



COVID-19 vaccination in Africa: A case of unsatisfied expectation and ill-preparedness



Osmond C. Ekwebelem^a, Phemelo Tamasiga^b, Abdullahi Tunde Aborode^c, Ismaeel Yunusa^d, Uju Nwauzoma^f, Helen Onyeaka^{e,*}

^a Faculty of Biological Sciences, University of Nigeria, Nsukka, Nigeria

^b Am Debenbrock 8, 33332 Gütersloh, Germany

^c Healthy Africans Platform, Research and Development, Ibadan, Nigeria

^d Department of Clinical Pharmacy and Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC, USA

^e School of Chemical Engineering, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK

^f Faculty of Environmental Studies University of Nigeria, Enugu Campus, Nigeria

ARTICLE INFO

Article history:

Received 27 July 2021

Received in revised form 23 October 2022

Accepted 25 October 2022

Available online 9 November 2022

Keywords:

COVID-19 vaccination

Vaccination

Africa

COVAX

COVID-19 vaccine

ABSTRACT

With a population of 1.3 billion people, of which 56% reside in rural settings, Africa seemed ill-prepared to handle the distribution of a COVID-19 vaccine. In addition, the capacity needed for a successful COVID-19 vaccination campaign in Africa surpassed the available resources in local and state health agencies. As a result, African governments were advised to coordinate resources, health officials, and vaccinators, including local health practitioners, medical technicians, and pharmacists for the largest-ever vaccination campaign in Africa. Although the rolling out of the SARS-COV-2 vaccine was, as expected, slow in many African countries, and not yet enough to cover the entire population in Africa, the mass vaccination campaign in Africa must continue to ensure that priority for vaccination is extended beyond front-liners (healthcare workers) and specific high-risk populations, which has largely been the case in some African countries. This article highlights the overarching areas that we believe need to be prioritized to enhance Africa's effectiveness and coverage in the mass COVID-19 vaccination program.

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1. Perspective piece

The race to contain the current pandemic with a safe and effective vaccine has shown immense progress lately. However, analysts believed that Africa was not ready for a mass vaccination program considered the continent's most extensive immunization program [1]. A Vaccine Readiness Assessment Tool, which provides a blueprint for planning and preparation of COVID-19 vaccine roll-out, was released to all 47 countries in the World Health Organization (WHO) Africa region [1,2]. With the support of the United Nations Children's Fund (UNICEF) and WHO, this assessment tool was intended to be used by ministries of health. It covered 10 key areas ranging from planning and coordination to resource and funding, vaccine regulation, service delivery, training and supervision, monitoring and evaluation, vaccine logistics, vaccine safety, surveillance and communications, and community engagement [2]. From the benchmark of 80 % readiness as recommended

by WHO, Africa averaged 33 % readiness for a COVID-19 vaccination program.³ Interestingly, WHO estimated that it will cost around 5.7 billion United States dollars (USD) to deploy a COVID-19 vaccine on the African continent to protect the initial 20 % of the priority high-risk population [3,4]. This cost was exclusive to the additional 15–20 % needed to deliver vaccines and injection materials [3,4]. This estimation was based on the average vaccine price of USD 10.55 per dose and USD 21.10 for the required two-dose regime [3,4]. As shown in Fig. 1, most African countries have been unable to cover this initial 20 % of the priority list, with other factors ranging from inadequate infrastructure to lack of access to a supply of infrastructure-aligned vaccines, and the ability to facilitate campaigns.

Lessons learned from Africa's past vaccination campaigns in West Africa have shown meeting the temperature requirements of vaccines (2–8 °C) is still a big challenge given the non-existent and unreliable electricity. The fact that the Pfizer vaccine must be kept at a storage temperature equivalent to that of Antarctica raised concerns about its suitability in Africa. Putting resources in place to meet such super-cold storage temperatures was challenging in Africa. Suppose an estimated 25 % of vaccines are

* Corresponding author at: School of Chemical Engineering, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK.

E-mail address: h.onyeaka@bham.ac.uk (H. Onyeaka).

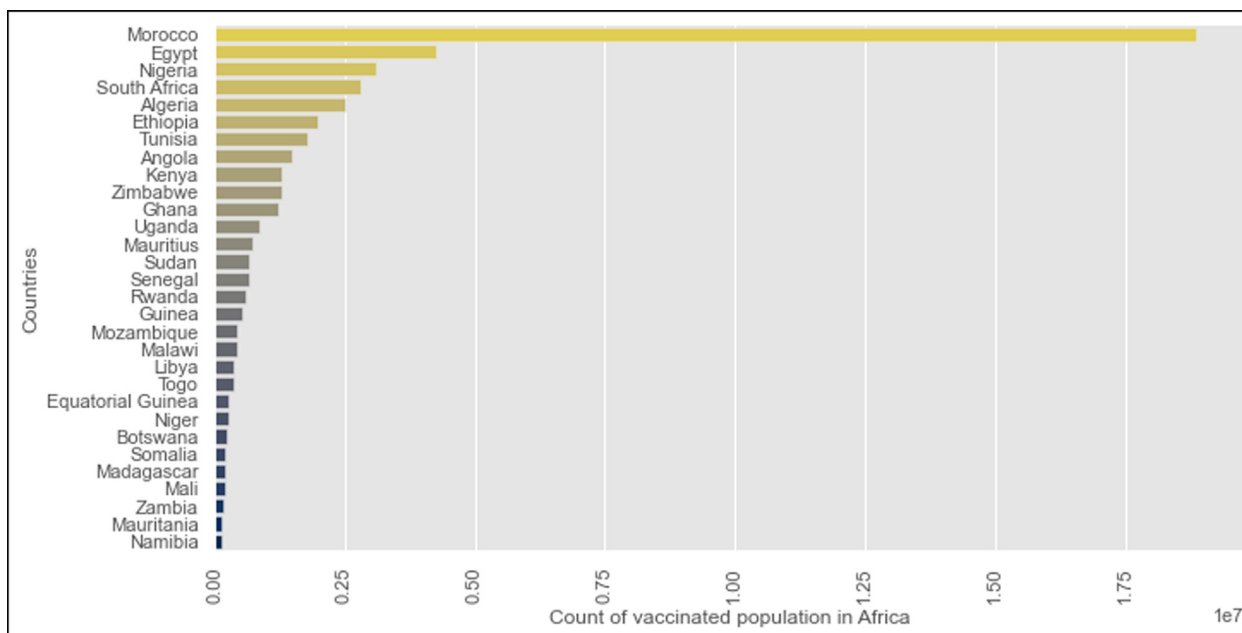


Fig. 1. Count of vaccinated people receiving at least one dose in African Countries. Source: Mathieu, E., Ritchie, H., Ortiz-Ospina, E. et al.(2021) A global database of COVID-19 vaccinations. Nat Hum Behav.

thrown away due to challenges related to cold chain logistics [5], it was envisaged that the percentage of vaccines that could be lost would be much higher if the Pfizer vaccine was deployed in Africa, where the needed infrastructures are limited and about 56.4 % of the population live in rural areas. For instance, in Nigeria, the most populous country and one of Africa’s economic powerhouses, six out of ten hospital wards are not equipped with active cold chain equipment, while 58 % of immunization centers are without electricity [6]. Due to the lack of these facilities, the number of vaccines available to each African country remains limited, which has led to unequal access to COVID-19 vaccine distribution (Fig. 1) [3].

The global community was concerned about the inability of many African countries to build the cold chain facilities needed for the most effective COVID-19 vaccine – Pfizer-and that Africa did not have the financial capacity to buy enough doses of COVID-19 vaccine. In the past, due to high demands, high costs, vaccine hesitancy, and below-par global and continental allocation procedures, most African countries have witnessed delayed and unequal distribution of vaccines. Due to these complexities, many African nations depend on the COVAX facility, a co-financing vaccine acquisition program set up to ensure equal access to purchase vaccines. Based on fairness and equality, COVAX was recommended to be administered to all countries until 3 % of each country is protected from COVID [7]. By being a part of COVAX, this recommendation was assured for each participating country regardless of its economic status.

On the other hand, Africa CDC has beckoned on the international community to help make vaccine distribution equal among African nations [3]. Fortunately, the World Bank announced over \$4 billion will be provided for the purchase and deployment of COVID-19 vaccines for 51 developing countries, half of which are in Africa [5]. While Morocco, South Africa, Egypt, Nigeria, and Zimbabwe are topping the list of COVID-19 vaccinated countries in Africa, some countries such as Tanzania, Eritrea, Burundi, and the Republic of Sahrani are yet to officially administer a single dose of COVID-19 vaccine as at the time of writing [5]. In addition, Burkina Faso, Chad, and the Central African Republic, recently moved off this list. These data show that not only were many African countries ill-prepared for COVID-19 vaccination, but they are also

currently lagging behind the vaccination goal even as the continent is heading towards a possible third wave. Figs. 2-5 show the vaccination time series of some of the top COVID-19-vaccinated African countries. The shaded area above and below the diagonal indicates a 95 % confidence interval on the fitted values. There are large differences in the rate of vaccinations over time in African countries. These differences can also be explained amongst others by the country’s access to the vaccines and the hesitancy of the vaccines. Fig. 2 shows a positive steep linear trend of people fully vaccinated per hundred in Malawi, and from March 21st to June 27th there is a non-linear decrease in the daily vaccinations in Malawi. On the 2nd of March 2021, Nigeria received its first batch of 3.9 million doses of AstraZeneca through the COVAX global sharing program. The country started rationing the doses received and Fig. 2 reflects the rationing of the doses by showing the disjointed/non-continuous curve of the total people vaccinated over time. In April 2021, the Nigerian government instructed its states to halt giving the first vaccine doses and this is reflected by the sharp decline in the number of daily vaccinations as depicted in Fig. 3 Morocco is amongst the leading countries in the COVID-19 vaccination drive in Africa and Fig. 4 indicates a gentle steeped curve indicating positive increases in the number of people fully vaccinated per hundred and total vaccinations in Morocco, however, there was a decrease in the recorded daily vaccines from the 4th of April to the 25th of April 2021. As illustrated by Fig. 5, South Africa started administering COVID-19 vaccines on the 17th February 2021. There were less than 10,000 daily administered vaccines until around the 2nd of May 2021. This slow progression can be attributed to around 1 million AstraZeneca/Oxford vaccines that were put on hold due to their ineffectiveness to the new COVID-19 variant.

Before the full roll-out of the COVID-19 vaccine, there were concerns on which vaccine could reach Africa first. Even before the Pfizer vaccine’s availability, a host of high-income countries have signed a purchase agreement with Pfizer to purchase millions of doses of the vaccine. However, as clearly highlighted above, some African countries are still waiting for COVID-19 vaccines, while developed nations are already well-covered by the first half of 2021. Apart from challenges related to storage temperature, funding, and infrastructure, producing enough vaccines to meet the



Fig. 2. COVID-19 Vaccinations time series analysis for Malawi. Source: Mathieu, E., Ritchie, H., Ortiz-Ospina, E. et al.(2021) A global database of COVID-19 vaccinations. Nat Hum Behav.

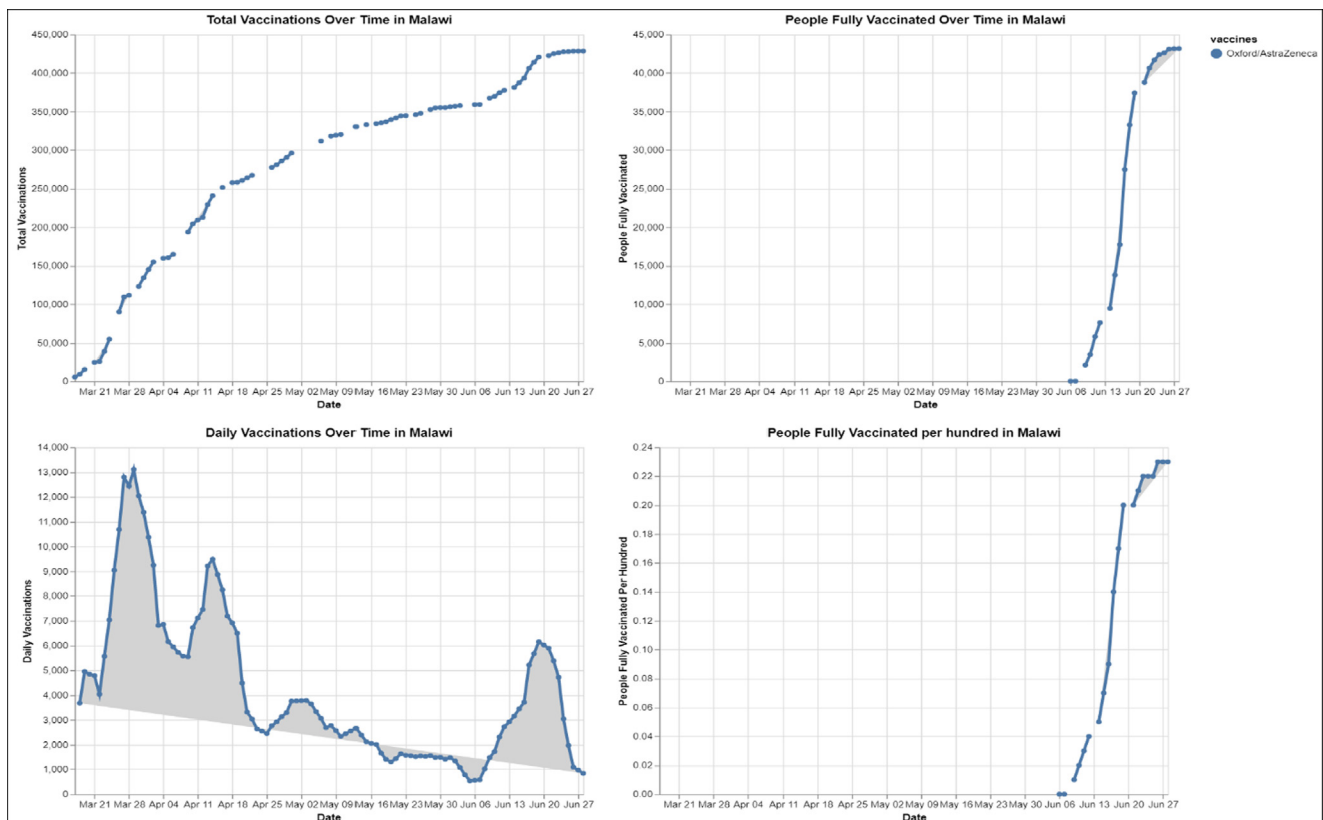


Fig. 3. COVID-19 Vaccinations time series analysis for Nigeria. Source: Mathieu, E., Ritchie, H., Ortiz-Ospina, E. et al.(2021) A global database of COVID-19 vaccinations. Nat Hum Behav.

supply needed is among the major constraints faced in Africa. Regarding ensuring equitable and widespread distribution in Africa, the vaccine by AstraZeneca and Oxford was ranked first because the actual price (USD 6–8) is apparently low and stable at standard refrigerating temperature (2–8 °C). Considering Pfizer and Moderna, the ultra-cold chain requirement for Pfizer and the very high price per dose for Pfizer (USD 39) and Moderna (USD 50–74) made them much more complicated and less accessible to low- and middle-income countries (LMICs).

2. The way forward

In periods of disease outbreaks and pandemics, public health intervention in mass vaccination is a crucial way out that requires dedicated preparedness [1]. Challenges that may hinder the continued implementation of mass vaccination campaigns, not only COVID-19 vaccinations but also yellow fever and polio etc, in Africa includes insufficiently qualified vaccinators, logistical barriers in maintaining the cold chain, limited infrastructure in local health-

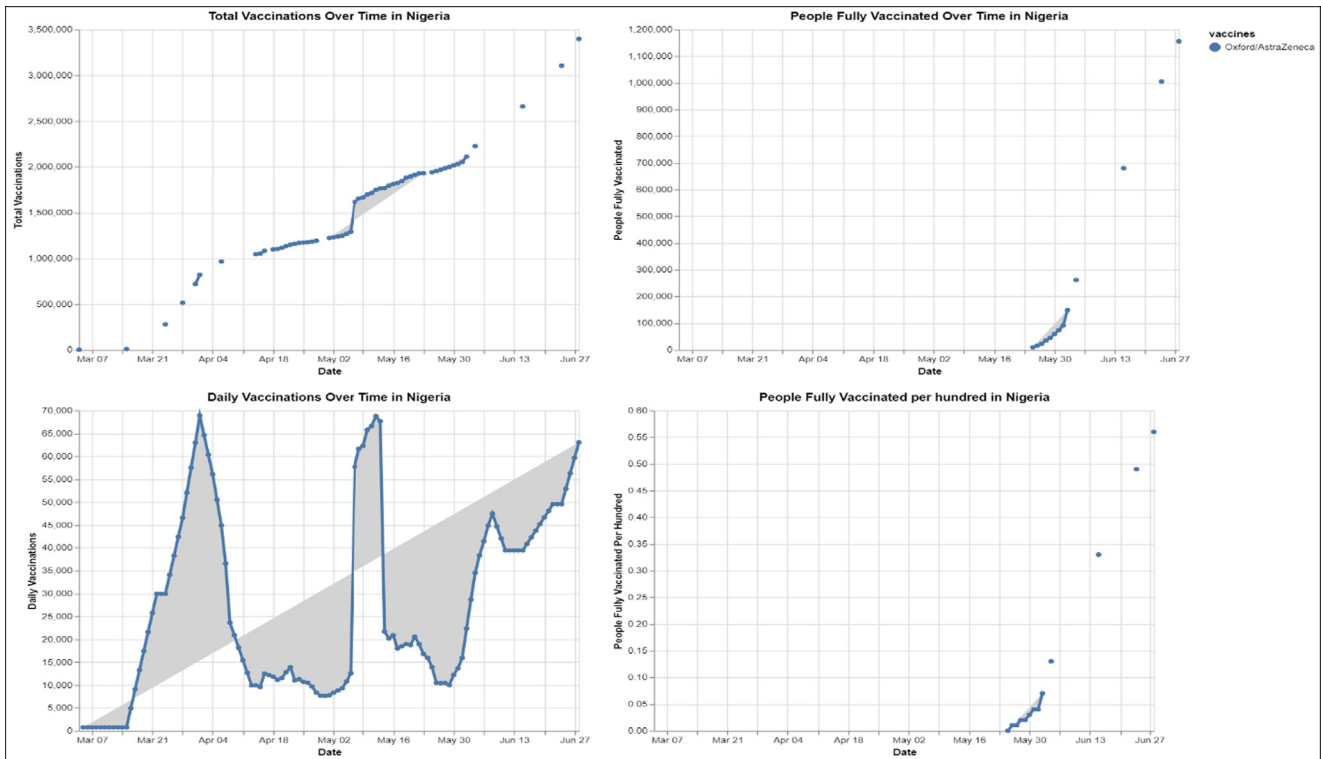


Fig. 4. COVID-19 Vaccinations time series analysis for Morocco. Source: Mathieu, E., Ritchie, H., Ortiz-Ospina, E. et al.(2021) A global database of COVID-19 vaccinations. Nat Hum Behav.

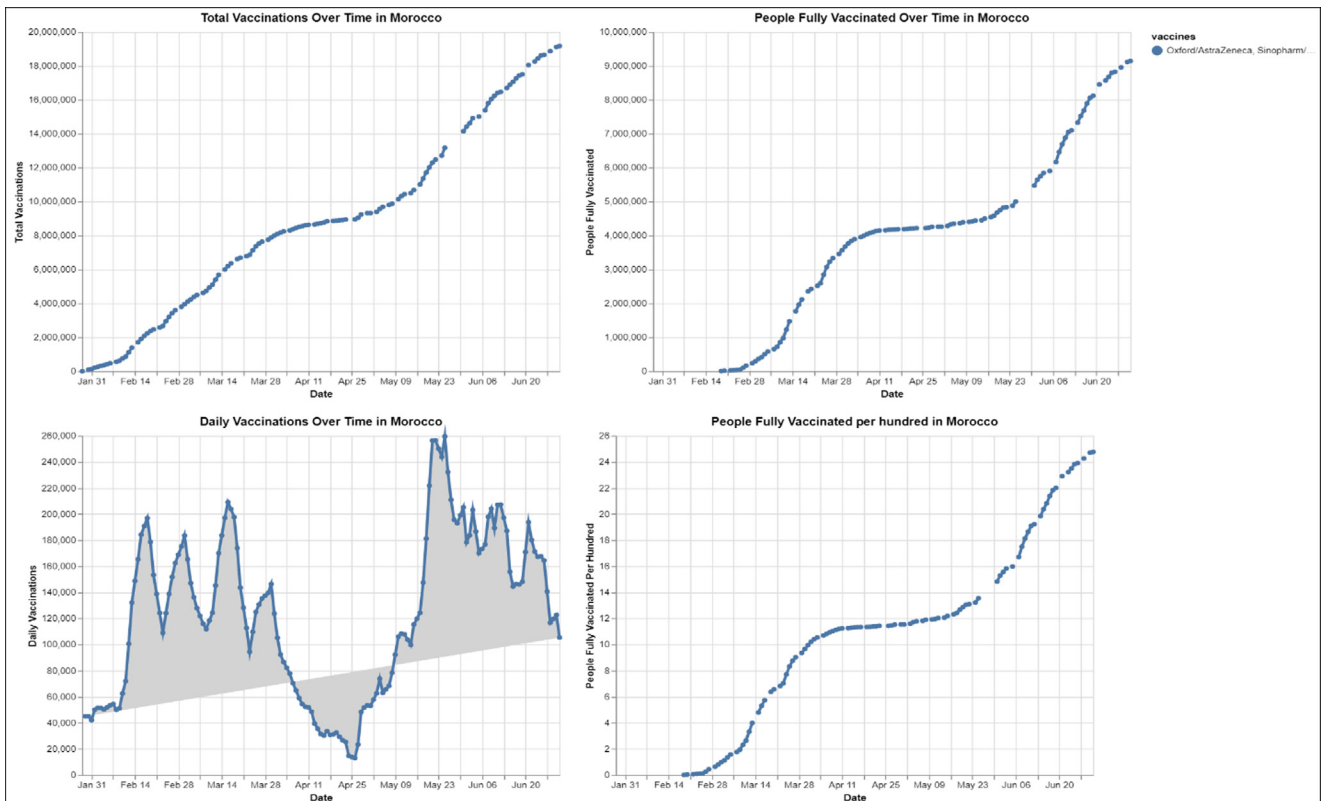


Fig. 5. COVID-19 Vaccinations times series for South Africa. Source: Mathieu, E., Ritchie, H., Ortiz-Ospina, E. et al.(2021) A global database of COVID-19 vaccinations. Nat Hum Behav.

care centers, and operational challenges in addressing high-risk and overall populations. Nevertheless, if some key factors such as the inability to coordinate campaigns due to insufficient infrastructure, access to supplies of infrastructure-aligned vaccines, money for vaccine purchases, and availability of vaccines that African governments failed to fulfill in advance (before vaccine roll-out) can be implemented, we envisage a successful COVID-19 vaccination campaign in Africa.

COVID-19 vaccination in Africa should continue to engage a diverse population and audience through traditional and social media platforms. Owing to the high level of illiteracy in Africa, the vaccination awareness campaign should be strategic, cutting across every organ of society in order to avoid high rates of vaccination rejections. Channel of sensitization should focus more on places of worship (churches, mosques, temples, and synagogues), through religious leaders, educational institutions through their administrative heads, and local communities via the chairman, youth, and women leaders. It is crucial that anti-COVID-19 vaccine information is countered, and social media can also be a powerful tool in achieving this aim [8]. Counteracting unverified facts will help prevent the normalization of dangerous ideas by uninformed and uneducated individuals, as well as curb the spread of conspiracy theories that the COVID-19 vaccine will be used to moderate the ever-increasing global population and/or inject microchips to monitor people's daily activities [9]. Equally, identified potential interference to vaccine acceptance should be addressed proactively using culturally and linguistically competent communication strategies focused on involving social influencers, targeting misinformation, and carrying out grassroots sensitization [1]. Failure to curtail the spread of such fringe notions and dangerous myths will give room to sporadic vaccine hesitancy that will undermine the mass vaccination campaign in Africa and the rest of the world.

Lessons learned from Africa have shown that personnel qualification, point of dispensing (POD), documentation, and cold-chain requirements are critical operational needs for a successful mass vaccination program [10–11]. The vaccination PODs need vaccinators with specific licenses and training. Without a doubt, these specific qualifications have limited the number of workforces available to administer the vaccine, leading to increased patient volume in vaccination PODs. Therefore, efforts should also focus on carrying out vaccination training for nurses, immunization staff, and public health personnel. A curriculum for short courses for vaccine administration should be developed. Doing so will unburden POD operations with high staff demand, as well as increase the rate of vaccine coverage. Furthermore, appropriate policies and legislation should be introduced to expand the eligibility to administer a vaccine that will allow dentists and medical technicians to serve as vaccinators, particularly in rural areas.

Previous mass vaccination programs in Africa points out that accessing high-risk and vulnerable population at the grassroots is also one of the leading constraints. Efforts should actively identify major barriers in engaging vulnerable populations, including internally displaced people, people with disabilities, refugees, and the elderly. POD locations should be appropriately publicized, and populations should be educated about vaccination procedures and vaccine risks. Drive-through POD is an alternative way of improving vaccination coverage; however, this may also present additional challenges due to poor road and transportation networks across Africa [12]. Incorporating health incentives such as; bed nets, multivitamins, and deworming capsules into the COVID-19 mass vaccination program can also be a good way of meeting the grassroots populations' neglected needs. The inclusion of these incentives will not only increase vaccine acceptance but also reassure people as well as increase their confidence that the government wants what is best for their communities. In addition, establishing a strong partnership with the local community, volun-

teer groups, and humanitarian and philanthropic organizations will help foster trusted relationships with vulnerable communities and help respond to the specific needs of the vulnerable populations.

The current pandemic has exacerbated economic stagnation in Africa [13]. Efforts which entail purchasing and maintaining equipment, recruiting additional personnel, facilitating training, supplying inventories, and conducting community outreach, will demand massive funding support. However, if the needed financial support for this is obtained, guidance should be provided on how the funds could be used appropriately in purchasing vaccines and supplies for public health responders and recruits in training. As cases of new COVID-19 strains are arising and vaccine supplies from the COVAX gradually dipping due to waves in other countries, it is becoming increasingly important that COVAX and ACT promote the equity in COVID-19 distribution [14]. This will help reduce the hindered geographical production of the COVID-19 vaccine in African nations. At the same time, high-income countries (HICs) and donor organizations should continue donating COVID-19 vaccines to Africa, although this capacity is now stretched. Other avenues for funding vaccines should be explored. For example, only five African countries have met the key requirements of the special funding deal that offers 400 million doses of the Johnson and Johnson vaccine. Other countries are largely reluctant to borrow funds for COVID-19 vaccines. There is an acknowledged need to scale up resources to ensuring vaccination coverage in all regions of African.

3. Conclusion

Africa stands at a critical juncture. The COVID-19 pandemic offers an opportunity to rethink the condition of the public health infrastructure of Africa, a sector of systemic neglect in the last few decades. Our past observations have shown that vaccines become available in LMICs many years after being deployed in high-income countries. Again, this has happened with the COVID-19 vaccine, as a timely and equitable vaccination is yet to be achieved. Nevertheless, scaling up mass vaccination operations is a challenge for Africa. Each country has a unique requirement, and an effective implementation strategy in one country may not be successful in another country [14]. For this reason, efforts toward effective and successful vaccination should also focus on understanding the population's concerns in Africa and the bottlenecks around COVID-19 vaccine deployment and sustainable solutions to overcome them. Equally, shared responsibility and strong collaboration with governmental and non-governmental agencies, civil societies, and community organizations will play a critical role in addressing these challenges [15,16]. Whilst Africa's COVID-19 vaccination rate is still far from satisfactory, we still anticipate a successful mass vaccination campaign in Africa.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability

No data was used for the research described in the article.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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