











Advancing Immunization in Africa: Overcoming Challenges to Achieve the 2030 Global Immunization Targets

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Abstract: African immunization programs are crucial in reducing the prevalence of infectious diseases and improving public health outcomes. This review provides an overview of the current status of immunization efforts in Africa, highlights key challenges, and offers recommendations to help the continent achieve the 2030 Global Immunization Goals. While progress has been made, significant challenges remain. For instance, the WHO African Region reports full immunization coverage at 56.5%, partial coverage at 35.1%, and zero immunization coverage at 8.4%. Between 2019 and 2021, approximately 67 million children in Africa did not receive routine vaccinations, with West and Central Africa particularly affected. DTP1 coverage remained stable at 80%, but DTP3 coverage saw a slight drop to 72% between 2021 and 2022. As of 2022, MCV1 coverage reached 69%, reflecting ongoing efforts against measles. Key barriers to vaccination include limited parental education, religious beliefs, inadequate healthcare systems, and vaccine hesitancy. Addressing these barriers requires community-driven approaches like door-to-door campaigns and mobile clinics. To reach the 2030 immunization targets, health systems must be strengthened, vaccine supply chains optimized, and financial resources—both domestic and international—expanded. The Immunization Agenda 2030 (IA2030) emphasizes data-driven decision-making, nation-ownership, and tailored strategies to overcome obstacles and raise immunization coverage among several demographic groups. Achieving these 2030 goals in Africa requires collaborative efforts to ensure equitable access to vaccines, address sociocultural challenges, and strengthen health system infrastructure.

Keywords: immunization, vaccination, immunity, vaccine, Africa

Introduction

Vaccination has been a cornerstone of public health since the 18th century when Edward Jenner pioneered the first vaccine for smallpox. As one of the most cost-effective public health interventions in history, immunization has significantly reduced the global burden of infectious diseases and has been instrumental in saving millions of lives globally.¹ The global community has responded to the success of immunization with ambitious targets, such as the Global Immunization Vision and Strategy (2006–2015) envisioned by the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF).¹ This initiative aimed to ensure universal access to vaccines by 2030 and emphasized reducing morbidity and mortality from vaccine-preventable diseases (VPDs),

improving coverage, and integrating vaccination services with broader healthcare programs.^{1,2} In response to the evolving global health landscape, various strategies were proposed, including sustaining immunization for those already reached, expanding to underserved populations, introducing new vaccines and technologies, linking immunization to other health interventions, strengthening vaccine supply and logistics management, promoting research and development of new vaccines and technologies, increasing financing for immunization, and improving surveillance for VPDs and adverse events following immunization.^{3,4}

The Global Vaccine Alliance Program (GVAP) emerged with ambitious goals, including the eradication of polio, achieving global vaccination goals, saving millions of lives, making economic gains, and reducing child mortality rates. The plan focuses on developing new vaccines, recruiting scientists, and introducing additional vaccines for diseases, such as cholera, dengue, malaria, inactivated poliovirus, and typhoid.^{5,6} The Immunization Agenda 2030 (IA2030) was endorsed by all WHO member states in August 2020 to ensure universal access to vaccines and improve health and well-being.⁷ IA2030 emphasizes tailored implementation, country ownership, partnerships, and data-driven decision-making; integrating immunization into primary health care services; addressing inequities and gender-related barriers; and promoting global commitment and accountability for better health outcomes.^{8,9} The global immunization efforts, beginning with the Expanded Program on Immunization (EPI), launched in 1974, marked a significant moment in global immunization efforts. One of its early successes was the Universal Childhood Immunization Initiative, which aimed to achieve 80% coverage of diphtheria-tetanus-pertussis (DTP3) vaccines by 1990, a target that was nearly achieved. These early initiatives laid the foundation for future campaigns targeting the eradication of polio, maternal and neonatal tetanus, and the control of measles and rubella across WHO regions.^{10,11}

Technological innovations, such as digital health and mobile health solutions, are being explored to enhance immunization outreach, track vaccine coverage, and improve monitoring in Africa. These technologies are particularly critical in reaching remote areas and overcoming logistical barriers.^{12,13} Surveillance improvements through these initiatives have strengthened communicable disease monitoring in low- and middle-income countries (LMICs), enhancing epidemic detection and response capacities over the past four decades.¹⁰ The COVID-19 pandemic brought attention to the global challenges of vaccine distribution, including disparities in access and supply chain issues.¹⁴ Lessons learned from the pandemic, such as the need for robust infrastructure and international cooperation, can be applied to strengthen routine immunization efforts in Africa.¹⁵ Ensuring sustainable vaccine supply chains and financing models remains critical for maintaining the continuity of immunization programs. Economic analyses show substantial returns on investment from immunization, with projections indicating significant cost savings from averted illnesses.¹⁶

The impact of immunization on global health outcomes is profound, contributing substantially to achieving Millennium Development Goal 4 by reducing under-five mortality rates by 47% between 2000 and 2019.¹⁷ Between 2000 and 2019, vaccination averted approximately 37 million deaths across 98 LMICs, reflecting a 45% reduction in mortality from 10 vaccine-preventable diseases.¹⁸ Economic analyses indicate substantial returns on investment, with immunization programs projected to avert significant illness costs and generate substantial economic benefits.¹⁹ Between 2019 and 2022, the vaccination rate in the WHO African Region increased significantly (Figure 1). There was a modest increase in the number of babies receiving the DTP1 immunization from 30.4 million in 2021 to 30.8 million in 2022, which translated into an extra 350,000 children receiving vaccinations. From 2021 onward, DTP1 coverage stabilized at 80% after declining from 83% in 2019. Likewise, DTP3 coverage has decreased from 77% in 2019 to 72% in 2021 and 2022 (Table 1). 26.5 million children had MCV1 vaccinations in 2022, up from 26 million in 2021, with a 69% coverage rate throughout this time (Figure 2).²⁰ Despite progress, achieving the global immunization target for 2030 remains a challenge, having been met by only a few countries. Therefore, this review aims to comprehensively analyze the current state, challenges, and strategic recommendations for advancing immunization efforts in Africa to achieve the goals set for 2030.

Overview of Immunization in Africa

Africa, a populous continent, is expected to have a well-functioning healthcare system but faces diverse challenges in building robust healthcare systems. However, immunization in Africa is subject to personal interpretations because of differing beliefs and understanding levels.²¹ Despite this, immunization offers numerous advantages, such as preventing

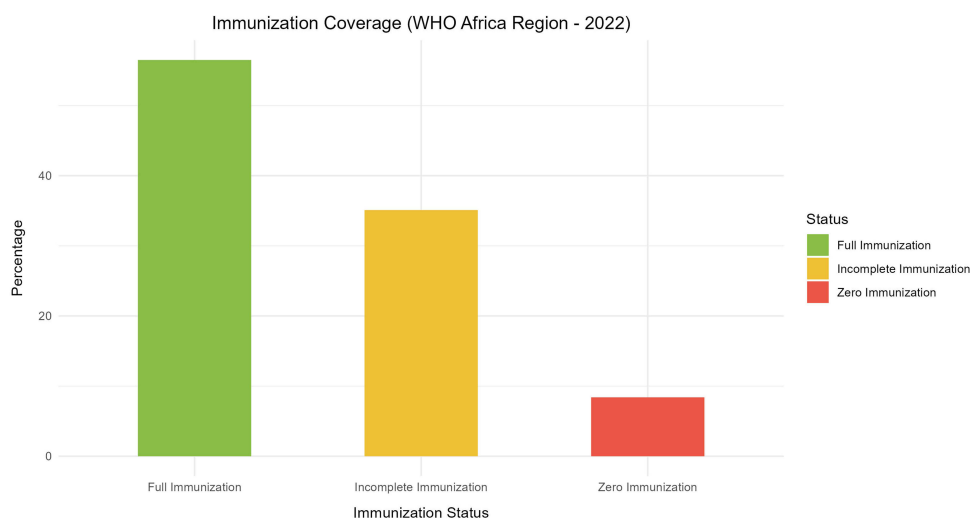


Figure 1 Immunization coverage in the WHO Africa Region.

chronic illnesses and disabilities and reducing the disease burden on families, communities, and society. It also saves medical expenses, increases productivity, and improves education. The return on investment for immunization is estimated to be \$44 for every dollar spent, considering broader social and economic benefits.^{22,23}

Although Africa's healthcare system faces limitations beyond immunization, efforts to enhance vaccine coverage have led to positive outcomes. The continent is making strides in increasing access to immunization services, which are pivotal to addressing child mortality and controlling infectious diseases.²⁴ Diseases such as polio and maternal and neonatal tetanus are close to being eradicated, and the introduction of new vaccines is helping combat long-standing illnesses.^{22,23} Efforts to improve immunization coverage in sub-Saharan Africa (SSA) have yielded positive results. Factors such as decentralized planning and monitoring, multi-year national planning, and allocation of domestic and external resources, including support from organizations such as GAVI, have played a significant role. Routine immunization coverage, which has remained stagnant since the 1990s, is now showing an encouraging upward trend in many SSA countries.^{25,26}

The WHO promotes a decentralized planning and monitoring approach, known as the "reaching every district" (RED) strategy. This strategy has gained global acceptance and has shown successful results in improving vaccination coverage, such as the Diphtheria, Tetanus and Pertussis (DTP) vaccine in Ethiopia. The implementation of the RED strategy in underperforming districts led to a significant increase in DTP vaccine coverage from 35% to 71% between 2002 and 2005. Evaluations in nine countries indicated that the strategy's focus on outreach services contributed to improved coverage in the districts where it was implemented.^{25,27}

Immunization Agenda 2030 (IA2030) partners, including WHO, UNICEF and Ministries of Health, united in April 2023 to advocate for "The Big Catch-Up" to bring childhood immunization rates up to or above pre-pandemic levels.²⁵ With the support of this program, nations will be able to make up for vaccines that were missed, recover from the effects of COVID-19 on routine immunization, and fortify their health systems to include immunization in primary

Table 1 DTP Vaccination Coverage Rates (2019–2022)

DTP1 Coverage	Percentage (%)	DTP3 Coverage	Percentage (%)
2019	83%	2019	77%
2020	81%	2020	74%
2021	80%	2021	72%
2022	80%	2022	72%

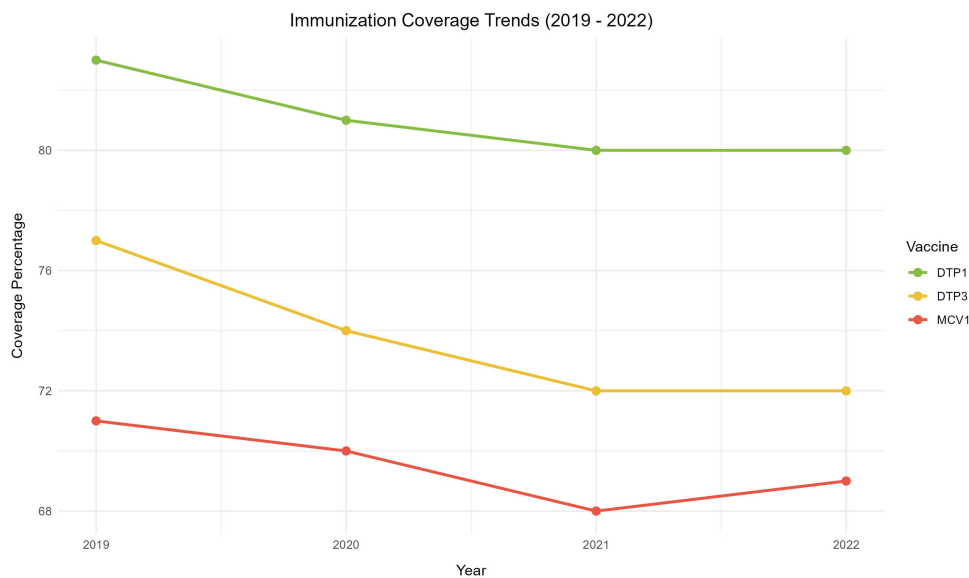


Figure 2 Immunization Coverage Trends for DTPI, DTP2, and MCVI (2019–2022).

healthcare. The goal of the ambitious IA2030 global strategy is to save 50 million lives by 2030 by optimizing the life-saving effects of vaccination. This initiative aims to build a world where immunization is integrated into broader health and welfare systems to benefit all.^{20,25}

Factors Contributing to Low Immunization Rates in Africa

Several factors contribute to the low immunization rates in Africa, with religion being one of the most significant. Religion is deeply embedded in African societies, and some religious beliefs perceive immunization as a threat to life.²⁸ Illiteracy further compounds the issue, as some parents lack an understanding of the healthcare system and its benefits. They preferred locally trained caregivers to health workers. A mixture of traditional drinks is more efficient than vaccines.²⁹ In one study, factors influencing immunization were categorized into two groups: health system-related factors and community-related factors. Health system-related challenges include concerns about vaccine safety, extended waiting times at healthcare facilities, inadequate health-seeking behaviour, language barriers, limited affordability and accessibility of healthcare facilities, negative attitudes of healthcare workers, appointment delays, insufficient vaccine supply, and inadequate knowledge among healthcare workers regarding vaccination.³⁰

Community-related factors that affect immunization include disagreements over vaccine acceptance, distance to immunization centres, exposure to mass media, limited knowledge regarding the benefits of immunization, and concerns about vaccination causing discomfort or pain in children.^{30,31} Another study categorized these challenges as modifiable and non-modifiable factors. The modifiable factors included obstetric factors, maternal knowledge, maternal outcome expectations, maternal attitude, maternal self-efficacy, and environmental factors. In contrast, non-modifiable factors encompass parental socio-demographic factors such as maternal age, maternal education, paternal education, maternal marital status, area of residence, wealth index, number of siblings, religion, ethnicity, and family income, and child-related socio-demographic factors such as gender and age. Furthermore, environmental factors, such as the distance to the healthcare facilities, mode of transportation, ease of access to vaccination sites, satisfaction with vaccine services, the quality of the vaccine provider-client relationship, and availability of the vaccine, also play critical roles in determining immunization rates.^{28,30}

Significance of Achieving the 2030 Immunization Goals in Africa

Over 400 million children currently live on the African continent, which remains particularly vulnerable to infectious diseases due to several factors, including limited access to healthcare, poor sanitation, and widespread malnutrition.

Achieving global immunization goals in Africa is critical for addressing these vulnerabilities and improving health outcomes in the region.³² Achieving these immunization targets will help curb the spread of VPDs by not only increasing access to vaccines, but also promoting better hygiene and sanitation practices, and addressing malnutrition through programs that provide access to essential vitamins and minerals, such as vitamin A supplementation.³³ These efforts are vital for enhancing the health and well-being of African communities, reducing the burden of infectious diseases, improving economic outcomes, and strengthening health security in the region.³⁴ Immunization in Africa offers numerous advantages, including saving lives, protecting public health, improving productivity, and fostering resilience. By reducing mortality rates and improving workforce participation, widespread immunization enhances the continent's capacity to manage health crises. Additionally, successful immunization campaigns promote global health security, encourage regional cooperation, and advance progress toward sustainable development goals. Ultimately, these benefits extend beyond Africa, contributing to a healthier and more prosperous world.^{34,35}

Challenges to Achieving the 2030 Immunization Goals in Africa

Africa has made significant strides in immunization; however, it continues to face substantial challenges, with approximately 67 million children either partially or completely missing routine vaccinations between 2019 and 2021. In West and Central Africa, this number is as high as 19.5 million children.³⁶ This decline in immunization rates underscores a deep issue of inequality, disproportionately affecting marginalized communities. Many of the unvaccinated children belong to mothers who have limited education and lack decision-making power within their families.³⁷ The introduction of new and costly vaccines to the EPI since 1974 has significantly increased expenses. Securing sufficient and predictable funding is crucial for sustaining vaccination coverage, and LMICs depend on external support. While alternative financing mechanisms are being explored, the adoption of new vaccines in middle-income countries that are not eligible for Gavi support has been slower. Vaccine prices also vary across these countries, with inefficient procurement practices acting as barriers to obtaining competitive pricing.^{6,38}

Numerous studies have established a strong connection between healthcare worker density and immunization coverage. However, addressing the shortage of healthcare workers remains a challenge for public health stakeholders and governments alike. These solutions are far from simple, as they require significant investments in training, retention, and the development of healthcare workers.^{6,39} Moreover, merely making health services available to communities does not guarantee health-seeking behaviour, as vaccine hesitancy is a global issue, with over 90% of countries reporting encountering vaccine hesitancy for a variety of reasons.^{40,41}

Another significant barrier to improving immunization rates is the lack of timely and reliable data. Inaccurate coverage estimates and outdated population data pose challenges in planning and implementing effective immunization efforts.^{6,42} Ensuring high and equitable vaccination coverage is crucial to maximizing the impact of vaccines. Many countries still struggle to achieve 90% vaccination coverage, with 20 million children under-immunized in 2019 and many not receiving any vaccines, primarily in impoverished or vulnerable communities. Additionally, existing policies may inadvertently exacerbate inequalities, such as excluding refugee or migrant populations from access to immunization services. A shift toward equity-focused policymaking and revising current guidelines can help address these disparities and improve coverage.^{43,44}

Furthermore, vaccination coverage has declined in fully self-financing middle-income countries, while high-income countries and Gavi-supported LMICs have seen stable or increased coverage. MICs ineligible for Gavi support lag in regional progress.^{6,42} Governance-related challenges also hinder immunization goals in Africa, necessitating the need for improved decision support, stronger political commitment, and better coordination for achieving disease elimination.⁴²

Innovative Recommendations for Achieving 2030 Immunization Goals in Africa

To enhance vaccination coverage in Africa, it is essential to implement community-level strategies. These strategies should include the deployment of mobile clinics to effectively reach remote areas. Additionally, conducting door-to-door immunization drives will make it easier for people who face challenges in accessing medical facilities. Establishing

school-centred immunization programs will also make it possible to effectively reach a greater number of children.^{45,46} International and global organizations must continue to offer robust technical and financial support to bolster national and regional immunization programs worldwide (Figure 3). Prioritizing improved coordination systems and equitable vaccine distribution is crucial, along with fostering R&D initiatives on developing novel vaccines and advanced technologies (Figure 3). Furthermore, advocacy campaigns should intensify efforts to secure additional financial and political support for immunization.^{47,48} Ongoing monitoring and comprehensive evaluations are necessary to uphold accountability standards and identify areas for improvement.

The EPI plays a crucial role in enhancing international immunization efforts.²⁵ The EPI was established in 1974 to provide universal access to life-saving vaccines for children worldwide. It has been successful in expanding immunization services globally, with every country now implementing a national immunization program. EPI offers a wide range of vaccines for different age groups, contributing to the global reduction in vaccine-preventable diseases.⁴⁹ GAVI, the Vaccine Alliance, has focused on vaccinating children in the poorest countries against infectious diseases, having successfully vaccinated over 981 million children since 2000. GAVI collaborates with partners to provide vaccine access, strengthen primary healthcare, and support universal health coverage (UHC).⁵⁰ The African Vaccine Acquisition Trust (AVAT), a team established by the African Union, has secured COVID-19 vaccines for the continent

Strategic Recommendations

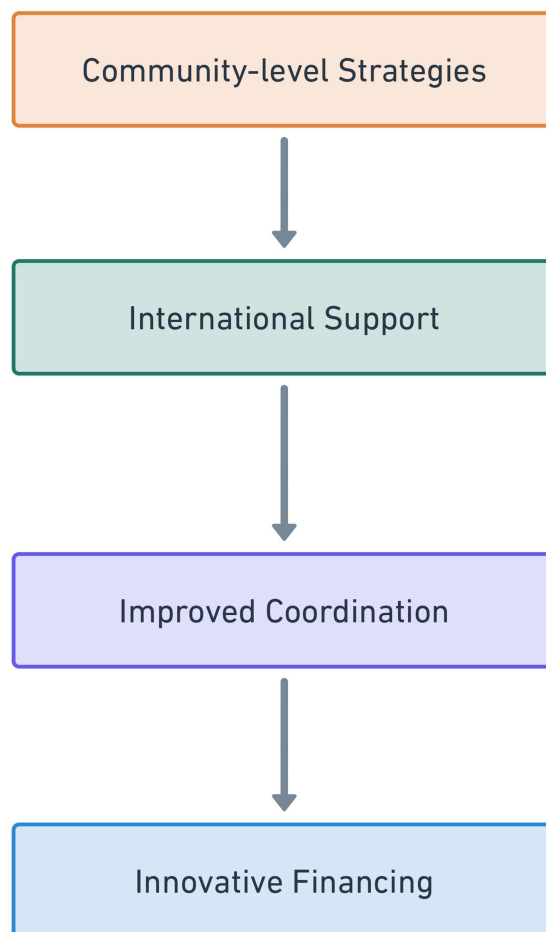


Figure 3 Strategic Recommendations for Advancing Immunization Goals in Africa.

to vaccinate at least 60% of the population. This marks the first collective vaccine purchase by African Union member states, made possible through funding from Afreximbank and logistical support from UNICEF and the AMSP.⁵¹

Vaccination should be integrated into health services throughout life, including catch-up vaccinations and booster doses. This requires integrated delivery points, data systems, and awareness of the vaccination benefits for various age groups. Collaboration with different sectors and monitoring coverage at different ages are crucial for successful integration.⁴⁴ Prioritizing immunization programs is crucial for enhancing primary health care and UHC. Optimizing vaccine supply chains is essential for efficient delivery and ensuring timely vaccination of target populations, thereby improving community health outcomes and overall well-being.⁵² It is crucial to increase domestic investments, allocate resources, explore innovative financing mechanisms, strengthen financial management systems, improve cost-effectiveness, and maintain political commitments (Figure 3).^{35,44} The IA2030 strategy emphasizes the importance of innovative technologies and strategies to improve immunization programs by addressing local needs and enhancing service delivery. These efforts should prioritize equity, strengthen systems; overcome bottlenecks, involve new products, implement research, and address managerial, socio-behavioural, financial, and communication challenges.⁶

Conclusion

Immunization Agenda 2030 (IA2030) requires commitment from all WHO member states and stakeholders, including governments, international organizations, healthcare providers, communities, and individuals, to prioritize and support immunization efforts. Governments must prioritize immunization as a fundamental component of primary healthcare and universal health coverage. The journey to global vaccination has progressed over the years in Africa. Governments, international organizations, and civil society groups must work together to identify and address barriers to full vaccination and ensure that all children have access to life-saving vaccines.

Abbreviations

DTP1, Diphtheria-Tetanus-Pertussis first dose; DTP3, Diphtheria-Tetanus-Pertussis third dose; EPI, Expanded Program on Immunization; GVAP, Global Vaccine Action Plan; IA2030, Immunization Agenda 2030; LMICs, Low- and Middle-Income Countries; MCV1, Measles-Containing Vaccine first dose; SSA, Sub-Saharan Africa; UNICEF, United Nations International Children's Emergency Fund; VPDs, Vaccine-Preventable Diseases; WHO, World Health Organization.

Ethical Approval

Approval from the ethics committee was not required.

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Disclosure

The authors declare that they have no conflicts of interest in this work.

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