COVID-19 vaccine equity in Africa

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The coronavirus disease 2019 (COVID-19) pandemic has dominated global health discourse since early 2020. By early 2021, the unprecedented speed of vaccine development against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by government, academia and industry contributed biotechnological tools to reduce severe COVID-19 infections, hospitalizations and deaths. However, vaccine distribution has not been equitable. We address one element of this challenge, namely the low COVID-19 vaccination rates in African countries, which lag behind higher-income nations. We evaluate key obstacles to initiatives addressing this inequity and emphasize Africa-based research and development as a sustainable solution to ensuring vaccine equity in Africa.

Keywords: Africa, COVID-19 vaccines, health equity, health services accessibility, global health, vulnerable populations

Introduction

By November 2022, only 25% of the total population on the African continent had been fully vaccinated against coronavirus disease 2019 (COVID-19) despite the fact that Africa accounts for 17% of the world’s population. Even before vaccines were marketed, this inequity was anticipated and the resolve to avert this possibility spawned at least four initiatives. A first effort endeavoured to improve access through the COVID-19 Vaccine Global Access (COVAX) of the Access to COVID-19 Tools (ACT) Accelerator, co-led by Gavi (the Vaccine Alliance), the Coalition for Epidemic Preparedness Innovations (CEPI) and the World Health Organization (WHO). Gavi announced in December 2022 that COVAX would be integrated into mainstream vaccine programs rather than maintained as an emergency program. Second, the African Vaccine Acquisition Trust (AVAT) of the African Union (AU) was formed to facilitate vaccine procurement through a partnership between the African Export–Import Bank (Afreximbank), the Africa Centres for Disease Control and Prevention (Africa CDC), the World Bank and the United Nations Children’s Fund (UNICEF). Third, the COVID-19 Technology Access Pool (C-TAP) was formed from a partnership between the Medicines Patent Pool (MPP), the Open COVID Pledge and the Tech Access Partnership (TAP), with the goal of sharing knowledge, intellectual property and data between developers of therapeutics and quality-assured manufacturers. Fourth, the Partnerships for African Vaccine Manufacturing (PAVM) was launched by the AU in April 2021 to increase local capacity to manufacture vaccines across the African continent, citing the demonstrated fickleness of international solidarity in global crises like the COVID-19 pandemic.

Despite the noble intentions that spurred the set-up of these COVID-19 vaccine equity initiatives, all of them encountered significant obstacles that hindered the realization of the desired impact of improved vaccine access and timely wide vaccination coverage in Africa. Here we evaluate these obstacles and emphasize Africa-based research and development (R&D) as a sustainable solution.

Cold chain handicaps and short shelf lives

COVID-19 vaccines based on messenger RNA (mRNA) technologies, originally thought to require temperatures of −70°C (−94°F) for stable transportation, with refrigeration at 2°C–8°C (35°F–46°F) prior to administration. These ‘cold chain’ conditions, coupled with vaccine deliveries at short notice and donated doses with short shelf lives, have presented a logistical burden on stretched health systems; many African countries lack enough costly transport and storage freezers to ensure vaccine integrity. Further study now indicates that −20°C (−4°F) is adequate for shipping and storage of mRNA vaccines, but this still represents a challenge. More forgiving cold chain properties for the live vector vaccines and even near-room temperature standards for inactivated vaccines give these products some advantages, but side effects and/or lower immunogenicity are concerns. Heterologous boosting with mRNA products could optimize their use. Lyophilization of mRNA vaccines is a goal to overcome these cold chain complexities.
Intellectual property and profit priorities

Pharmaceutical companies are typically hesitant to share technological know-how and manufacturing rights without compensation and these business considerations drive the focus of the vaccine market towards high-income nations. Moderna and Pfizer, the two largest COVID-19 mRNA vaccine manufacturers, declined to participate in C-TAP, leaving COVID-19 vaccine production for much of the world to less immunogenic inactivated vaccine producers such as India’s Serum Institute and China’s Sinopharm and Sinovac. While donor nations and companies have procured vaccines for low- and middle-income countries, the global shortfall is estimated at 10–20 billion doses.

Pledges and vaccine hoarding

As of November 2022, COVAX had shipped >1.8 billion COVID-19 vaccines to 146 participating nations. However, by November 2021, >1 y into the pandemic, none of the four largest European and North American pharmaceutical entities (AstraZeneca, Pfizer/BioNTech, Moderna and Johnson & Johnson) had sold the targeted commitment of >25% of their vaccine supply to COVAX; the G7 and Europe had donated 14% of their 1.8 billion promised doses and the USA had delivered 16% of its 1.1 billion promised doses. Some high-income countries might be seen as ‘vaccine hoarders’, purchasing enough doses to vaccinate their populations many times over with inherent vaccine wastage.

Africa-based R&D

The lack of vaccine R&D and limited manufacturing capabilities in Africa are linked to the comparatively low research output in the region, only 2% of global research output. This is due to a combination of factors, including limited R&D and manufacturing investments in Africa, members of the skilled workforce who emigrate at high rates, limited collaborations between researchers within Africa, counterproductive procurement policies, a dearth of regulatory authorities on the continent and weak intellectual property law enforcement. Vaccines manufactured in Africa include yellow fever and tetanus, whose technologies are more familiar than the complex capabilities needed for mRNA or live vector technologies that represent the most immunogenic COVID-19 vaccines.

A way forward: increased scientific collaborations with and within Africa

Sustainable solutions will involve entities both within and outside Africa. Africans need to be stakeholders in this quest for vaccine equity and not merely recipients from benevolent donors. Africans are addressing this as a compelling priority; a forthcoming report from South Africa has studied sustainable vaccine manufacturing on the continent. VacTask: South African Vaccine Manufacturing Capabilities: Key Findings and Recommendations
will be released to the public in early 2023 after its presentation to the South African government.

An exemplary collaboration is Africa’s first-ever COVID-19 mRNA vaccine technology transfer hub in South Africa, through a partnership of the WHO, COVAX and a South African consortium comprising Biovac, Afrigen Biologics and Vaccines, the South African Medical Research Council, African universities and the Africa CDC (Fig. 1). Similarly, plans by two biotechnology companies to build mRNA vaccine manufacturing facilities in Africa for the first time—the German company BioNTech in Rwanda/Senegal and the US company Moderna in Kenya—hold promise to lessen dependency on vaccine imports from Europe and North America (Fig. 1). To be sustainable, Africa needs consistent investments in infrastructure and workforce to upgrade science and manufacturing capacities, accompanied by procurement reform and regulatory harmonisation.

It is equally important to pay attention to the regulatory frameworks that must be established for successful manufacture of safe and effective vaccines. While the USA has the US Food and Drug Administration and Europe has the European Medicines Agency, Africa has only one comparable regulatory authority, the South African Health Products Regulatory Authority. Investments will be needed to build capacity and manage the new African Medicines Agency (AMA), based in Kigali, Rwanda, established in November 2021.

Continued global support for initiatives like COVAX, C-TAP and AVAT is needed to capacitate African ministries of health in their efforts to immunize the continent’s population against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The initiatives set up to bolster local production of COVID-19 vaccines are longer-term goals that will take years to fully realize (Fig. 1). However, it is imperative that we invest in these R&D and manufacturing capabilities within Africa lest we find ourselves in a similar situation when the next public health crisis occurs. Choices of which vaccines to produce in Africa are critical to avoid the dilemma that locally produced vaccines prove to be in lower demand than imported vaccines.9 Drivers within the continent, such as the H3D Drug Discovery and Development Centre’s small molecule drug discovery work,10 suggest how African capacity can aid the rest of the world. COVID-19 serves as a potent catalyst for overdue investments in R&D capacities and regulatory frameworks towards African vaccine needs. Africa’s vaccine efforts are imperative for both humanitarian concerns and global self-interest, given that the emergence of SARS-CoV-2 variants is expected in areas where viral replication persists, fuelling pandemic burdens through the ease of global travel. Lessons learned from COVID-19 vaccine capacity building in Africa can contribute to the overall effort to capacitate the African continent towards more fully meeting its acute and long-term vaccine needs for the wide swathe of vaccine-preventable infectious threats.

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References


