African Union

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

Optimizing Strategies for COVID-19 Vaccine Roll-out in Benin and Ghana

Epidemiological and economic evidence to inform national-level decision making for COVID-19 vaccination programs.

POLICY BRIEF **11 MAY 2023**

This Policy Brief builds on previous evidence (Policy Brief Release: 10 May 2022), summarizing the latest research on the Epidemiological and Economic Impact of COVID-19 Vaccine Roll-out Scenarios in Africa. This quantitative analysis compares the costs and outcomes of different vaccine roll-out scenarios in two unique national contexts, namely: Benin and Ghana – shares recommendations for structuring vaccine roll-out to achieve the greatest benefits and maximize value in resource allocation. Recognizing prevailing shifts in continental COVID-19 epidemiology, the recent announcement ending the COVID-19 global health emergency period, and broader continental policy discourse signaling the pursuit of long-term control strategies for COVID-19 across African Union (AU) Member States is timely; the brief offers critical insights which can be harnessed in strengthening regional pandemic preparedness and responses to future public health emergencies and inform decision-making considerations for emerging continental priorities.

KEY MESSAGES

1. Analysis of epidemiological and economic data from Benin and Ghana confirms earlier evidence that investing in COVID-19 vaccines and vaccination (when deployed in combination with non-pharmaceutical measures-NPIs) yields good value for money and is cost-effective, achieving greater health benefits over a no-vaccination scenario.
2. While vaccination of supported in evidence, in both national contexts, higher vaccine coverage alone, does not necessarily lead to greater health or economic benefits. Increasing vaccine coverage to 40% alongside continued NPI adherence maximizes health outcomes in terms of averted COVID-19 cases, hospitalizations, and deaths; sustains health system resilience in terms of reduced hospital occupancy and averted risk of exceeding available capacity and is cost-effective.
3. However, when considering cost-effectiveness alone, vaccine coverage was found to be cost-effective in Ghana at 20%, 40% and 60% population coverage; and in Benin, only at 40% population coverage – where vaccinating less than or more than 40% of the population was not cost-effective. The cost-effectiveness of increasing COVID-19 vaccine coverage is influenced by coverage rates, national context and scope of costs considered.
4. The latest evidence highlights the critical importance of maintaining a balanced approach in optimizing COVID-19 vaccine roll-out. To achieve the greatest possible health benefits, minimize costs and maximize value, vaccine roll-out must be deployed in combination with NPIs.
5. Equally, it is crucial for countries to make conscious policy choices through careful consideration of cost-effectiveness in tandem with affordability, budget constraints and wider population health needs when planning vaccine roll-out. The WHO global target of 70% population coverage was not cost-effective in either national-setting and the choice of analytic perspective in assessing the cost-effectiveness of vaccine roll-out also has an important impact on value assessment.
6. The close of the emergency response period (as announced by WHO on 5 May 2023) signals a contraction in available external support to fight COVID-19, whilst uncertainties around the evolution of the virus persist, heightening the need for continental preparedness and response to disease threats and health emergencies. The findings suggest holistic, multifaceted strategies for protecting populations can elevate health system resilience and achieve efficiencies during challenging times. In view of constrained fiscal space for health, for countries like Ghana that have achieved coverage of 36% COVID-19 vaccine coverage (as at mid-2022), it is likely pragmatic and cost-saving to pursue targeted strategies which increase vaccine coverage in high-risk groups and/or increase coverage of cost-effective interventions for basic health services.
7. As the continent refocuses efforts on essential health services, African Union (AU) Member States (MS) face complex decisions regarding optimizing the integration of COVID-19 into Primary Health Care, essential immunization systems, and standard infectious disease management. Evidence derived through cost-effectiveness analysis and robust mathematical modelling, particularly if informed by context-specific data, will offer an invaluable tool to guide decision-making and should be responsive to fast changing global health dynamics, and generating a sounds evidence base to substantiate the need for new investments in continental health system architecture and technologies, particularly in areas where early evidence exists for substantial and far reaching benefits, for example, laboratory systems, vaccine manufacturing and oral antivirals for COVID-19.

WHAT ARE NON-PHARMACEUTICAL INTERVENTIONS (NPIs)?

- Public health and social measures which are adopted by governments and communities to minimize the impact of the COVID-19 pandemic by decreasing effective transmission rates, or community transmission, to slow the spread of COVID-19.
- Examples include the use of alcohol-based hand sanitizers, international travel bans, social distancing, mask-wearing, self-isolation if symptomatic, screening, working from home, school closures, and handwashing interventions.

WHAT ARE PHARMACEUTICAL INTERVENTIONS?

- Clinical interventions which minimize the impact of the COVID-19 pandemic by treating COVID-19 infection and its symptoms using medicinal and pharmacological products.
- Vaccination which minimizes the impact of the COVID-19 pandemic by increasing the number of people who are non-susceptible to infection or to severe outcomes of infection in the population.

WHAT DID WE LEARN FROM EARLIER EVIDENCE?

- Earlier and faster rollouts yielded greater health benefits and are more cost-effective. 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.
- COVID-19 vaccination is likely to offer the best value for money when targeted to the most vulnerable populations, especially for later launches.
- 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.
- COVID-19 vaccine rollout will therefore be more effective if they are FAST, TARGETED and FRUGAL

OBJECTIVE

This policy brief draws from the latest evidence on the impact of vaccination coverage and coverage of Non-pharmaceutical Interventions (NPIs) on health benefits and cost-effectiveness, in Ghana and Benin. The objective is to support governments and policymakers on decisions to structure COVID-19 vaccine programme roll-out to achieve the greatest possible health benefits and minimize costs, whilst also offering critical insights which can be harnessed in strengthening regional pandemic preparedness and responses to future public health emergencies.

The primary study answered the following question:

? What happens to the dynamics of COVID-19 infections, deaths, and costs when vaccination coverage is increased and coverage of Non-pharmaceutical Interventions (NPIs) is reduced, at different rates, in Benin and Ghana?

CONTEXT

AU Member States are vastly diverse in their demographic, economic and health system contexts, and political and cultural environments. As a result, the epidemiological progression of the COVID-19 pandemic, specific transmission dynamics, varied levels of vaccine hesitancy and distinct consequences of vaccine supply challenges have manifested uniquely across the continent. As a result, optimal strategies for deploying vaccination programmes in specific Member State contexts are limited.

This Policy brief builds on earlier evidence released in May 2022, which assessed the impact of vaccination program start date and vaccine roll-out rates on health benefits across 27 African Union Member States, and isolated key features of COVID-19 vaccine roll-out strategies likely to yield the greatest health benefits and offer the best value for money.

The Africa CDC's Health Economics Programme (HEP) recognizes that deriving the greatest benefit from these regional insights necessitates a tailored approach. The latest evidence summarized in this Policy brief offers an invaluable layer of context by purposefully adopting a range of techniques to yield insights suited to directly inform national policy processes, specifically in Benin and Ghana.

ABOUT THE AFRICA CDC HEALTH ECONOMICS PROGRAMME

The Health Economics Programme was established by the Africa Centres for Disease Control and Prevention (Africa CDC) in November 2020 with a mission to strengthen Africa's capacity for generating and utilizing health economics evidence to improve public health decision-making and practice. The programme adopts a responsive approach to priority Africa CDC and African Union Member State needs- equipping decision-makers with relevant evidence, expertise, and local capacity to accelerate equitable resource allocation, stronger, more efficient, and effective health systems, and healthier populations and communities across the continent.

APPROACH

The policy brief summarises evidence generated using mathematical modelling and cost-effectiveness analysis to assess the costs and health impacts expected to accrue under four different vaccination scenarios, each accounting for NPIs adopted at varying levels of intensity. The costs and health impacts of each scenario are modelled, using a range of locally derived parameter estimates drawn directly from Benin and Ghana.

One of the principal strengths of this primary study is its ability to apply real-world epidemiological parameters which characterised the country-level evolution of the COVID-19 pandemic from the date of each country's first recorded case to a period of wide, ongoing deployment of COVID-19 vaccines. In doing so, all NPIs implemented by both the government(s) of Benin and Ghana, prior to and/or during vaccine deployment were retrospectively characterised based on their specific features and intensities, and through epidemiological evidence on reported cases, COVID-related deaths, demographic data, and health systems pressure.

Modelled Scenarios

Leveraging on this advantage, the health and economic impact of vaccination programs implemented by the government of Ghana and Benin between March 2021 to February 2023 was quantified and subsequently used to simulate the following four hypothetical scenarios (observed between March 2020 and December 2021), in Benin and in Ghana:

BENIN GHANA

MODEL PROJECTION PERIOD: Start: **MARCH 2020** End: **DECEMBER 2021**

	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4
VACCINATION COVERAGE	Baseline No-vaccination No	Vaccination coverage increased between 20%-80% Yes	Vaccination coverage increased between 20%-80% Yes	Vaccination coverage increased between 20%-80% Yes
NON-PHARMACEUTICAL INTERVENTION COVERAGE	Yes All NPIs	Yes All NPIs	Partial (relaxed) Relaxed NPIs	No No NPI

The following Non-pharmaceutical Interventions (NPIs) were applied: Screening, Self-isolation if Symptomatic, Household Isolation, International Travel Ban, School Closures, Handwashing, Social Distancing, Working at Home as defined by Aguas et al. (2020)

1 **Scenario 1 (Base):**
All NPIs that have been adopted by national governments remain in place alongside zero-vaccination. As the 'NPI-only' scenario, this model yields evidence on the health and economic impacts likely to have accrued in Benin and Ghana, under conditions of where there is no vaccine supply and/or prohibitive vaccine pricing.

2 **Scenario 2:**
Vaccination coverage is increased between 20%-80% and all NPIs adopted by the national government(s) remain in place and are being adhered to

3 **Scenario 3:**
The intensity and coverage of NPIs implemented by the government(s) are reduced at a rate lower than the baseline scenario (1) and vaccination coverage is increased between 20%-80%.

4 **Scenario 4:**
All NPIs adopted by the government(s) of Ghana and Benin are no longer in place or, are no longer being adhered to my the population.

Estimating Health Impacts

The primary study adopted a pre-existing mathematical model developed by the COVID-19 International Modelling Consortium (CoMo) to estimate the health impacts expected to accrue under each of the four vaccination scenarios, accounting for the effect of NPIs at varying levels of intensity outlined. The CoMo Model is an age-structured, compartmental SEIR (susceptible-exposed-infectious-recovered) model developed by the global CoMo consortium, through a participatory approach. The model is used to predict the spread of COVID-19 in a population based on different situations - and considers how people of various age groups interact and move through four stages: susceptible (can catch the virus), exposed (infected but not yet contagious), infectious (infected and can spread the virus), and recovered (no longer contagious). By analyzing these stages and potential scenarios of NPI implementation and/or vaccination programs, the model helps predict the future course of the pandemic.

The CoMo model quantified health impacts in terms of expected COVID-19 infections, deaths, hospital occupancy rates and hospital demand (hospital surge beds, ICU beds without ventilators, and ICU beds with ventilators), enabling a comparative assessment across each scenario.

The CoMo model was adapted using a range of country-specific epidemiological, demographic, and health system parameters for Benin and Ghana, enabling detailed and tailored insights into the COVID-19 pandemic's progression for each country, under each scenario. The adaptation process involved calibration using local estimates of daily reported confirmed cases of COVID-19, deaths, initial vaccination of older adults, number of ventilators, ICU beds, and NPIs that were implemented from March 2020. We assumed a constant vaccination coverage across all age groups with 78% efficacy against disease and transmissibility.

Estimating Costs

Health impacts were contrasted against costs estimated from a societal perspective - for each scenario. The analysis used economic costs, which reflect the opportunity cost and incorporated both recurrent and capital costs; using a discount rate of 3% all capital cost were annualized over their relevant useful life years. Health system costs included severity-specific treatment costs for the clinical management of COVID-19 infections, vaccine procurement costs, and costs of vaccination programme deployment (including planning, coordination, demand generation and communications activities).

An ingredients approach[ii] was used to capture cost of vaccine deployment using secondary evidence derived from the Ghanaian context; the same vaccination cost was applied across vaccination strategy and coverage. Treatment cost estimates were sourced from secondary sources which employed bottom-up approaches and primary data collection to estimate the cost of clinical management of COVID-19 infection in Ghana across disease severity. Wider societal costs were estimated using the human capital approach. Productivity losses due to COVID-19 illness (excluding long COVID) applied average Gross domestic product (GDP) per capita and duration of disease estimates. Productivity losses from premature death due to COVID-19 were quantified by determining the years of life lost (YLL) due to premature mortality and average productivity measures.

Estimating Value for Money

The primary outcome of the cost-effectiveness analysis was reported in terms of disability-adjusted life years (DALYs), calculated based on projected health impacts estimated by model simulations and considered using a discount rate of 3%. DALYs are a widely used measure that combines years of life lost due to premature mortality and years of life lived with disability. To estimate value for money, incremental cost-effectiveness ratios (ICERs) were calculated as the net change in total costs and DALYs averted between comparators. The cost-effectiveness analysis of COVID-19 vaccination was undertaken from both a societal and health system perspective over a 1.75-year time frame. The ICER was compared with the opportunity cost-based on each country's GDP per capita, and acknowledges the limitations of established cost-effectiveness thresholds in these settings.

APPROACHES ADOPTED TO ADVANCE PREVIOUS EVIDENCE

- Integrating real-world, local epidemiological and demographic parameters which tailored COVID-19 pandemic progression models to country-specific transmission dynamics and population characteristics.
- Fitting mathematical model using data which reflects national-level transmission dynamics after wide use of vaccines in each setting.
- Adopting a societal perspective where health benefits and costs are considered alongside wider societal benefits and costs.
- Considering local health system realities, including the number of ventilators, ICU beds, hospital occupancy, testing rates, procedures for, and availability of testing centres.
- Accounting for various coverage rates of Non-pharmaceutical Interventions, in tandem with COVID-19 vaccine roll-out
- Utilizing local cost estimates of direct medical costs (vaccine pricing, vaccination deployment, clinical treatment), indirect costs (productivity losses due to illness), and other societal costs.

KEY FINDINGS

RECOMMENDATION

1

Maximizing Health Outcomes

To achieve the greatest health benefits through vaccine roll-out, both countries should increase vaccination coverage to 40% alongside continued adherence to NPIs. In both Ghana and Benin, increasing vaccination coverage to 40% achieves a reduction in COVID-19-induced deaths in all age groups.

Expected Impact of Vaccination Scenarios on Health Outcomes

BENIN	No-vaccination	Vaccination + NPIs				Vaccination + Relaxed NPIs				Vaccination Only			
Vaccination Coverage		20%	40%	60%	80%	20%	40%	60%	80%	20%	40%	60%	80%
Reported Cases													
% Population	0.2	0.2	0.1	0.1	0.1	1.2	0.9	1.0	0.9	2.6	2.6	1.3	2.5
Reported + Unreported Cases													
% Population	1.5	1.4	1.0	1.2	1.1	10.2	12.0	9.9	10.0	23.5	21.4	15.2	21.9
Deaths													
Number of Deaths	84	64	51	59	56	363	308	305	283	735	684	383	685
Deaths (No-vaccination) – Deaths (Alternative Vaccination Scenarios)													
Number of Deaths		-20	-33	-25	-28	279	224	221	199	651	547	282	584
		POSITIVE HEALTH OUTCOMES RELATIVE TO 'NO-VACCINATION’				NEGATIVE HEALTH OUTCOMES RELATIVE TO 'NO-VACCINATION’				NEGATIVE HEALTH OUTCOMES RELATIVE TO 'NO-VACCINATION’			

GHANA	No-vaccination	Vaccination + NPIs				Vaccination + Relaxed NPIs				Vaccination Only			
Vaccination Coverage		20%	40%	60%	80%	20%	40%	60%	80%	20%	40%	60%	80%
Reported Cases													
% Population	1.6	1.0	0.7	0.8	0.9	2.5	3.1	3.3	3.0	2.1	2.9	2.9	2.9
Reported + Unreported Cases													
Number of Deaths	35.3	23.1	18.8	19.9	22.6	44.0	50.7	53.0	49.5	46.8	47.8	48.2	48.0
Deaths													
Number of Deaths	4,912	1,917	1,327	1,369	1,583	5,155	6,152	6,485	5,991	5,819	5,728	5,782	5,678
Deaths (No-vaccination) – Deaths (Alternative Vaccination Scenarios)													
Number of Deaths		-2,995	-3,585	-3,543	-3,329	243	1,240	1,573	1,072	907	816	870	766
		POSITIVE HEALTH OUTCOMES RELATIVE TO 'NO-VACCINATION’				NEGATIVE HEALTH OUTCOMES RELATIVE TO 'NO-VACCINATION’				NEGATIVE HEALTH OUTCOMES RELATIVE TO 'NO-VACCINATION’			

Over the period March 2020 to December 2021, the projected impact of each scenario under consideration on health outcomes indicates that only a scenario combining increased vaccination coverage with continued adherence to NPIs (Vaccination + NPI, scenario 2) is expected to reduce the number of reported and unreported cases of COVID-19, and avert a substantial number of deaths due to COVID-19, relative to a 'No-vaccination' scenario, where the population adheres to the NPIs implemented by the Government of Benin without the roll-out of vaccines.

In both Ghana and Benin, increasing vaccination coverage as high as 80% does not avert COVID-19 related deaths or COVID-19 cases, when deployed under relaxed NPIs (scenario 3) or no NPI adherence (Vaccination-only, scenario 4)

- In Benin and Ghana, only a scenario of increased vaccination coverage between 20%-80% combined with continued adherence to NPIs (scenario 2) is expected to reduce the number of reported and unreported cases of COVID-19 and avert a substantial number of deaths due to COVID-19, relative to a 'No Vaccination' scenario.

Expected Impact of Vaccination Coverage on Health Outcomes

	Reported Cases % Population		Reported + Unreported Cases % Population		Deaths Number of Deaths		Deaths Averted Number of Deaths	
	BENIN	GHANA	BENIN	GHANA	BENIN	GHANA	BENIN	GHANA
No-vaccination	0.2%	1.6%	1.5%	35.3%	84	4,912		
Vaccination + NPIs								
20% coverage	0.2%	1.0%	1.4%	23.1%	64	1,917	-20	-2,995
40% coverage	0.1%	0.7%	1.0%	18.8%	51	1,327	-33	-3,585
60% coverage	0.1%	0.8%	1.2%	19.9%	59	1,369	-25	-3,543
80% coverage	0.1%	0.9%	1.1%	22.6%	56	1,583	-28	-3,329

The projected impact of the most effective scenario (2), combining increased vaccination coverage with continued adherence to NPIs, shows that higher levels of vaccine coverage does not necessarily lead to superior health outcomes, relative to a 'No-vaccination' scenario.

- In Benin, a scenario of increased vaccination coverage to 40% combined with continued adherence to NPIs (scenario 2: Vaccination + NPI) averts more deaths and reduces more Reported and Unreported Cases than 20%, 60% and 80% vaccine coverage, relative to a 'No Vaccination' scenario.
- In Ghana, a scenario of increased vaccination coverage to 40% combined with continued adherence to NPIs (scenario 2: Vaccination + NPI) averts more deaths and reduces more Reported and Unreported Cases than 20%, 60% and 80% vaccine coverage, relative to a 'No Vaccination' scenario.
- Also in Ghana, a scenario of increased vaccination coverage to 60% combined with continued adherence to NPIs (scenario 2: Vaccination + NPI) reduces more Reported and Unreported Cases, and averts more deaths, than 80% vaccine coverage

Expected Impact of Vaccination Scenarios on the Health System Outcomes

RECOMMENDATION

2

Sustaining Health System Resilience

To maintain health system resilience during an ongoing pandemic, both countries should increase vaccination coverage to 40% alongside continued adherence to NPIs to reduce hospital occupancy and avert the demand for hospital surge beds, ICU beds and ventilators exceeding available capacity.

Over the period March 2020 to December 2021, the most effective scenario, combining increased vaccination coverage with continued adherence to NPIs (scenario 2: Vaccination + NPI) is expected to reduce hospital occupancy and health system demand in both Ghana and Benin, relative to a 'No-vaccination' scenario.

- In almost all cases, vaccination coverage of 40% prevented the number of hospital admissions exceeding capacity of hospital surge beds, ICU beds with and without ventilators compared to the baseline scenario of no vaccination coverage.
- Vaccination coverage at 40% reduced hospital demand, reducing the numbers of needed hospital surge beds and patients requiring ICU beds without and with ventilators falling below the available capacity of the health facilities.

Expected Economic Value and Cost-effectiveness of Vaccination Scenarios

RECOMMENDATION

3

Optimizing Resource Use and Value

To produce positive health outcomes at the lowest cost Benin should aim to vaccinate 40% of the population with continued adherence to NPIs. Below or above 40% vaccination coverage indicates that available resources will not be directed to maximize health benefits.

In Ghana, increasing vaccination coverage to 20%, 40%, and 60% of the population combined with continued adherence to NPIs is cost-effective and would likely receive a positive policy recommendation, A 20% coverage rate may also result in net savings; vaccinating more than 60% of the population indicates that available resources will not be directed to maximize health benefits, and is not cost-effective.

The discounted sum valuation of reductions in future years of healthy life lost to illness, disability, and premature mortality due to symptomatic and asymptomatic cases of COVID-19 achieved by different rates of population vaccine coverage was estimated for the most effective scenario, only.

In the cost-effectiveness analysis, the economic value of overall health benefits and costs expected to result from combining increased vaccination coverage with continued adherence to NPIs (scenario 2: Vaccination + NPI) in any calendar year identified viable policy options in both countries.

BENIN

	COVID-19 infection averted per 100,000	DALYs thousands	Total Costs USD ($), millions		ICER USD ($) per DALY	
			Health System Perspective	Societal Perspective	Health System Perspective	Societal Perspective
No-vaccination		43.1	184.2	193.0		
Vaccination+NPIs						
20% coverage	0.13	40.1	203.7	212.3	6,436.0	6,146.0
40% coverage	0.67	28.7	186.2	192.4	137.3	-90.2
60% coverage	0.40	34.4	242.5	248.9	6,714.0	6,364.0
80% coverage	0.53	31.5	261.9	268.7	6,715.0	6,486.0

COST-EFFECTIVE

Cost-effectiveness threshold per DALY averted: $2,363.3 (Ghana), $1,319.2 (Benin)
DALYs, disability-adjusted life-years; ICER, incremental cost-effectiveness ratio. All costs are reported in 2021 United States Dollars ($)

- In Benin, increasing vaccination coverage to 40% combined with continued adherence to NPIs is cost-effective from both a societal and a health system perspective. However, increasing vaccination coverage to 20%, 60%, or to 80% (i.e. less than or greater than 40%) of the population in this scenario is not cost-effective

GHANA

	COVID-19 infection averted per 100,000	DALYs thousands	Total Costs USD ($), millions		ICER USD ($) per DALY averted	
			Health System Perspective	Societal Perspective	Health System Perspective	Societal Perspective
No-vaccination		161.3	$453.4	$602.7		
Vaccination+NPIs						
20% coverage	1.9	88.7	406.7	474.0	-643.7	-1,774.0
40% coverage	279.6	61.0	446.0	490.3	-74.1	-1,121.0
60% coverage	248.6	62.9	596.7	645.7	1,455.7	437.2
80% coverage	217.5	77.9	748.3	804.6	3,539.6	2,424.0

COST-SAVING COST-EFFECTIVE

Cost-effectiveness threshold per DALY averted: $2,363.3 (Ghana), $1,319.2 (Benin)
DALYs, disability-adjusted life-years; ICER, incremental cost-effectiveness ratio. All costs are reported in 2021 United States Dollars ($)

In Benin, increasing vaccination coverage to 40% combined with continued adherence to NPIs is cost-effective from both a societal and a health system perspective. However, increasing vaccination coverage below or greater than 40% is not cost-effective. In Ghana, cost-effectiveness profiles have been indicated when vaccine coverage is increased to 20%, 40% and 60% of the population and adherence to NPIs is maintained. These levels of vaccine coverage increase in value in the presence of monetized productivity losses due to COVID-19 illness and premature death and therefore receive a positive policy recommendation. A 20% population coverage may result in net savings when these societal costs are considered. Exceeding 60% vaccine coverage is not cost-effective and indicates an alternative mix of interventions exist which represent a more favorable use of resources.

- In Ghana, from a societal perspective, increasing vaccination coverage to 20% combined with continued adherence to NPIs is cost-saving, and increasing vaccination coverage to 40% and 60% of the population is cost-effective.
- From a health system perspective, increasing vaccination coverage to 20%, 40%, and 60% of the population combined with continued adherence to NPIs is cost-effective. When considering only health system costs, increasing coverage to 20% no longer is cost-saving.
- In Ghana, it is not cost-effective to increase vaccination coverage to 80% (i.e. higher than 60%) of the population in this scenario.

IMPLICATIONS FOR COUNTRIES

The adoption of integrated interventions, including vaccination and non-pharmaceutical interventions (NPIs) has played a critical role in the fight against COVID-19. In both Benin and Ghana, increasing vaccine coverage to 40%, when deployed alongside continued maintenance of NPIs, maximizes health outcomes in terms of averted COVID-19 cases, hospitalizations, and deaths; sustains health system resilience in terms of reduced hospital occupancy and averted risk of exceeding available capacity, and is cost-effective.

This evidence indicates that relying solely on vaccination does not yield the greatest health benefit or optimize resource allocation highlighting the importance of maintaining a balanced approach that includes both vaccination and NPIs. It also illustrates the consequences that would have resulted from sustained vaccine supply challenges and inequity. These findings confirm previous evidence on the cost-effectiveness of vaccine roll-out and endorses previous recommendations regarding the need for countries to prioritize rapid vaccine roll-out, target vulnerable populations and negotiate fair vaccine pricing.

It remains crucial that countries with similar contexts to Benin and Ghana make conscious policy choices with respect to population-level vaccine coverage. Higher vaccination coverage does not necessarily lead to greater health or economic benefits. COVID-19 cases and deaths across all age groups, as well as hospital occupancy rates and health system pressure, remain high without the maintenance of NPIs during vaccine roll-out, and also, in the absence of vaccination. At the same time, careful consideration of cost-effectiveness when planning vaccination strategies is vital particularly in consideration of vaccine coverage rates. The WHO global target urging countries to strive for 70% population coverage was not found to be cost-effective in the contexts of Benin and Ghana. The choice of analytic perspective in assessing the cost-effectiveness of vaccine roll-out has an important impact on value assessment. For instance, in Benin, the ICERs decreased on average 4.9% when the societal perspective was considered as opposed to the health system perspective. In Ghana, the ICERs decreased on average by 149.5% when the societal perspective.

Coinciding with the recent announcement ending the emergency declared by the World Health Organization for COVID-19 more than three years ago, Africa has experienced a shift in the epidemiology of the COVID-19 pandemic and is no longer facing the threats imposed by vaccine supply inequity. These developments underscore the broader value of the latest evidence. As the continent refocuses efforts on essential health services, Member States face complex decisions regarding optimizing the integration of COVID-19 into Primary Health Care, essential immunization systems, and standard infectious disease management. To ensure these strategies are relevant, efficient, and effective, maximize health and economic benefits for the population, particularly in light of risky macro-fiscal forecasts and finite fiscal space for health, further evidence derived through cost-effectiveness analysis and robust mathematical modelling, particularly if informed by context-specific data, will offer an invaluable tool to guide decision-making.

Further, the WHO announcement signals a likely contraction in available external support to fight COVID-19, despite persisting uncertainties about the evolution of the virus and future transmission dynamics. This emphasizes the importance of maximizing value and continuing momentum for improving continental preparedness and response to disease threats and health emergencies, which remain integral priorities of the Africa CDC and Africa's New Public Health Order. In addition to highlighting the longer-term impact of COVID-19 in the absence of global procurement mechanisms and vaccine supply, the findings reported in this Policy brief suggest future pandemic preparedness efforts should embrace holistic, multifaceted strategies that integrate vaccination with other measures to optimize health and economic outcomes during challenging times.

ABOUT THE STUDY

The Africa CDC Health Economics Programme oversaw the analyses informing this brief, with support and inputs from the University of Ghana. The study was funded by the Bill and Melinda Gates Foundation. Country partners include the Ministry of Public Health (Benin) and the Ministry of Health (Ghana)

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[i] "The Transition beyond the Acute Phase of COVID-19 Pandemic in Africa." 2023. Africa CDC. Link to Article

[ii] Levin, Henry M., and Patrick J. McEwan. 2001. Cost-Effectiveness Analysis: Methods and Applications. Google Books. SAGE.