was cost-effective.

Of less importance is the choice of vaccine products relating to vaccine effectiveness – even under assumptions of reduced efficacy of vaccines (perhaps due to newer variants), societal benefits of viral vector vaccines remain high. Therefore, choosing the cheapest vaccine options, especially in the case of budgetary limitations, remains pragmatic and improves cost-effectiveness. However, it is important to keep in mind for future planning that the majority of evidence on the performance of vaccines as booster doses to date is based on mRNA vaccines.

The evidence is clear: while vaccine supply remains an important issue, there is an urgent need to speed up COVID-19 vaccine rollout in countries to save lives and maximize value for money.

ABOUT THE STUDIES

The Africa CDC Health Economics Programme oversaw the regional analysis informing this brief, with the support of Africa CDC Science Office Division. The London School of Hygiene and Tropical Medicine prepared the regional technical analysis and paper, with inputs from the Center for Global Development. The study was funded as part of the international Decision Support Initiative (iDSI) by the Bill and Melinda Gates Foundation. Country partners include KEMRI-Wellcome Trust in Kenya, the University of Nigeria, Enugu, the Ethiopian Public Health Institute.



Africa Centres for Disease Control and Prevention (Africa CDC),
African Union Commission
Roosevelt Street W21 K19, Addis Ababa, Ethiopia