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Solve Delivery Challenges Today to Futureproof Africa's Vaccine Infrastructure

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Executive Summary

For the first time, the world is delivering vaccinations to adults on a global scale. As well as resounding successes with the rollout, we have seen consequential failures: the massive task of getting people vaccinated has been constrained by weak and unequal health systems, and marred by complex delivery challenges that impair countries' abilities to accelerate vaccination rates.

These challenges are most evident in Africa, where only 15 per cent of the population has been fully vaccinated even though the supply of vaccines is no longer an issue. The global vaccination rate stands at more than 56 per cent, but not enough people across Africa have the protection necessary to help the world move to a stable and manageable stage of the pandemic. Currently, only ten countries in Africa are on track to reach the World Health Organisation (WHO)'s global target of fully vaccinating 70 per cent of the population of every country by mid-2022, despite its adoption and incorporation into the Covid-19 strategies of most African countries and of the Africa Centres for Disease Control and Prevention (Africa CDC).

African countries now have steady access to vaccines: the Tony Blair Institute for Global Change (TBI) estimates that today, nearly 300 million doses are currently sitting in storage and vaccination facilities across the continent. The difficulty is no longer access, but delivery, which is constrained by logistical and distributional issues. It is essential that we understand these better and therefore are able to identify exactly why Africa has been lagging in vaccine rollout. What implications are there for health systems on the continent, preparedness for future pandemics and the rollout of new vaccines?

The challenges fall into six categories: financing gaps in vaccine delivery; health-system capacity (a shortage of health-care workers to administer and record vaccinations); low vaccine demand due to vaccine apathy and hesitancy; logistical complexities (such as cold-chain maintenance, transportation and stock monitoring); data-management issues, with systems that are not fit for purpose; and a lack of coordination of government stakeholders and donors.

To gain an in-depth understanding of how these issues are hindering the vaccine rollouts in certain African countries, we interviewed 12 representatives from relevant fields, including experts in public health and in the delivery, financing and transport of vaccines. These experts are working with the key players rolling out vaccines across the continent, from governments in East and West Africa to nongovernmental organisations and multilateral institutions. Based on these interviews, we have proposed steps to mitigate the six key delivery challenges.

How to Mitigate Vaccine-Delivery Challenges

To mitigate financing gaps in vaccine delivery ...

- Donors should cover recurrent costs, not just fixed expenditures
- African governments should identify the true cost of vaccination
- Donor countries and multilateral organisations need to increase funding for vaccine rollout in the form of grants

To mitigate health-system capacity constraints, specifically a shortage of health-care workers ...

- Use non-health-care workers at critical points of vaccination
- Prioritise investment in the health-care workforce now

To mitigate low vaccine demand ...

- Increase investment in tailored social-mobilisation campaigns
- Integrate Covid vaccination with existing health programmes
- Develop robust and flexible vaccination-campaign strategies

To mitigate logistical complexities ...

- Utilise a narrower range of suitable vaccines
- Use new vaccine-storage technology for transport to vaccine outposts
- Use alternative vaccine-carrier methods

To mitigate data-management issues ...

- Use tailored data-management systems
- Build greater political will for investment in health technology
- Allocate additional funding for data-entry staff

To mitigate lack of coordination between government stakeholders and donors ...

- Encourage a centrally led approach
- Aim for institutional capacity strengthening

Though there is no silver bullet to solve these problems overnight, the Covid-19 vaccine experience has highlighted that they are pressing, and that investment to resolve them today will pay dividends – not just in our present response to Covid-19, but in tackling other diseases, too. This moment could be an inflection point. New vaccines to protect against tuberculosis, malaria, HIV/AIDS, dengue and more will be available in the coming years, and solving delivery challenges will allow African countries to optimise vaccine-delivery infrastructure and streamline their responses to different threats in the future. Now is the time to invest in vaccinating Africa.

Introduction

Vaccinating the global population is key to achieving a state of stability in the Covid-19 pandemic. In our interconnected world, the risk of the emergence and rapid international spread of new variants of concern (VoCs) that are more transmissible and deadly than those prior remains high. The Covid-19 vaccines are the most effective tool we have to protect populations, economies and societies against the risks of Covid-19 and its variants. While most high-income countries have made significant progress towards vaccinating much of their populations, many African countries are trailing behind.

There is a wide disparity in vaccination rates between high-income countries and low-income countries: the continent of Africa has a 15 per cent vaccination rate, with another 5 per cent only partially vaccinated. By comparison, Asia has vaccinated 67 per cent of its population and Europe 65 per cent.

After more than a year of acute shortage of Covid vaccines, African countries finally have a steady supply. TBI estimates that nearly 300 million vaccines are currently sitting in storage and vaccination facilities across the continent. The critical priority now is overcoming in-continent delivery bottlenecks to get these vaccines administered as fast as possible.

Vaccination has a clear public-health value (lower morbidity and mortality) and social value (greater personal freedom) – but there are also economic benefits that provide a significant return on the investment made in vaccination campaigns. Covid-19 vaccination has helped high-income countries economically, with the growth outlook now looking positive; however, low-income countries continue to trend downwards – with a per capita GDP growth rate ten times lower than that of upper-middle-income countries. With the estimated cost of vaccinating LMICs (low- and middle-income countries) standing at \$25 billion, high-income countries would see a return of around \$4.80 for every \$1 spent delivering vaccinations to these countries. The Rand Corporation and Oxfam International estimate that high-income countries would collectively experience a \$119 billion annual drag on GDP if LMICs are not vaccinated.

There is a clear economic incentive for the equitable distribution of vaccines and for investment in their delivery. Economic modelling presented in a study supported by the International Chamber of Commerce makes a strong case for the benefits of inoculating LMICs. The authors estimate the global GDP drag could reach \$9.2 trillion, with high-income countries incurring 17 to 49 per cent of the drag depending on the scenario.

To provide countries with buffers against these economic shocks, the World Bank Group committed \$157 billion of support for emergency health operations, protecting the poorest and most vulnerable, saving jobs and building more resilient economies. This international support has primarily taken the form of

loans and low-interest financing, along with grants. The International Monetary Fund (IMF), similarly, has provided about \$170 billion in financial assistance, primarily through extensions of credit and debt-service relief.

In this paper, we focus on the vaccine delivery and administration challenges in African countries – in particular the financing of the logistics – and propose practical (and sometimes creative) enhancements to overcome these challenges. These enhancements are not proposed as a silver bullet for reaching the WHO's 70 per cent target, but rather as a course of action to incrementally increase the rate of vaccination from where it currently stands. The issues experienced in the rollout of Covid-19 vaccines are enduring, and an investment to resolve them today will pay dividends – not just in the present response to Covid-19, but in tackling future threats. New vaccines to protect against tuberculosis, malaria and Ebola will be widely available in the near future; the emphasis must now be on streamlining the vaccine-delivery infrastructure moving forward to allow countries to more quickly vaccinate a greater number of people against these diseases.

What Are the Critical Barriers to Vaccine Delivery?

The emergence of Covid-19 tested health systems immensely: particularly management of the strict maintenance protocol required across a range of different Covid-19 vaccines with different storage, temperature and transport requirements, and the necessity of prompt and speedy delivery of vaccines given shelf-life constraints.

In this paper, we outline the barriers to vaccine delivery identified through direct interviews with stakeholders, from those embedded in government helping to resolve vaccine backlogs, to people working with NGOs based in-country with experience in the delivery of vaccines and other treatments, to representatives from multilateral institutions that work in partnership with governments.

We define these challenges, set out how they impact vaccine delivery, and recommend practical solutions that can not only enhance the immediate vaccine rollout, but assist in working towards building a more robust vaccine-delivery infrastructure beyond Covid-19.

The six challenges identified are:

1. Financing gaps in vaccine delivery
2. Limited health-system capacity – shortage of health-care workers to administer and register vaccines
3. Low vaccine demand due to vaccine apathy and vaccine hesitancy
4. Logistical challenges – cold-chain maintenance, transportation and stock monitoring

5. Data-management challenges – systems not fit for purpose
6. Lack of coordination of government stakeholders and donors

Challenge 1: Financing Gaps in Vaccine Delivery

Adequate and targeted financing is essential to getting vaccines into arms across Africa. It underpins everything from the procurement of vaccines and the acquisition of critical supplies – syringes, refrigerators and freezers – to the delivery of vaccines from offshore manufacturing facilities to outposts in remote areas. But African countries have so far received only sparse funding to strengthen their health systems. Few countries have managed to allocate 15 per cent of their government budget to health as agreed in the African Union’s 2001 Abuja Declaration. Most countries have had to manage limited funds to respond to competing priorities.

With the average Covid-19 vaccination rate on the African continent sitting at just 15 per cent, increasing vaccine access and, critically, actual deployment are the central issues for Covid-19 in 2022 and beyond, with new vaccines becoming available for diseases such as malaria and tuberculosis. There are vital mechanisms and groups at the international and regional levels through which money has been funnelled to facilitate the supply and delivery of vaccines to LMICs. These mechanisms have helped to mitigate the inequity of Covid-19 vaccine access and will be important for both the remainder of this pandemic and future pandemics, so it is vital to understand their functions. In the **Annex** we outline some of the key mechanisms available for vaccine supply and distribution in Africa.

Considering the other infectious-disease concerns African countries must contend with, providing Covid-19 vaccine campaigns with sufficient resources to pursue the WHO’s 70 per cent target is not credibly an option. Understandably, governments are collaborating to pool resources and share risk across different sectors. However, several challenges have been hindering this pursuit.

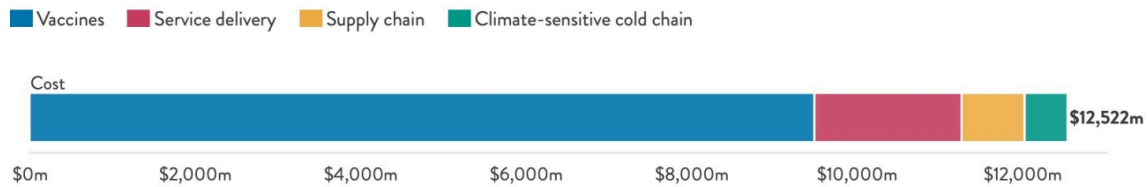
1. Insufficient funding and low estimates: Africa, and more specifically the sub-Saharan region, accounts for a significant portion of the global infectious-disease burden but allocates the least amount of resources to health care. Health-financing systems in sub-Saharan Africa are characterised by low government spending, underdeveloped insurance schemes and high dependence on external funding. Existing issues were further exposed by the emergence of Covid-19.

Using the national budget is one of the more reliable methods of financing vaccine rollout. This may be a bearable burden for high-income countries or countries not dealing with concurrent health emergencies, but for LMICs this creates a substantial dent in the available budget. Amid other development challenges and the need to allocate funding to other essential health services, this is especially challenging.

The World Bank estimates it will cost \$12.5 billion for sub-Saharan Africa to reach the WHO’s Covid-19 vaccination target of 70 per cent of the population of all countries. Of this, \$9.5 billion is required for the supply of vaccines, \$762 million for supply-chain costs, \$508 million for investment in cold-chain

infrastructure and \$1.8 billion for vaccine delivery (including salaries for vaccine-delivery staff, vaccine transport, per diem for outreach and other recurrent costs).

Figure 1 – Breakdown of cost (\$) to reach 70 per cent coverage in Africa by 2022



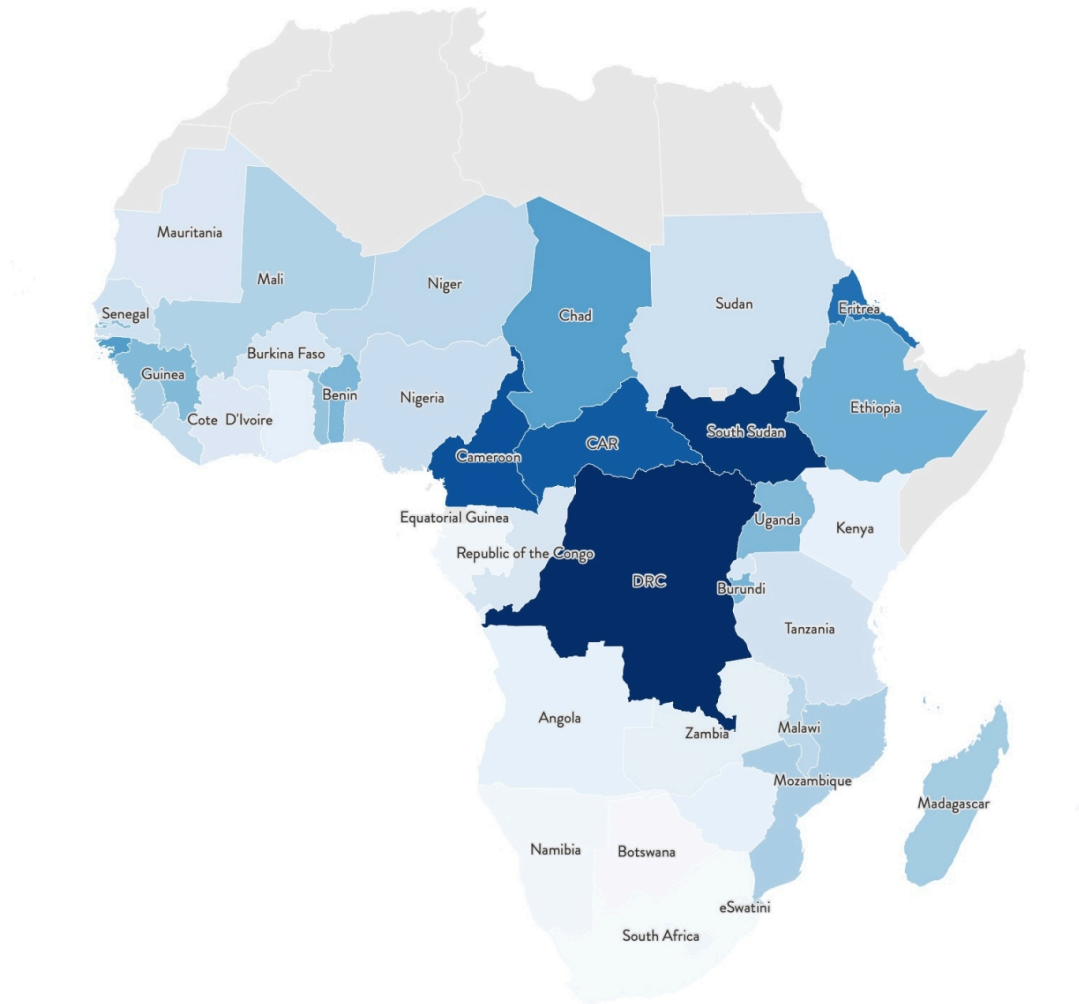
Source: [World Bank](#)

[World Bank analysis](#) shows that there is a significant financing gap. The vaccine-delivery cost amounts to approximately \$15.17 per person in the African region, with variations ranging from \$26.83 for Namibia to \$14.25 for Lesotho. [CARE International](#), an international humanitarian agency, has released real-time numbers based on current spending from [South Sudan \(\\$22\)](#) and [Zambia \(\\$17\)](#) that validate the World Bank's numbers.

In aggregate, these costs total around one-and-a-half times the average annual total health expenditure per capita of African governments. While this number varies across African countries, the amount is larger than the health budget in 25 of the 46 countries analysed (including the more populous ones) and more than double for 15 of the 46 (see Figure 2). And within these budgets, financing for Covid must compete with other priorities, including ongoing battles with malaria, yellow fever and other infectious diseases.

Figure 2 – Per capita cost of vaccination in sub-Saharan African countries as a proportion of total government health expenditure

Vaccination cost as a proportion of total government health expenditure (%) 4  513



Source: [Center For Global Development, World Bank](#)

These delivery costs apply from the receipt of the vaccine shipment to the distribution of the vaccines to the intended target population. According to a [review by the Center for Global Development and the WHO](#), the actual delivery cost is strongly associated with each vaccine’s attributes (such as its requirements for ultra-cold chain or its expiry time); the vaccination strategy adopted by the country (for instance, the target population covered); and characteristics of the local health-infrastructure system (such as the availability of trained staff).

To aid countries with their vaccination efforts in pursuit of the WHO target, the World Bank initially allocated [\\$12 billion to developing countries](#) – not just African or sub-Saharan African countries – to

finance the purchase and distribution of Covid-19 vaccines, tests and treatments. This financing was subsequently expanded to \$20 billion by the end of 2022, to be allocated among 50 LMICs, more than half of which are in Africa. It is primarily being used for the purchase of vaccines through mechanisms such as COVAX, with about 10 per cent dedicated to vaccine delivery. This \$2 billion is a fraction of the \$9 billion that the global collaboration Access to COVID-19 Tools Accelerator (ACT-A) estimates to be the minimum amount required to deliver vaccines, which itself is only a fraction of CARE's projected estimates for delivery: these range from \$40 billion to as high as \$60 billion. The inevitable shortfall will be borne by individuals on the ground.

2. The majority of support is in the form of loans: According to an analysis by CARE, 86 per cent of funding offered by the World Bank is in the form of loans, while the remaining is in the form of grants. Even though these loans carry low or no interest they put a strain on future national budgets, burdening countries that are already on a gruelling path to recover from the economic impact of Covid-19 with additional debt servicing and repayments. This is not a sustainable approach in the long term and will significantly undermine the political will and ability to invest in pandemic preparedness now, further widening inequities.

Of our 12 respondents, several mentioned that some African countries expressed an interest in seeking favourable terms for any international aid; in terms of funding from the World Bank for vaccine delivery, this would mean grants rather than loans.

3. A lack of donor funding for recurrent costs: In cases where external funding is available, donors tend to allocate it to fixed expenditure rather than recurrent costs. This unsustainable approach is pervasive in other areas of development assistance as well but has been particularly evident during vaccine efforts. One example of this phenomenon is cases where donors finance refrigerators or vehicles for vaccine delivery but do not finance the required maintenance and running of those refrigerators, or fuel for the vehicles. In addition to the form of support provided, this speaks to a larger problem relating to coordination among donors, governments and other stakeholders, which hinders the ability of countries to look ahead and build long-term, sustainable solutions that are useful beyond Covid-19.

Recommendations

- **External donors must make contributions to recurrent expenditures.** When donors provide fixed expenditures such as vehicles, make this contingent on recurrent expenditures being funded as well. Whether facilitated by donors or governments, all parties must hold each other accountable to ensure that enough funding is available to use and maintain the permanent resources.
- **African governments should identify and articulate the true cost of vaccination programmes** in their countries and incorporate this into the appropriate financial budget so that there is transparency and accountability, enabling the matching of donors who can meet the true cost. The

WHO-UNICEF Covid-19 vaccine introduction and deployment costing (CVIC) tool can be utilised to estimate the cost of vaccine deployment and enhance resource planning. It was introduced in Ghana, in collaboration with the WHO, in mid-2021 to estimate the relevant costs, and has helped with comprehensive costing and resource planning.

- **Donor countries and multilateral organisations need to increase funding for vaccine rollout and tailor the mechanism of funding for each recipient country's needs.** This means providing more grants as opposed to loans to encourage vaccine rollout without compromising long-term development. G20 countries need to deliver on commitments made and contribute their fair share to fill the ACT-A funding gap.

Challenge 2: Shortage of Health Workers

There is a shortage of health-care workers in Africa. In 2009, according to the most recent data available on the subject, there were 2.3 health-care workers for every 1,000 people in Africa versus 24.8 for every 1,000 people in the Americas. The WHO has calculated that Africa will face a shortage of 6 million health-care workers by 2030, and Covid-19 has only exacerbated this demand. At the same time, many African countries are responding to endemic diseases such as polio and yellow fever for which vaccination campaigns are already deeply integrated into the health system. With vaccination against Covid-19 now a priority, African leaders have been forced to allocate a limited number of health-care workers across a range of health priorities. This carries with it a risk of overstressing the capacity of the health system, damaging the capability to deliver even routine health services, and increasing the risk that systems will be unable to respond effectively to the re-emergence or spread of other infectious and deadly diseases.

The shortage of health-care workers is a systemic problem that cannot be resolved in this paper; however, we have identified two specific areas where incremental changes could be made to turn vaccines into vaccinations faster.

1. Vaccine administration is constrained by a limited supply of medically trained personnel. Taking health-care workers away from other essential health services and vaccination campaigns – for instance, polio and yellow fever – has been identified as carrying an opportunity cost. Anecdotal examples include health-care workers being redeployed from other immunisation programmes and essential health services, such as midwifery, to undertake Covid-19 vaccinations in Guinea Bissau, the Gambia, Kenya, Uganda and Zambia.

2. Efficient recruitment, retention, coordination and payment of the vaccination workforce is hindered by inadequate funding. Efforts have been made to use community health workers to support vaccine rollout; however, these attempts have not been scaled enough to fill the human-resource gap. Failure to pay health-care workers properly and on time has led to issues with retention, and persistent workforce strikes in African countries such as the Democratic Republic of the Congo and Kenya, as well as in other areas of the world, such as Papua New Guinea and the Philippines. The longer the pandemic goes on, the more likely this is to continue and the bigger the opportunity cost of vaccinations will be.

Recommendations

- **Use non-health-care workers to assist at critical points of the vaccination effort.** This will differ from country to country, but not all vaccinators need to be medical professionals. In some

countries, physiotherapists, student doctors and nurses, podiatrists, dietitians and occupational therapists are able to administer vaccines. On top of this, some of the most critical shortages in many African countries are of non-medical staff such as data-entry personnel and drivers to transport health-care workers. Without a support team – most of whom do not need much, if any, health-care training – the vaccinator cannot vaccinate as many people. We propose adjusting the National Deployment and Vaccination Plan for COVID-19 vaccines (NDVP)'s budget forecast to include the ratio of volunteers and non-health workers needed.

- **Prioritise investment in the health-care workforce now.** Covid-19 has highlighted that a strong health-care workforce is imperative to combatting pandemics and concurrent health emergencies or infectious diseases. For many African countries, assembling such a workforce has been a concern for decades and there is no immediate fix to this challenge. Rather, the extensive training required for this workforce necessitates a multi-year approach to capacity building. African countries need to continue to prioritise the investment and training of the health-care workforce to enable an effective response to both existing and emerging threats. This will be crucial for the inevitable rollouts of malaria, HIV/AIDS and tuberculosis vaccines to wider populations.

Challenge 3: Vaccine Hesitancy and Apathy

Despite the lack of comprehensive studies on attitudes towards Covid-19 vaccines in Africa, experts on the ground confirm that there is low demand for the vaccine across the continent. This low demand is caused by two factors: vaccine hesitancy and vaccine apathy.

Vaccine hesitancy, which is more common in high-income countries, is associated with anti-government sentiment, conspiracy theories and misinformation. In Africa this is exacerbated by:

- Challenges with specific vaccine types – for instance, despite its current widespread use, the initial pause in the AstraZeneca vaccine’s rollout previously caused hesitancy towards it
- Misinformation on the vaccine’s efficacy and possible side effects – including its supposed impact on fertility, which has specifically affected the willingness of women to be vaccinated
- An overall lack of trust in the health system and health actors, coupled with an intense and poorly controlled flow of information on Covid-19

Vaccine apathy, on the other hand, is due to the perception of vaccination as a low-priority task, a lack of understanding of the benefits of vaccines or the presence of other higher-priority daily stressors.

Respondents observed that vaccine apathy is exacerbated by:

- The low mortality rate of Covid-19 in Africa, relative to previous other endemic diseases, coupled with low testing and reporting levels has led to the perception of personal safety
- Relatively young populations and large numbers of asymptomatic cases resulting in Covid-19 not being perceived as a significant risk (a view further strengthened by the generally milder effects of the Omicron variant)
- Poor levels of awareness among the population of the benefit of Covid-19 vaccines – despite awareness of the value of childhood immunisations for other diseases
- Logistical challenges, such as reduced access due to remote locations, and domestic security issues due to political instability

Recommendations

The challenge of combatting vaccine hesitancy and apathy is extremely complex.

One approach is to **prioritise the immunisation of health-care workers and vaccine-delivery personnel**. Besides this being good practice from a public-health perspective, it will enhance confidence in the

vaccine among the general population if some of the most trusted people in their communities are seen to be vaccinated.

Another is to **participate in regional initiatives** such as the [African Union Covid-19 Vaccination Bingwa Initiative](#), which all countries should actively support. This public-private youth scheme is part of the Africa CDC's Saving Lives and Livelihoods programme, launched on World Health Day on 7 April 2022. The initiative seeks to establish a network of Covid-19 youth vaccination champions across the continent to accelerate the uptake of Covid-19 vaccination in Africa. This is particularly important given that young people constitute more than 60 per cent of the continent's population.

Additionally, **social-mobilisation campaigns** are seen as a reliable way to tackle apathy. All respondents mentioned the success that social-mobilisation campaigns are currently having with boosting demand for Covid-19 vaccines, stating that they are the most effective way to mitigate vaccine apathy and disinterest and encourage community acceptance. However, these campaigns require several critical enablers.

First, social-mobilisation campaigns need to be planned and funded in advance. These campaigns are long-term strategies that require consistent and continuous promotion in order for them to pay off. Second, social-mobilisation campaigns are expensive to set up and run, so dedicated and reliable funding for these campaigns must be made available – all respondents asserted that this is desperately needed. Third, local community leaders need to be deeply engaged in the design and running of the campaigns from their inception, in order to build trust and allow the campaigns to be tailored to individual communities.

Case Study: Considering National Immunisation Days for Adult Vaccination Against Covid-19

One form of social mobilisation that has proved successful for childhood polio vaccination is a National Immunisation Day. With the right coordination, these can be hugely effective: in 2010, for example, a massive, synchronised polio National Immunisation Day campaign was launched; coordinated across 19 countries, the campaign vaccinated nearly 85 million children against polio.

This could be a viable alternative to the current Covid-19 vaccination approach, and while not a silver bullet, it could efficiently maximise delivery and vaccinate as many people as fast as possible. This was not an option when vaccine supply was sporadic, but now that there is a reliable supply, it's a realistic possibility.

Generally, National Immunisation Days for polio are conducted in two rounds, one month apart. This format is similarly well-suited to Covid-19 vaccination and could be executed at the national or sub-national level; neighbouring countries could pitch in to supply vaccines alongside donors such as COVAX and provide health-care resources. This would enable vaccine donors (COVAX and bilateral donors) the ability to concentrate vaccines and pool resources for specific countries over precise periods of time. Similar short vaccination campaigns have been able to achieve impressive results in African countries. For example, in Ghana a five-day vaccination campaign was launched in early February 2022 with the aim of vaccinating 2.5 million people in that period.

Of course, there are some essential considerations. First, polio and Covid-19 vaccination campaigns are logistically different – since the polio vaccine is orally administered, the ancillary supplies are easier to source than the plastic stoppers, vials and needles required for Covid vaccines.

Administering Covid vaccines is more complex than administering a polio vaccine, therefore it is more difficult to expand the number of vaccinators beyond existing health-care workers. Polio vaccines are more temperature-stable and have more homogeneous storage requirements than the range of available Covid-19 vaccines. There are also data-management challenges – such as tracking who has received what vaccine and when – and opportunity costs, including the redirection of health-care workers away from other health priorities. Finally, the political will to prioritise Covid vaccination over other health priorities must be present in-country.

If a National Immunisation Day for Covid-19 is planned, the following questions should be asked:

- How will it be funded?
- Are ancillary supplies available?
- Is there sufficient storage capacity for vaccines?
- Which African countries have the WHO and Africa CDC identified as priorities?
- As an estimate, how much would a National Immunisation Day for adults cost?

Further recommendations for tackling vaccine apathy include:

1. Accurate reporting of Covid-19 cases and deaths: A [recent study](#) suggests that the underreporting of Covid-19 cases and deaths is linked to an increase in vaccine apathy and disinterest. In fact, another study on global [excess deaths](#) estimates the total to be three times the official number of Covid deaths reported and [cases to be underestimated by over 700 million](#). Fortunately, evidence suggests that timely and reliable information about Covid-19 cases and associated deaths plays a key role in achieving population-wide vaccine acceptance.

Accurate reporting of Covid-19 cases and deaths should be prioritised at the national and sub-national levels to mitigate apathy and boost understanding of why Covid-19 vaccination is still important.

2. Integrating Covid vaccination with existing health programmes and communities: Recognising the difficulties in accessing Covid-19 vaccination across many African countries and the existence of prior vaccination programmes (such as those for childhood immunisation), integration of Covid-19 vaccinations at the point of care across the health system should be considered. This could mitigate issues related to logistics as well as vaccine apathy. [CARE International](#) has seen success in integrating Covid-19 vaccines into antenatal care visits and early childhood care in Tanzania and Zambia. In addition to protecting people against Covid-19, this helps to close gender gaps in accessing health care.

3. Robust and flexible vaccination-campaign strategies: Acknowledging and accommodating communities' schedules reduces travel distance and the time people spend at vaccination centres. This includes door-to-door vaccine administration, setting up vaccination sites at schools, malls and other social gathering spaces, or using mobile vaccination units.

Challenge 4: Logistical Issues Around Vaccine Infrastructure

The catch-all term “logistical issues” was cited as one of the most significant challenges to delivering vaccines. Across African countries there are significant differences in the logistical issues faced.

Respondents grouped these issues into the following categories:

1. Sequencing and planning: Respondents noted that a lack of clarity – on when and what type of vaccines will arrive and in what quantity, and what storage requirements and shelf life each vaccine has – is what is hindering the sequencing and planning of vaccine delivery in-country, rather than a baseline lack of capacity of cold-chain storage or resources. The context of Covid-19 vaccination has made it difficult to seamlessly learn from some systems and coordination mechanisms that have been used during childhood-immunisation campaigns, both due to the volume and variety of vaccine types that are being delivered and the reluctance of people to take them. The fact that this is an adult-vaccination programme where there is significant reluctance to take the vaccine means that smooth coordination among stakeholders is required to make sure that storage for specific vaccine types is available, and that vaccines are delivered to areas where there is demand to ensure vaccines are utilised and do not go to waste.

2. Movement of vaccines: The specific movement of vaccines was noted as a challenge – including the arrival of vaccines at the airport, clearance at the border, refrigerated trucks to move from point A to point B, tracking the vaccines for stock visibility, transporting them to the sub-national level for administration and easy relay of the required information from national to sub-national level. The extent of the challenge is demonstrated by the faster progress of vaccinations in urban communities than in rural communities. One respondent highlighted that vaccination rates are higher in Nairobi than in regions of Kenya closer to the border with Somalia. Clear difficulties in moving vaccines and vaccinators from urban to rural centres have been cited as a reason for different vaccination rates between these areas.

3. Storage of vaccines: Only about 46 per cent of sub-Saharan Africa has access to electricity, with most capacity concentrated in urban areas. Combined with an erratic power supply and high temperatures in many countries, vaccine storage is a critical test, along with the number of storage facilities and the quality of equipment. Inadequate provision of storage facilities limits the ability to meet any future demand for vaccines (Covid and non-Covid) and exacerbates access difficulties for hard-to-reach rural communities as maintaining the required temperature for vaccines is difficult.

Recommendations

Ultimately, and with future preparedness in mind, system-wide infrastructure investment is needed to provide the requisite cold-chain facilities for storing current and future vaccines correctly. However, this is not a quick solution for the immediate challenge presented by Covid-19. Therefore, we outline the following considerations for mitigating these challenges in the near term:

- **Utilise a narrower range of suitable vaccines:** Some countries have received up to five different types of vaccines, all with different storage, administration, transport and shelf-life requirements. Simplifying this by assessing local capacity and infrastructure to determine the quantities and types of vaccines selected will result in a smaller range of vaccines that are more suitable for the climate of the particular country, are trusted by the population, have comparable requirements, will reduce cost, time and wastage, and will boost vaccine demand. For example, using single dose Johnson & Johnson vaccine can reduce administration cost and increase accessibility. Using the [Covid-19 vaccine toolkit](#) designed by the Center for Global Development and the WHO will aid decision-makers in their procurement decisions.
- **Use bespoke vaccine-storage technology to transport vaccines from urban centres to vaccine outposts:** For example the Ebola vaccine, which needs to be stored between -60 and -80°C, has been stored in a “super thermos” called [Arktek](#) that can hold up to 500 vaccine doses at the colder end of this range (known as ultra-cold chain) for as long as a week. The Pfizer vaccine has similar storage requirements and this technology, which was proven in a past epidemic to be a gamechanger, should be utilised to aid access to rural communities.
- **Use alternative vaccine-carrier methods:** New vaccine-carrier methods such as nasal-spray vaccines or oral thin-film delivery technology can enable storage, distribution and administration by non-health-care workers in a non-health setting. Oral thin-films are temperature stable and can be self-administered or administered by non-health-care workers, and developed and adapted for future vaccine rollouts in the areas where they are needed most. Use of such technology can spread the vaccination effort and improve the reach and speed of vaccination. While most of these mechanisms are still in their trial phases, countries should proactively engage in these developments as these technologies will be exceptionally useful in the African context. For example, as the polio vaccine is administered orally, the number of potential vaccinators can be expanded well beyond trained health-care professionals.

Challenge 5: Data-Management Systems Not Fit for Purpose

With any vaccination programme, managing who has been vaccinated, with what vaccine and when is incredibly important. There are several complexities to tackle.

1. Inputting and managing data: Paper-based systems or those heavily reliant on constant internet connection hinder swift data entry and analysis. In areas with very slow internet, intermittent signal or no internet whatsoever, offline cloud-based vaccination systems that log data when connected to the internet are gamechangers.

2. A lack of data systems that support transparency, feedback and adaptation based on changing needs: Lack of information at each vaccine site about which vaccines are available, when they are available, and who is eligible to receive them precludes effective recruitment and coordination for reaching eligible populations. Bottom-up information sharing has also been hindered due to a lack of resources for data-management tools that would enable swift communication of real-time challenges from vaccination sites and districts, and subsequent swift resolution by responsible bodies.

3. A shortage of data-management staff and composition of vaccination teams: Understaffed vaccination teams – a common occurrence – do not always have the extra capacity needed to enter data into a digital system if they also want to vaccinate everyone who has turned up that day. Digital entry has to be faster than manual to avoid staff deferring to inputting the data manually. When it is not, staff shortages can result in delays to the manually logged data being transferred to the digital system in a timely manner, causing a time lag in the population's vaccination progress, logistical difficulties with organising people to return for subsequent doses, and inconsistent reporting of vaccines administered and in stock, with knock-on effects for procurement and storage.

Recommendations

- **Tailored data-management systems:** To counter internet-access issues, African countries should seek data-management system providers or administrators with offline versions of data-management systems. While systems highly reliant on internet function well in some countries, they can present challenges in countries where internet penetration is low and power outages are common. Governments and data-technology companies should prioritise investment in offline data-management tools that are tailored to countries' contexts.
- **Enhanced political will for continued investment in end-to-end vaccine registry systems:** in several African countries, there are already existing projects underway that seek to establish cloud-based

registries, both for personal health records and medical devices and tools such as vaccines. Continued investment in these projects and enhanced political will to get them over the line will dramatically enhance future vaccine rollouts and enable clear end-to-end accounting for every vaccine procured and administered.

- **Additional funding for data-entry human resource:** ensuring one dedicated data-entry staff member for every one or two vaccination teams will enable real-time inputting of data and a greater number of people being vaccinated, as the vaccinator can concentrate their time and effort on a single task. The training for data-entry staff is also relatively easy and provides ancillary benefits through broader job and technology training. Alternatively, if this cannot be done, centralised teams of data-entry personnel should be funded to regularly collect vaccination-record books and input this data into the national electronic database.

Challenge 6: Coordination of Stakeholders and Budgets

One of the most pervasive challenges identified was stakeholder coordination. The number of stakeholders and donors jostling for space and commitment from government is overwhelming and incredibly difficult to coordinate. Through our research, we have identified some of the reasons why stakeholder coordination presents such a challenge. These include:

- 1. A lack of political will:** Financial resources have not been an issue in countries where leaders are critically engaged with the issue of Covid-19 and rank it as a priority. In cases where there is no political will, there is an under-allocation of money for the current response, inevitably followed by an underinvestment in future pandemic preparedness and likely loss of the investments that have been made throughout the Covid pandemic, such as vaccine-delivery infrastructure.
- 2. Vaccine-rollout representatives are not at the decision-making table:** At least one respondent mentioned that vaccine taskforces are often not represented at the point where financial resources are distributed, so the money that is needed to pay for the delivery of vaccines is often not allocated or under-allocated due to a lack of understanding of the scale of the issue at the decision-making stage.
- 3. A lack of coordinational breadth:** There is a need to coordinate across a much broader range of stakeholders, from private-sector actors to local civil-society groups to governments to donors. Just donors plus governments won't be enough to ensure people are vaccinated at the required speed.

Recommendations

- **A centrally led approach:** Governments leading coordination efforts can be greatly beneficial. A strong central leadership with oversight across the various stakeholders and districts is paramount to the success of national efforts such as mass vaccination. This is critical to facilitate smooth coordination across sectors and swiftly handle bottlenecks. This should be a holistic approach: vaccine taskforces, health ministries and other relevant bodies need to be at the decision-making table when money is being allocated.
- **Institutional capacity strengthening:** Strong health institutions that are underpinned by agile structures, systems and skills, are key to successful vaccination campaigns and will have long-lasting benefits that endure beyond Covid-19. TBI supports governments to develop health systems with increased capacity to ensure that they are better placed to absorb the impacts of shocks such as Covid, build back better from crises, and learn and implement the lessons of these shocks to establish sustainable infrastructure. This goes beyond country-level calls for strong regional and

institutional public-health institutions that are well equipped for a rapid and coordinated response for future diseases. This regional outlook is highlighted further in our recent publication on a new public-health order for Africa.

Implications for the WHO Global Vaccination Target

Progress towards the WHO's global target of fully vaccinating 70 per cent of the population of every country by mid-2022 has been steady across many African countries, despite the difficulties of obtaining sufficient supply and aligning the component parts for vaccine delivery. This is the aspirational North Star goal that the international community needs and that most countries continue to align their health strategies towards. However, as outlined throughout this paper, Covid vaccine rollout in Africa presents significant financing issues and human-resource challenges. In addition, concurrent infectious diseases pose a higher risk to the general population in Africa than Covid-19, and the continent's relatively young population is not particularly susceptible to severe Covid disease.

The determined focus on Covid vaccination has had knock-on effects in the African context. Our respondents mentioned new outbreaks of yellow fever in Ghana and polio in Malawi, directly attributing them to the diversion of limited resources away from these diseases and towards Covid-19; they also pointed to deeper financial distress from expanding and prioritising Covid-19 vaccination programmes. The 70 per cent WHO target made sense when vaccines were thought to provide long-term immunity, but the landscape has now changed and the target, while laudable, is probably not fit for purpose for most African countries. Continued emphasis on vaccinating the most vulnerable, and on maintaining and solidifying the infrastructure and lessons that have been learned during the Covid vaccine rollout, will ensure that the opportunity cost of vaccinating the population is not greater than the cost of Covid.

Looking beyond the 70 per cent target and based on their particular country profile and health strategies, African governments should position themselves to prioritise Covid-19 vaccinations accordingly. This may take the form of focusing on the vaccination of vulnerable or at-risk groups such as the elderly and immunocompromised, and identifying specific country targets for this. This could be appropriate when half or more of a population is under 18. Concurrently, governments should identify outcome-based targets for Covid-19 – such as a certain number of people per 1,000 being infected with Covid-19, a certain number of people per 1,000 being hospitalised with Covid-19 and a certain number of people per 1,000 dying from Covid-19.

Future Vaccines and Implications

Covid-19 has exposed the weaknesses in countries' health systems as well as more broadly in global coordination. The challenges we have identified and discussed throughout this paper have implications well beyond the Covid vaccine rollout. As a recent report from the Global Health Security Consortium (GHSC) outlines, in the coming years there will be a range of new vaccines for tuberculosis, malaria, HIV/AIDS, dengue and other diseases. As at least 10 million deaths per year are attributable to diseases with existing or forthcoming adult vaccines and preventative injectable therapies, the ability to quickly deliver these vaccines and therapies as soon as they are available to those who need them can become a positive legacy of Covid-19. However, this investment needs to be made now. Health systems have markedly improved since the start of the Covid vaccine rollout in Africa, but there is still a way to go, as evidenced by the low African vaccination rate of 15 per cent. The vaccination effort has nonetheless been significant: some countries have had to more than double their yearly health spending per capita. New investments must transcend the immediate requirements of the pandemic to enhance broader health systems and relieve the future financial burden.

We must double down and pivot these learnings for use in future response efforts. The world, and particularly African countries, must ensure that these systems remain ready and enabled to do their jobs. We must continue learning from the Covid vaccine rollout and address the identified challenges to avoid the same pitfalls in the future. As well as ensuring these systems remain ready for use, this means bolstering initiatives such as the Partnership to Accelerate Testing (PACT), the Africa Vaccine Acquisition Task Team (AVATT), the African Union's Trusted Travel Portal, the Africa Medical Supplies Platform and Partnership for African Vaccine Manufacturing, which have proven themselves to be critical in continental collaboration and the provision of "African solutions to African problems" when they were most required. While these systems were created in response to Covid, they have a significant role to play in future pandemic response.

Conclusion

Only 15 per cent of the African population has been immunised since the Covid-19 vaccine rollout began in Africa in February 2021. This is a predictable outcome given the range of obstacles faced, from vaccine supply to vaccine demand and everything in between. Some of this is to be expected as – for the first time in history – the world is delivering vaccinations to adults on a global scale.

After speaking with a range of professionals on the ground to identify the roadblocks and ways around them, we found that logistics, a shortage of health-care workers, vaccine hesitancy and apathy, weak data-management systems and a lack of stakeholder coordination were the main hurdles facing governments in Africa, and that sufficient and consistent financing is at the heart of most (if not all) of these issues.

It is often repeated that Covid-19 will not be the last pandemic we live through. This may be true, but for many African countries, the reality is that outbreaks of infectious disease – especially ones without effective vaccines – have been fixtures for decades. The difference now is that highly effective vaccines to combat many of these viruses and diseases will soon be available. However, their rollout will face the same challenges that we're seeing today with the Covid-19 vaccine, which is why solving these challenges now is opportune and will give African countries the best return on investment possible. This is a call to action for the global community: invest in the vaccine delivery systems and overcome the challenges now to realise the full potential of Covid-19 vaccines, and even more importantly in the African context, new, life-saving vaccines for endemic and epidemic diseases.

The Covid-19 vaccine experience has highlighted that these vaccine-delivery challenges are enduring and that investment to resolve them today will pay dividends in our present response and well into the future. It is an inflection point. If the world, and African nations cannot prioritise investment in these critical people and systems, the momentum will disappear, we will revert to the status quo of early 2020, and the sacrifice and investments that have been made by so many will be lost.

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Annex: Key Players in Financing African Vaccine Delivery

Access to Covid-19 Tools Accelerator (ACT-A) The Access to COVID-19 Tools Accelerator (ACT-A) is a WHO partnership to coordinate the development of tools to fight the pandemic. ACT-A comprises four pillars: diagnostics, treatment, vaccines (also known as COVAX) and health-systems strengthening.

It is currently looking to raise an additional \$17 billion (for a total of \$23.8 billion) to end the pandemic, of which \$6.8 billion is slated for the actual delivery of vaccines. While this aim is a good start, it remains far short of the IMF's proposal for \$35 billion of grantor funding. Even this moderate goal looks difficult at this point, with only six countries meeting what ACT-A estimated to be their fair share contributions for the 2020–2021 budget.

COVAX COVAX is the vaccines pillar of ACT-A and is co-led by Gavi, the Coalition for Epidemic Preparedness Innovations (CEPI) and the WHO, alongside key delivery partner UNICEF. Its aim is to accelerate the development and manufacture of Covid-19 vaccines, and to guarantee fair and equitable access for every country in the world. COVAX aims to offer:

- Doses for at least 20 per cent of countries' populations
- A diverse and actively managed portfolio of vaccines
- Vaccines delivered as soon as they are available
- An end the acute phase of the pandemic
- The rebuilding of economies

Since the inception of COVAX in early 2020, it has delivered over 1.3 billion vaccines to 144 countries.

The United Nations Children's Fund (UNICEF)

The [United Nations Children's Fund \(UNICEF\)](#) is supporting delivery in the largest vaccine-supply operation ever. Essentially, UNICEF works with manufacturers and other partners to procure Covid-19 vaccines, as well as freight, logistics and storage.

UNICEF also procures and transports supplies such as syringes, safety boxes for their disposal, and cold-chain equipment such as vaccine refrigerators and freezers.

Furthermore, UNICEF has also been working on community engagement in many countries to combat vaccine hesitancy and create awareness on Covid-19 and the necessity of vaccinations.

Primarily UNICEF is working to ensure that all countries and territories participating in COVAX have equitable access to COVID-19 vaccines.

World Bank

The World Bank is a key source of financing in the global push to vaccinate 70 per cent of the world's population against Covid-19. Many actors point to this as the funding that will cover any additional delivery needs for Covid-19 vaccines that national governments cannot meet. With \$5.8 billion in funding already approved out of a \$20 billion commitment, the World Bank funding is an important part of the picture.

The World Bank has committed [\\$108 billion to help countries recover](#) from the health, economic and social impacts of Covid-19.

The World Bank Group committed \$157 billion of support for emergency health operations, aimed at protecting the poorest and most vulnerable, [saving jobs and building more resilient economies](#). This international support has primarily been in the form of loans and low-interest financing, along with grants. The International Monetary Fund (IMF) has similarly provided about [\\$170 billion in financial assistance](#) primarily through [extensions of credit](#) along with debt-service relief.

African Vaccine Acquisition Trust (AVAT)

To ensure widespread access to Covid-19 vaccines across Africa, the African Union (AU) launched the African Vaccine Acquisition Trust (AVAT). The trust aims to secure vaccine doses to complement initiatives such as COVAX and attain a target of 60 per cent immunisation for Africa's population.

Afreximbank, in partnership with the AU, provided advance procurement commitment guarantees of up to \$2 billion for the AU to purchase Covid-19 vaccine doses on behalf of its member states.

**Bilateral
donations**

Dose donations from one country direct to another have been an important source of supply while sources such as COVAX and AVAT were ramping up. To date, millions of vaccines have been provided to African countries through bilateral arrangements, although the majority of donations, up until December 2021, were ad hoc and provided with little notice and with short shelf lives, which exacerbated the logistical burden on vaccine-delivery systems.

In Africa, there is a strong commitment to continuing collaboration with donor countries, vaccine manufacturers and partners to work towards achieving Africa's vaccination goals.

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