**COVID-19 Vaccine Wastage in Africa: A case of Nigeria**

**COVID-19 Vaccine Wastage in Africa**

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**Abstract**

The World Health Organization (WHO) has launched campaigns to boost immunization rates to 70 percent globally by the middle of 2022. However, despite the global success of about 64% COVID-19 vaccination coverage, there is a big gap in Nigeria. To date, only 13.8% of the population has received the recommended dose. This demonstrates a significant disparity between the vaccinated and the unvaccinated. Amidst the wide gap in vaccination, COVID-19 vaccine wastage still occurs in Nigeria. At the end of 2021, it was estimated that over a million doses of the COVID-19 vaccine had been wasted. It is anticipated that there will be more COVID-19 vaccine wastage in Nigeria, because of the combined factors that threaten vaccination uptake including vaccine hesitancy, lack of appropriate storage facilities, poor electricity supply, insecurity challenges, and inadequate health promotion. This results in concomitant financial and opportunity losses. In this paper, we discuss COVID-19 vaccine wastage in Nigeria including causes, and solutions that can be applied to mitigate this wastage.

**Keywords**: COVID-19, Vaccine, Wastage, Waste, Nigeria

**Highlights**

* The COVID-19 pandemic has brought economic and health challenges across the globe
* As the world prepares for a post-COVID world, countries are striving to vaccinate their citizens to achieve herd immunity
* Amidst this, COVID-19 vaccines are being wasted
* Vaccine wastage can threaten economic recovery and undermine the healthcare system

**Introduction**

The index case of COVID-19 was reported in Nigeria on 27 February 2020, and this quickly spread to all 36 states of the Federation. By the end of September 2022, about 265,382 confirmed cases had been reported in the country, with 3,155 deaths and 258,381 discharged cases.1 While various national governments lead and coordinated pandemic response activities to contain the virus, the global surge of COVID-19 sparked a rush to create an effective vaccine that can protect people from the rapidly mutating virus.

After the initial COVID-19 vaccine was developed in 2020, more pharmaceutical companies produced COVID-19 vaccines with distinct mechanisms of action. Although the World Health Organization (WHO) rolled out campaigns to increase immunization rates globally to 70% by the middle of 2022, as of 1 October 2022, 12.7 billion shots of the COVID-19 vaccine had been administered.1 As a voluntary collaborative effort to share innovation, COVID-19 vaccine manufacturing output reached 11.2 billion doses in 2021 which resulted in vaccinating half of the world’s population (55.3%) within a year.2 With the potential to further scale up the manufacture of COVID vaccine to meet the global demand, and the dose sharing of COVAX by HICS gaining momentum to reach those who have not yet been vaccinated, we are dismayed that vaccines are being wasted. We are concerned about the ongoing global waste of these life-saving therapeutics.

There has been an estimated 30% of COVID-19 vaccine wastage globally.4 Despite the small allocation of these vaccines among low- and middle-income countries, these life - saving therapeutics continue to be wasted in Africa, adding to the global burden of COVID-19 vaccine waste. In countries such as Malawi, South Sudan, Liberia, Mauritania, Gambia, Sierra Leone, Guinea, Comoros, and the Democratic Republic of Congo, up to 450,000 vaccines expired due to delays in the shipment.3 More wastage is likely to be reported due to the recent stall in vaccination rates around the world, especially in Africa where there is residual doubt about the effectiveness of these vaccinations.4 One million doses of AstraZeneca vaccines were wasted in Nigeria in December 2021. This wastage was attributed to the vaccine’s short shelf life combined with the country's enormous amount of vaccines supplied via COVAX that were already close to expiring.5 With the global vaccination of more than 5.35 billion people worldwide (69% of the world population) and a stark gap between vaccination programs in different countries, wastage must be avoided.6

While these vaccines are the cornerstone for COVID-19 pandemic mitigation, a strategy for fair global distribution that reduces vaccine wastage is crucial for maximizing the effects of vaccination.7 Though COVID-19 vaccines have been made available for more than a year, only about 21.2% of the African population have received the recommended doses of the vaccine, with Nigerians accounting for 13.8% as of August 2022 and yet unneeded vaccine wastage is still occurring.8 Therefore, there is an urgent need for plans in Nigeria to monitor, forecast, and ultimately reduce vaccine wastage. In this paper, we discuss COVID-19 vaccine wastage in Nigeria including solutions that can be applied to mitigate this wastage.

**Causes of Vaccine Wastage**

**Mistrust, disinformation, and hesitancy-derived vaccine wastage**

Vaccine hesitancy is a major problem around the world and in many African countries. In Nigeria, inadequate community engagement, negative social media propaganda, and politicking by stakeholders fueled the mistrust even before the development of the COVID-19 vaccine. These ultimately contributed to the rejection of the COVID-19 vaccine and indirectly to vaccine wastage.9 The disbelief of the existence of Covid further endangered the already vulnerable population.. Although the need for vaccines is greater than the supply in many parts of the world, hesitance in Nigeria is proving to be the most persistent roadblock to herd immunity; as well as attaining the 70% threshold recommended by WHO.9

**Inability to Advocate for Social Change**

The anti-vaccine movement locally and globally prevented advocacy through religious outreaches, and other sociocultural platforms to promote the uptake of COVID-19 vaccination. As a consequence of a widespread anti-vaccine campaign against the COVID-19 vaccine during its rollout in Nigeria, vaccines had reached their expiration dates, contributing to vaccine wastage.9 Weak public promotion in the Nigerian context for dealing with this issue also contributed to vaccine wastage. By the end of 2021, about a million doses were wasted.5

**Societal Reluctance to be vaccinated**

There were personal biases against covid vaccination, due to the government's failure to meet the basic needs of the population. These include infrastructure, water supply, electricity distribution, motorable roads, as well as security of life and property.9 Insecurity was a major contributor to vaccine wastage. Many states in the northern parts of Nigeria experienced conflicts, disruption in COVID-19 vaccine campaigns, and underutilization of vaccine allocation leading to expiration.10

**Inadequate Power Supply**

Power supply in Nigeria declined from 3,199.37 MW to 2,400 MW in 2022. This was as a result of the collapse of the national energy grids.11 This affected the cold chain of vaccines. Without energy and the breakdown of the cold chain, it is impossible to maintain the recommended internal temperature for refrigeration of Janssen, Moderna Spikevax, and Pfizer-BioNTech vaccines at the recommended temperature of minus 90to minus 15 degrees Celsius (-90°C and -15°C).3 In the absence of nationally generated electricity, many storage facilities resorted to the use of diesel-powered generators. This alternative source of power is expensive and difficult to sustain. For example, in 2019, the percentage increase in the price of diesel was 7.49%, increasing to 8.05% in June 2021 and an all-time high of greater than 200% in July 2022.12,13 This was compounded by a projected decline in Nigeria’s economy at an average rate of 3.2% from 2022 to 2023 and a public debt of 41.6 trillion Naira ($39.69 billion).14

**Poor vaccine scheduling and supply chain**

Poor scheduling of vaccine doses and/or booster doses causes dose-skipping and wastage. The supply chain and logistics involved in the purchase, storage, and delivery of COVID-19 vaccines are quite complicated. This is exacerbated by a breakdown in the cold chain. Over 50% of African countries were unable to preserve their vaccines, leaving a significant vacuum in the cold chain network in 30% of those countries.8 Where cold chain facilities are available, ineffective transportation and distribution, as well as contamination of multiple-dose vials, all contributed to lack of access and thereby wastage.10

**Solutions and Recommendations**

The following solutions and recommendations are proffered:

**Proper inventory and tracking of vaccination**: A tracking system such as the Vaccine Tracking System (VTrckS) can be adopted in Nigeria.15,16 This is a secure, web-based information technology system that integrates the entire publicly funded vaccine supply chain from purchasing and ordering through distribution to participating state, local, and territorial health departments (referred to as ‘awardees’) and health care providers. The timely and targeted shipment of vaccines to Nigeria and other African countries may reduce wastage considering the short shelf life of the COVID-19 vaccines.

**The strategic roll-out of vaccination**: The Centre for Disease Control (CDC) recommended strategies to help reduce wastage.17 These include completing comprehensive plans and standard operating procedures (SOPs) for the administration of the COVID-19 vaccine, in addition to understanding the laws and regulations for the disposal of medical waste. The roll-out of vaccines can only be successful if simultaneous measures are implemented to reduce waste in COVID-19 vaccine storage, transport, handling, and administration per the CDC and manufacturer’s guidance.

**Utilizing solar energy-powered refrigeration**: In communities in Nigeria, where there is no electricity or where electricity is extremely unreliable, there is usually enough sunlight to provide solar power.18 This is an appropriate technology that can be used to preserve the COVID-19 vaccines. Solar-powered refrigeration has proven to be effective in the maintenance of cold chains.19 Nigeria has abundant sunlight, all year-round, to generate energy for the sole purpose of preserving these vaccines.

**Health education and grassroots advocacy**: Health education through the media and advocacy targeted towards grassroots focus groups, as well as educating religious clerics regarding the need for COVAX, are some of the ways to influence the public. It is imperative to prioritize those who have a primary health condition and are at risk of the virus within the community. The State and Local governments must develop a comprehensive strategy to boost timely vaccine uptake through vaccine promotion in the various local dialects. In addition, they should optimize the vaccination of vulnerable populations. The future direction should be advocacy for vaccine data bank units in Nigeria and throughout Africa. Advocacy should be targeted to provide insight for policymakers thereby curtailing future occurrences of wastage.

**Community-based healthcare workers**: The rate of COVID-19 vaccine wastage could be reduced by hiring healthcare workers, especially community health officers, nurses, and other qualified professionals from conflict-affected areas. They should be trained to handle and administer vaccines because they are better placed to have access to the people in their community. These healthcare workers can reach difficult terrains with minimal difficulty to vaccinate those who have a primary health condition and are at risk of the virus.

**Vaccine Outreach**: The CDC advises that providers should not miss any opportunities to vaccinate every eligible person who presents at a vaccination site17. This means they can puncture a multidose vial to administer the vaccine without having enough people available to receive each dose. In addition, health workers should vaccinate family members or friends who accompany patients to medical visits even if they are not established patients at the vaccination practice. They should also reach out to employers or other community partners that have a large membership or network to arrange vaccination events for primary or booster doses.

**Distribution Technology**: The utilization of affordable and practical technology, for example, the use of drones in Ghana. These can be used to distribute vaccines to highly volatile places within a country. Drones can also be employed to redistribute vaccines to areas of need within the community before the expiration date. Drones have been used to transport drugs to people living in difficult terrains.20,21,22 Another practical means of re-distribution of vaccines to communities is the popular tricycle called “Keke” which has been used as an ambulance in Nigeria.22

**Wastage reporting**: simple reporting and routine analysis of the amount of vaccine wasted will enable better planning by awardees. Vaccine centers will be able to determine the thresholds for the number of vials in danger of being wasted and therefore call for guidance. A better understanding of waste patterns will enable awardees to reduce the over-thawing of vaccine.

**Conclusion**

Vaccine waste can undermine economic recovery and weaken the economy and health care systems. This is especially true in economically underdeveloped countries. Reducing vaccine waste requires an understanding of the causes, consequences and solutions. In this paper, we examined the causes of vaccine waste and provided several recommendations that, if implemented, can address the problem.

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