

Transformations driving sustainability and impact

The case of integrated supply chains for HIV-related health technologies





Table of contents

Overview	3
Summary of Findings	8
Country Case Studies	10
■ Brazil	11
Background	11
Systems Innovation and Structural Design	12
Political Leadership and Commitment	13
Transformation in Action	13
Financing	15
Capacity Building	15
■ Ethiopia	16
Background	16
Systems Innovation and Structural Design	17
Political Leadership and Commitment	18
Transformation in Action	18
Financing	19
Capacity Building	19
■ Nigeria	20
Background	20
Systems Innovation and Structural Design	21
Political Leadership and Commitment	22
Transformation in Action	23
Financing	24
Capacity Building	25
■ Zambia	26
Background	26
Systems Innovation and Structural Design	27
Political Leadership and Commitment	28
Transformation in Action	29
Financing	29
Capacity Building	30
Lessons and Recommendations	31
References	33

Overview



The world has made significant progress in expanding services and solutions for people and communities affected by the HIV pandemic. Despite this progress, the HIV response faces several barriers and challenges to achieving the goal of ending AIDS as a public health threat by 2030. By the end of 2024, 31.6 million people were accessing antiretroviral therapy (ART) globally (1). The availability of ART has been the major game-changer in the effort to achieve epidemic control, and procurement and supply chain management (PSCM) systems¹ are the backbone of effective HIV service delivery. These ensure timely, cost-effective sourcing, storage, transportation and delivery of HIV-related health products—such as medicines, diagnostics and other medical supplies—while maintaining quality, transparency and efficiency throughout the entire supply chain. However, funding overall remains heavily dependent on external sources, although governments are playing a significant role in

every country. The countries most affected by HIV rely on imported HIV-related health products, despite the fact that governments are the largest purchasers of HIV products globally (44%, or US\$ 1.3 billion), followed by the Global Fund to Fight AIDS, Tuberculosis and Malaria (31%) (2), and the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) (24%) (2). National health supply chains are a key component of effective health systems and are especially important for the sustainability of the HIV response, particularly as resources decline (3). To sustain the supply of HIV-related products, many countries prioritized investments in building resilient and integrated national supply chain systems with the assistance of partners (4).

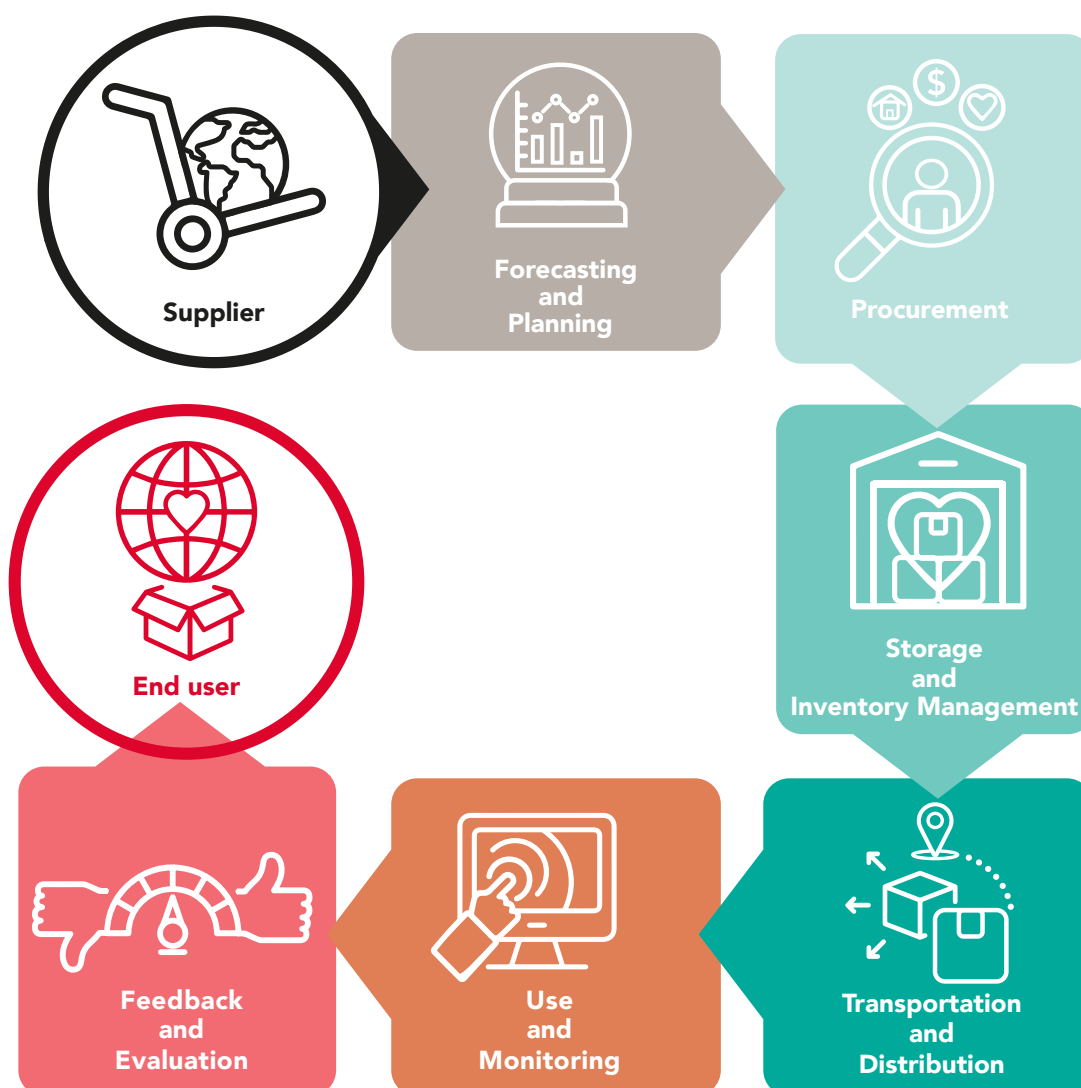
Early in the HIV response, national PSCM structures were largely underdeveloped, limiting functions to mass drug administration. Many countries had some form of central medical stores or vertical programme logistics systems pre-HIV,

¹ Procurement and supply chain management (PSCM) systems refer to the coordinated processes, tools and structures involved in acquiring goods and services and managing their movement from suppliers to end-users.

especially for TB, immunization and family planning. During the past two decades, global initiatives and investments have supported integrated supply chains for health services. A one size fits all approach cannot be used for reforming and transforming national health supply chains, particularly in the context of diversified African health systems (5). Strategies for achieving universal health coverage (UHC)—including health supply chain reforms—must be adapted to local contexts and national dialogues. Therefore, countries are employing various strategies to tailor systems to their context, while improving the health system’s performance by building on existing investments and leveraging multiplicity and integration strategies. Reforming and integrating the management of supply chain systems require planning, governance and regulation, Capacity Building and the establishment of and adherence to standards and procedures to be effective. Strengthening integrated supply chain systems is a complex, long-term undertaking requiring sound systems thinking, robust diagnostics and planning capabilities, and effective coordination and follow-up as systems evolve (6).

Supply chain management is a continuum, for all health products, including HIV-related products, and encompasses several stages requiring defined and strong local leadership and technical roles for a range of stakeholders.

■ **Figure 1. Schematic of the PSCM continuum**



Sources: USAID (7)

Figure 1 is compiled from several international policy frameworks and guidance, which in turn shape country-level health and HIV supply chain management by defining a robust and mature system (7). The United States Agency for International Development (USAID), developed and used such robust supply chain frameworks and systems that cover the full life cycle of HIV-related health products—from forecasting to last-mile delivery (8). The United Nations Children’s Fund (UNICEF) also developed the Supply Chain Maturity Model to help countries and partners assess, develop and improve the performance and capabilities of their supply chain systems. It supports the strengthening of health supply chains, ensuring reliable access to essential medicines and health products, including HIV-related products (7). Countries have used these global frameworks as a baseline to identify gaps that need to be addressed in strengthening national PSCM (9). The World Health Organization (WHO) recommends strengthening integrated supply chain systems by focusing on improving country owned and managed national and subnational systems to deliver integrated health services for universal health coverage(UHC) (10). Four key strategies for strengthening health-care systems include: avoiding duplication in infrastructure, expertise and experience; building on existing systems; recognizing and utilizing the private sector; and operationalizing the health system strengthening (HSS) perspective.

International partners have assisted in contextualizing various aspects of this continuum in national systems to achieve the goal of a sustainable, unified, government-led supply chain system. For instance, the USAID Global Health Supply Chain Program: Procurement and Supply Management (GHSC-PSM) project has provided technical assistance, Capacity Building and procurement support for many countries (4). GHSC-PSM supported supply chain and procurement activities for a broad range of health products, including for the treatment of HIV, TB, malaria and sexual and reproductive health issues. Five core functional areas were covered: logistics and integrated supply chain management; procurement management; freight forwarding management; supplier compliance; and client relationship management. Jointly,

these functional areas help implement the vision of making global commerce work better and import/export activities easier, with less risk and greater cost-effectiveness. The Global Fund invests approximately \$2 billion annually—about half of the Global Fund’s total investments—mainly in procuring medicines and health products, including for HIV. This underscores the centrality of supply chain systems in accelerating and scaling the HIV response (11). As awareness of systemic risks and the importance of supply chains has grown, UNAIDS and WHO jointly issued a report entitled Technical guidance note for Global Fund HIV proposals: access to medicines and health technologies and strengthening the pharmaceutical sector component of health systems strengthening funding requests, which covered supply chain topics such as quantification, forecasting, logistics management and transportation. (12). Following the 2025 US funding cuts, UNAIDS published a report on the impact of the cuts on HIV commodity availability and management risks (13). In this report, addressed supply chain management issues, including recommendations for mitigating the risk of stock-outs, delivery delays and the importance of procurement coordination.

Sustaining the HIV response requires integrated systems, strong country leadership, streamlined support and structural transformations that align policies, services and supply chains to ensure resilience and long-term continuity amid complexity and uncertainty globally

”

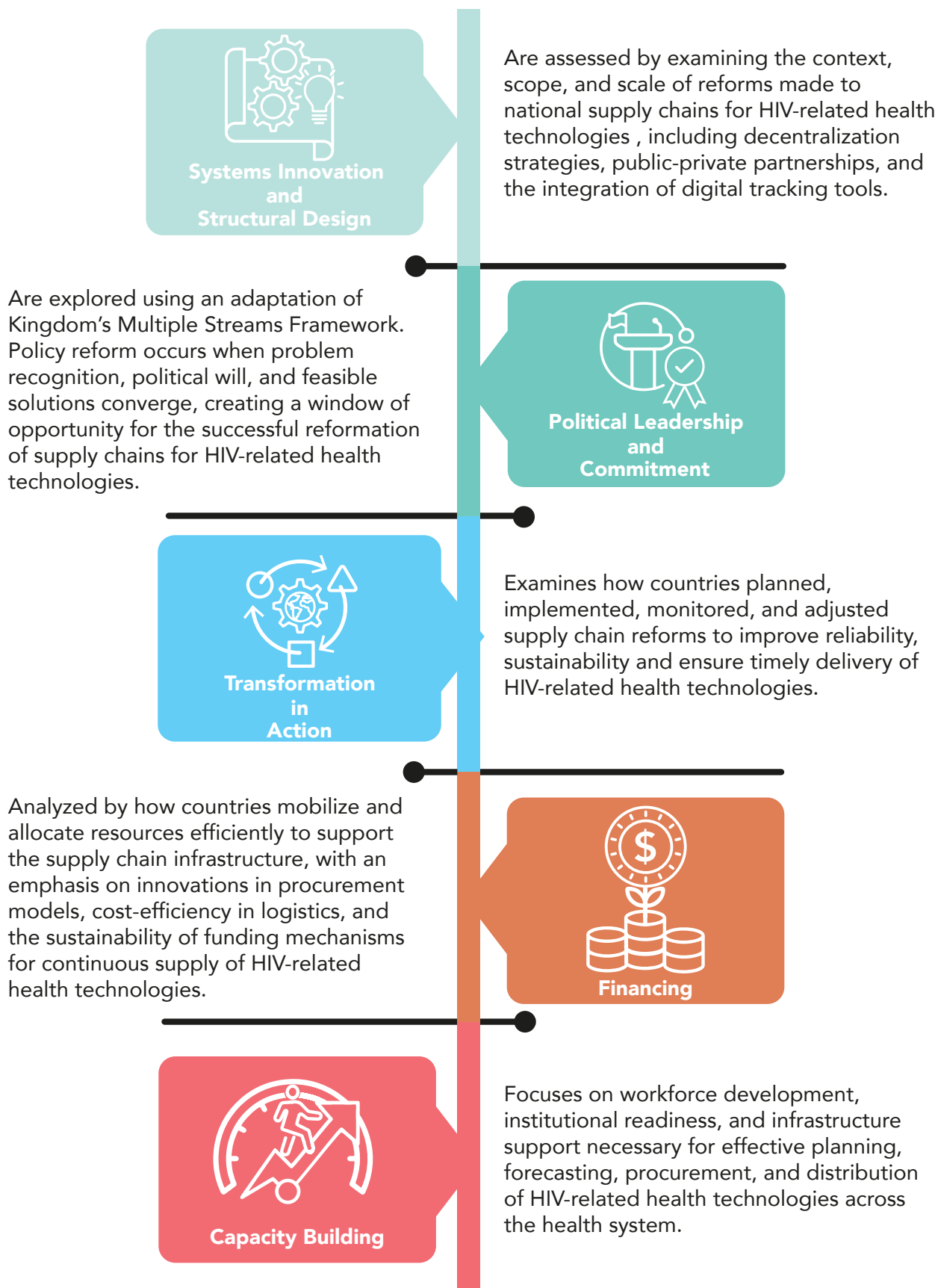
Over the past decade, investments in HIV health product supply chains have focused on enhancing procurement, distribution and operational agility. Yet, many countries still lack mature, integrated systems as envisioned by WHO's Integrated Supply Chain approach. Limited understanding of how to adapt to increasing complexity, digitalization and evolving regulations continues to hinder progress. To close remaining prevention, diagnostics and treatment gaps and ensure long-term programmatic and financial sustainability—especially amid declining external assistance—greater investment is needed to leverage community-based systems, align supply chains with national strategies and preserve the gains of past multitiered investments (6).

UNAIDS, with partners, developed a new HIV response sustainability approach with the primary aim of securing the future of the HIV response. For this to be realized, the existing HIV response also must be transformed. These transformations require clear, well-crafted steps towards stronger health systems, better integration of services, stronger country ownership and more streamlined external support. At the same time, transformations must contribute towards UHC, gender equality, human rights and better financing. The UNAIDS HIV response sustainability primer and related guidance outline a transformation in the HIV response as intentional, structural shifts across policy, programmes, financing, systems and services so that the gains of the HIV response can be sustained into and beyond 2030. This goes beyond incremental change to re-imagining how services, systems and financing operate for long-term sustainability. An important aspect of transforming HIV response is moving from siloed and parallel structures to a full integration of HIV services, policies and supply chains with national health and social systems. This includes shifting from external, donor-centred, short term models towards country-led and owned models with sustainable local capacity and domestic financing, and with an emphasis on rights-based, people-centred approaches that ensure equity of access (14, 15).

As countries pursue transformations in their HIV response, this series of case studies aims to aggregate country examples of the kinds of transformations envisaged by the HIV response sustainability approach. This report looks at valuable lessons across various epidemic, income and health system contexts in the integration of procurement and supply management of HIV-related health technologies. Brazil, Ethiopia, Nigeria and Zambia were selected as examples of countries that have undertaken sound and promising transformations of various parts of their HIV responses. It should be noted that these case studies are in no way representative of the totality of reforms needed, though they are examples and offer lessons learnt as countries work on transforming their HIV responses.

There are many examples of transformations in countries as related to supply chain integration. To ensure relevance, diversity and analytical depth, the following criteria were used to select the case studies. First, supply chain integration maturity, looking at centralized versus decentralized models in various stages of changes and recent evidence of reforms or innovations. Second, a conducive policy environment and alignment with UNAIDS, WHO, or Global Fund frameworks and recommendations. Third, availability of data publicly and willingness of national stakeholders to provide documentation. Finally, there was an attempt to provide geographical diversity, particularly the inclusion of countries outside the African context. The case studies are structured to look at some key ingredients, considerations and opportunities for transformational change in the HIV response, as extracted from scientific publications, reports and websites of governments and think tanks. The five core components of the HIV response sustainability framework was the backdrop the synthesis of evidence obtained from different sources in this report along five practical elements (Figure 2) (15).

■ **Figure 2. Five elements in the methodology for analysing integrating supply chains for HIV-related health technologies**



Summary of Findings



The analysis of the countries underscores the need for context-specific strategies that leverage existing strengths while addressing systemic gaps, rather than relying on a one size fits all approach and uniform solutions. The experience of various countries demonstrates that integrated supply chains for HIV-related health technologies can successfully transition HIV responses from donor dependence to more domestically owned and managed systems when certain conditions are met. It must be noted that there are not many publicly-cited, country-specific assessments or evaluations of the maturity of integrated supply chains. Some key findings are outlined below:

- **Collaboration with stakeholders is essential.** While governments provide vision and oversight, formal mechanisms for multilevel collaboration are critical. Community-led organisations are vital to resilient, people-centred supply chains, using their proximity to clients and early detection of problems to keep systems strong. Engaging the private sector is also key, as industry leaders may bring valuable expertise in building sustainable, public health-oriented supply chains.

- **Sustainable transformations require investment in Capacity Building, re-tooling and upskilling.** Operationalizing integrated supply chain systems from an HSS perspective requires skilled human resources. This makes it imperative for there to be investment in training, technical assistance and building the capacity of national health systems to manage their own supply chains effectively.

- **Political commitment to financing HIV-related health technologies is key.** One of the main barriers to integrated supply chains in countries is the fragmented and donor owned, led and managed structures, which are often disease specific. A single government-led system that manages the entire supply chain is important for the sustainability of HIV-related health technologies.

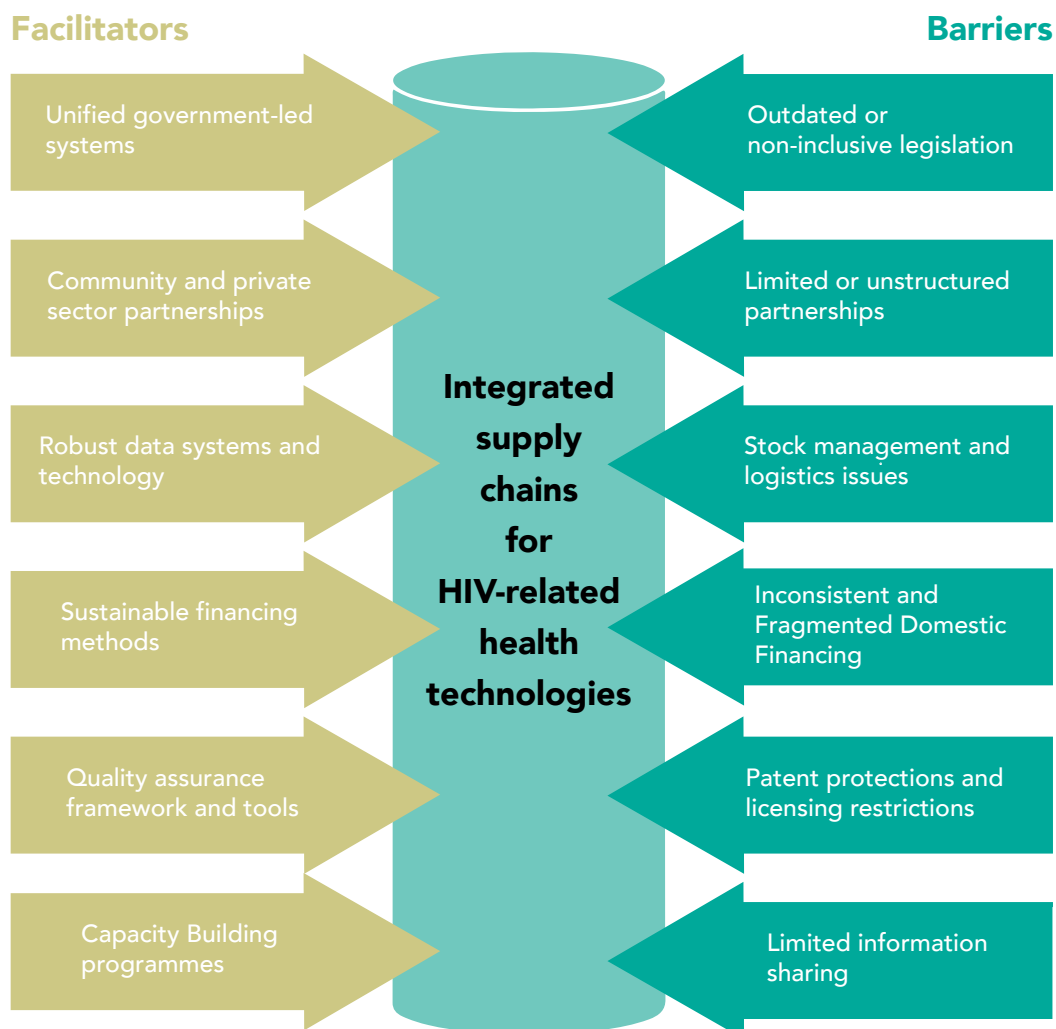
- **Need for updated legislation.** In many countries, outdated laws fail to address the complexities of procurement of health technologies, including the HIV-related products. Strengthening national supply chains requires legislation that ensures transparent forecasting, procurement, quality assurance and storage, while also regulating pricing, distribution and

enabling strategic partnerships with private sector and community stakeholders. This impacts the availability, accessibility, acceptability and affordability of essential HIV-related health products across the PSCM continuum.

● **Countries need to leverage digitalization and technology.** Many health information systems remain outdated, hindering accurate forecasting and increasing the risk of stockouts. Leveraging technology to modernize supply chain processes improves visibility, efficiency and coordination. Integrating data across systems enables real-time monitoring of inventory, transport and performance indicators—fostering a more agile and responsive supply chain. Yet, many countries have yet to adopt and implement these advanced digital tools.

The synthesis of findings across case study countries revealed a complex interplay of facilitators and barriers influencing the performance of national integrated health supply chains (Figure 3). Key facilitators included strong political commitment for a unified government-led system, and the integration of digital tools for robust data systems and technology. These elements were consistently associated with improved forecasting accuracy and reduced stockouts. Conversely, barriers such as fragmented structures and lack of coordination, limited and inconsistent domestic financing and inconsistent regulatory enforcement undermined system efficiency and sustainability. In several contexts, the lack of skilled human resources and weak interagency coordination further compounded operational challenges.

■ **Figure 3. Key facilitators and barriers for integrating supply chains for HIV products**





Country Case Studies



Brasil

Nigeria

Ethiopia

Zambia

Brazil

Background

Since Brazil's first HIV cases in 1982, the country's HIV response has evolved significantly. Early efforts included São Paulo State's local health programmes (1983) and a national AIDS programme (1986). Civil society, such as Grupo Pela VDDA, played a key role in expanding early support. In 1990, Brazil established a Unified Health System (SUS), reinforcing universal access to care. The Brazilian 'AIDS Policy' was introduced in 1992, followed by the 1998 National Medicines Policy (Política Nacional de Medicamentos), which governs procurement and supply chains. In 1995, Brazil was one of the first countries to begin local production of antiretrovirals (ARVs), helping reduce costs and increase access. In 1996, Brazil was the first middle-income country to launch a free and universal antiretroviral therapy (ART) programme for people with low CD4 counts and formed a technical group to align its programme with WHO guidance and recommendations. However, with an estimated 1 100 000 [1 000 000–1 200 000] people living with HIV in Brazil in 2024, and only 73% [66–78%] having access to treatment, there is still a significant gap in treatment coverage (16).

Brazil differs from many countries by managing its own tenders and contracts through its public health system, rather than relying on external agencies. Over time, Brazil added newer ARVs, such as tenofovir, efavirenz and some fixed dose combinations, but still relies heavily on imports from originator companies and generics from India. In 2007, Brazil issued a compulsory licence to import generic efavirenz, showcasing its use of flexibilities in terms of the World Trade Organization's Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement. Despite higher ARV costs tied to its middle-income status, Brazil's 'model' has advanced universal access through universal free treatment, local production and price negotiations. However, structural and market challenges still hinder timely, cost-effective ARV importation, threatening the long-term sustainability of its HIV



response (17). Challenges include lack of transparency from originator companies and in pricing negotiations, which limits Brazil's ability to secure fair and affordable prices for ARVs, especially for newer HIV products. There are also funding and budget constraints, despite being publicly funded, and financial limitations, which complicate large-scale purchases, especially for costly patented medications (18). Additionally, challenges with coordination across the health system, data management and national/subnational price negotiations exist (19, 20). Overall, Brazil's experience highlights the importance of integrated planning, domestic manufacturing, strategic policy-making and legislative frameworks in sustaining its HIV response.

■ Systems Innovation and Structural Design

The Brazil model emphasized universal access, local production, decentralized management, community involvement and institutional coordination—offering a precedent for sustainable, equitable HIV supply chain integration. Brazil's early HIV supply chain transformation was driven by strong political, legal and institutional frameworks, supported by a rights-based approach and a decentralized governance model. Four main facilitators of the early transformations stood out:

- **Constitutional and legal foundation.**

Brazil's 1988 Constitution recognized health as a universal right and State responsibility. In 1996, a law guaranteed free and universal access to ART through the Unified Health System (SUS) (21, 22, 23).

- **Decentralized and locally responsive**

system. Decentralized procurement in Brazil, enabled through SUS, improved responsiveness to local HIV needs and enhanced commodity availability at subnational levels. While the 1996 law guaranteed free and universal access to antiretroviral therapy (ART), the federal government retained responsibility for centralized procurement and distribution of ARVs to states and municipalities. SUS allowed states and municipalities to tailor strategies, supported by conditional funding transfers and accountability mechanisms. This approach addressed geographical challenges, promoted community engagement and integrated HIV services into broader health systems. A national logistics system further strengthened forecasting and procurement at local levels. (22, 23, 24, 25).

- **Integrated and multifaceted approach.**

Brazil fostered local production of medicines, enforced stringent regulatory oversight through the Brazilian Health Regulatory Agency (ANVISA) and involved national laboratories for quality assurance. Procurement was consolidated into large lots and regionalized to ensure equitable access. Civil society and people living with HIV were involved in decision-making processes. Health professionals received continuous training, and procurement staff were supported by technical guidelines and regularly updated specifications (26, 27).

- **Data integrity and management.** In 2019, Brazil's HIV supply chain faced disruptions as the country's two information systems—Sistema de Controle Logístico DE Medicamentos (SICLOM) and Sistema de Controle de Exames Laboratoriais (SISCEL)—underwent integration and management changes, leading to data delays, inconsistencies and reporting gaps. The Ministry of Health responded by upgrading the systems, mandating workforce training, centralizing ARV procurement, establishing buffer stocks and enhancing transparency with civil society oversight (28, 29, 30). By 2021, these measures reduced stockouts, improved data quality and expanded multi-month ARV dispensing. There is a high degree of interoperability through integrated use for patient monitoring and surveillance. SICLOM tracks the dispensing of ART, while SISCEL records laboratory results such as viral load and CD4 counts, providing a nationally centralized view of treatment and testing (31, 32). Both systems share common demographic identifiers, enabling linkage and supporting administrative

and surveillance functions. These systems are centrally managed by the Ministry of Health and are used together for health technology assessment and monitoring. While integration exists within HIV programmes, experts recommend adopting national interoperability standards to strengthen data exchange between SICLOM, SISCEL and other health systems, enhancing Brazil's Digital Health Strategy (33). Additionally, both SICLOM and SISCEL were developed long ago; their architecture may not be optimized for modern health data standards or for integration with more recent national digital health frameworks, like the Rede Nacional de Dados em Saúde (RNDS) (34).

■ Political leadership and commitment

Brazil's approach to HIV supply chain integration is distinguished by its policy autonomy, early legislative action and political willingness to confront global pharmaceutical power (22). While many countries depended heavily on donor frameworks, Brazil advanced a strategy that leveraged legal tools and political capital to assert national control over the supply chain continuum. One of Brazil's most defining actions was its use of compulsory licencing to bypass patent restrictions—signalling to international markets and domestic institutions that public health would override profit motives. This decision was not only a procurement tactic, but a political statement about health equity (35). Brazil's rights-based policy framework made treatment access a constitutional guarantee and therefore successive governments ringfenced HIV spending from austerity cuts. This also justified large scale investments in local drug production and health infrastructure, even amid fiscal pressures (22).

There is political commitment in Brazil for digitalizing its health system as a part of a broader digital health agenda. The Brazil

Digital Health Strategy (ESD28, 2020–2028) prioritizes interoperability, integration, data exchange standards and a national health data platforms as central pillars of its vision (36). In 2023, the Secretariat of Information and Digital Health (SEIDIGI) was established within the Ministry of Health and a technical cooperation agreement was signed with the Pan American Health Organization (PAHO) to strengthen the use of health information and advance digital transformation in the SUS (37, 38). Brazil has developed the Rede Nacional de Dados em Saúde (RNDS) as the national pillar for health data, offering significant potential to support supply chain management functions, such as demand planning, monitoring, forecasting, policy decision-making and analysis of consumption patterns, waste, stockouts, and overuse—critical elements for supply chain optimization (39). However, notable challenges remain. RNDS is not designed as a Logistics Management Information System (LMIS) and there is no documented evidence that it includes built-in modules for inventory management or the technical capacity to generate dashboards or queries specific to supply chain management needs (40).

■ Transformation in action

Achieving a sustainable and cost-effective supply chain in Brazil, with the government actively promoting strategic procurement and local production to reduce dependency on external markets, was an overall goal of the reforms. Leveraging its large-scale demand, Brazil used bulk purchasing strategies to negotiate favourable procurement terms, helping to ensure a stable supply of HIV-related health technologies. To address access barriers, Brazil also introduced other health system innovations such as automated dispensing machines for pre-exposure prophylaxis (PrEP), post-exposure prophylaxis (PEP) and HIV self-tests in public transit hubs in São Paulo City alongside teleconsultation platforms and home delivery services for prescriptions, with a plan to expand to other cities in the future (41).

The monitoring and evaluation infrastructure was a critical component of strengthening the system with SICLOM, the national computerized system, recording all ART dispensing across both public and private sectors, enabling real-time stock level monitoring and procurement cost-tracking. The system has been pivotal in maintaining consistent ARV availability and in generating data to assess efficiency (42). Brazil's Ministry of Health also established structured technical and intersectoral working groups that integrated procurement officers, legal advisors, public health specialists and civil society into HIV product planning. This architecture allowed for sustained policy feedback loops, adaptation to regional needs and mitigation of logistical bottlenecks, particularly in states with lower administrative capacity. Rather than creating vertical HIV programmes, Brazil emphasized system-wide integration, using HIV as a lever to improve procurement and supply chain transparency (22).

The pace of modernization and digitalization of health and HIV supply chains in Brazil varies by programme and health-related products (36). Significant supply chain challenges persist in Brazil due to fragmentation and limited integration; for example, the Ministry of Health's Logistics Master Plan (2024–2026) indicates 'differentiated logistics for strategic inputs' and acknowledges difficulties in unifying procurement and distribution systems across the SUS (43). While the Ministry aims to modernize supply chains, its 2024–2026 Logistics Master Plan suggests varying levels of digital maturity across logistical functions—and the transition to fully digital reporting systems may not yet be uniform across all health facilities. The plan indicates ambitions to strengthen sustainability and digital governance—but does not explicitly establish a fully integrated nationwide system for real-time tracking of procurement, warehousing, distribution and facility-level consumption (43, 44).

There are opportunities to build on stat- and programme-level digitalization efforts. For instance, certain vertical programmes, such as the HIV/AIDS programme, maintain dedicated digital tools for stock management—e.g. SICLOM for antiretroviral drugs and SISLOGLAB for laboratory test kit logistics—and some states, including Bahia, have implemented business intelligence dashboards to monitor consumption, inventory and demand in real time (45, 46). Investments are also expanding across the SUS network in digital dashboards, barcode scanning and reporting tools, including e-SUS Notifica and SI-PNI, which track immunization coverage and vaccine logistics.



Brazil built a rights-based decentralized HIV supply chain supported by strong legal frameworks, local production, community involvement, and upgraded digital systems that improved data quality, interoperability, and equitable access nationwide while strengthening local responsiveness, public accountability, and long-term sustainability

■ Financing

Brazil spends considerably more today on ARVs, particularly the firstline regimen, than it did a decade ago, even though the cost of generic medicines has decreased. Its limited ability to fully benefit from global generic price reductions is influenced by several interrelated factors (47). As a middle-income country (MIC), Brazil is ineligible for donor-negotiated pricing, which restricts access to low-income countries. Patent protections on newer HIV-related products further constrain affordability and frequently delayed access to innovative HIV medicines, including long-acting injectable formulations for MICs (1). Additionally, Brazil's domestic production strategies—while aimed at self-sufficiency—often result in higher unit costs. Independent procurement policies, which operate outside global pooled mechanisms, also limit price advantages, although Brazil participates in regional pooled procurement through the PAHO Revolving Fund in specific cases (21, 48, 49).

Patent protections on newer HIV-related products further constrain affordability and frequently delayed access to innovative HIV medicines, including long-acting injectable formulations for MICs



■ Capacity Building

Brazil has a well-developed health workforce management system, but is experiencing a crisis in ensuring an adequate supply of health-care workers (50). To build the capacity of the health workforce in HIV supply chain management, the country prioritized mapping and refining health workforce needs collaboratively with stakeholders to improve supply chain performance and responsiveness in HIV service delivery (30). They then focused on strengthening skills through integrated health system approaches. Efforts include collaboratively identifying and refining workforce needs with stakeholders to improve supply chain performance, responsiveness and sustainability—particularly in HIV service delivery (51). Training and development are

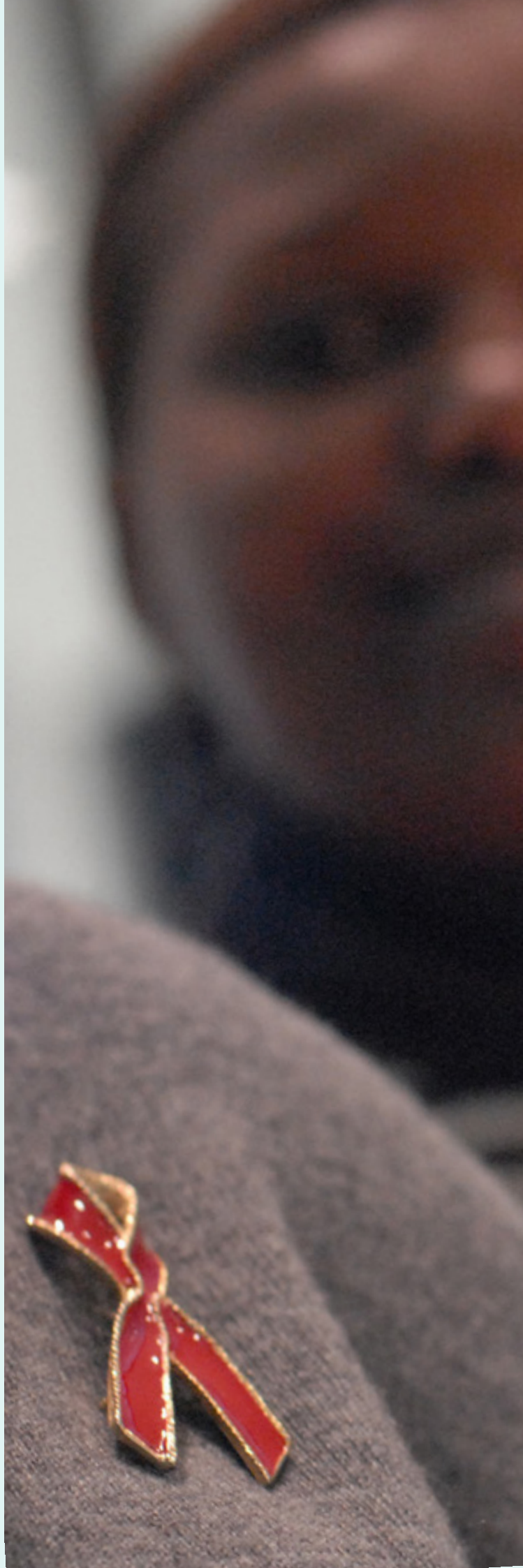
embedded within the broader health system to ensure long-term resilience and adaptability (52, 53). Brazil's public health system responded to health events like COVID-19 and improved the overall performance of the system with a strategy focused on health workforce development and how it can strengthen capacity (54). Core development priorities are identified and discussed within the context of a 'whole-of-health' systems and integrated model of health workforce development. This included framing the structure for mapping the health workforce development priorities, sharing and refining the core priorities with stakeholders and suggesting potential actions that might be taken to advance the priorities (30).

Ethiopia

■ Background

Ethiopia, one of Africa's most populous nations, reported the first HIV case was in 1984. The HIV response began with the National Policy on HIV/AIDS in 1988 and the establishment of the Federal HIV/AIDS Prevention and Control Office in 2002. In 2003, ART became available to people living with HIV on a self-payment basis, with patients paying out of pocket. Access was limited to 50 treatment sites until it was introduced in public hospitals in 2005. As a result, only 24 400 people were receiving ART out of over one million people living with HIV in 2006. Between 2010 and 2014, the government expanded ART sites to 1047 and launched reforms to strengthen the supply chain (55). By 2024, national prevalence among adults aged 15–49 fell to 0.7% [0.6–0.8%], with an estimated 600 000 [500 000–720 000] people living with HIV and efforts continuing towards UNAIDS 95–95–95 targets, achieving 94–94–97. Persistent inequalities in Ethiopia's HIV response exist, for instance the gap in ART coverage between children and adults is striking: only 41% of children living with HIV are receiving ART, compared to 91% of adults (56). This disparity underscores the need for targeted interventions to close the coverage gap and ensure equitable access to lifesaving treatment for all age groups.

Ethiopia is considered the second largest economy in East Africa and is likely to achieve middle-income country status by the end of 2025 (57). Despite this, the HIV response remains heavily dependent on international funding, with PEPFAR providing 53% of the funding in the country. The 2025 funding cuts by the U.S. Government pose a direct threat to critical components of the HIV response, particularly in the areas most reliant on external funding. This includes threatening treatment continuity and increasing the risk of new infections and drug resistance. Over 500 000 people rely on ART services across 1400 facilities, many of which depend on PEPFAR support. The cuts have reduced service capacity, halted community outreach and closed drop-in centres for women,



girls and key populations. Essential prevention services—including HIV testing, PrEP, condom distribution and education—have been scaled back. Significantly, delays in the supply of viral load and early infant diagnosis reagents, which are fully funded by PEPFAR, have undermined patient monitoring and early treatment initiation. (58).

Armed conflict in Tigray and sporadic unrest in other regions displaced populations, destroyed health infrastructure, and disrupted the supply of HIV-related products. These disruptions left many people without access to ART and essential laboratory monitoring (59). An

independent, repeated cross-sectional study conducted at a tertiary hospital in northern Ethiopia documented significant service interruptions, ART discontinuation, reduced viral load and CD4 testing and overall deterioration in HIV outcomes during the conflict compared to pre-conflict periods (60). Similarly, research across 33 rural health facilities in Tigray reported a sharp decline in patient follow-up and laboratory services during the conflict (61). Extensive damage to health facilities, rendering approximately 70% of hospitals and 83% of health centres non-functional, has also been highlighted (62, 63).

■ Systems Innovation and Structural Design

By 2006, Ethiopia had committed to providing free HIV diagnosis and treatment. To meet the resulting supply chain demands, the government—with support from partners like USAID, UNICEF and WHO—developed a comprehensive pharmaceutical logistics strategy focused on sustainability, efficiency and integration (55). Since then, Ethiopia has built a robust, nationally led logistics system that integrates HIV services into a broader health infrastructure—marked by decentralization, digitalization, Capacity Building, agility and governance reform. Key developments included the following:

- **Pharmaceutical logistics master plan.** The plan used a build, operate, transfer and optimize approach to develop infrastructure (including new warehouses), build local capacity and reform systems. Early efforts also saw the introduction of the Integrated Pharmaceutical Logistics System (IPLS) and digital tools to improve inventory tracking and data use (64).
- **Supply chain expansion.** The Pharmaceuticals Fund and Supply Agency (later renamed EPSS) was restructured with 19 regional hubs (64). Between 2005 and 2009, treatment sites grew from 25 to 412 (half in rural areas), and ART recipients increased from 24 400 to 155 000; over \$88 million worth of HIV-related products were procured (55).
- **Distribution improvements.** Infrastructure development resulted in a five-fold increase in

warehouse capacity and included the roll out of cold-chain trucks and motorbikes for last-mile delivery. Thousands of health workers were also trained in logistics management, and the national logistics system was expanded to cover HIV, TB, malaria and family planning commodities (65).

● **System integration and resilience.** Ethiopia created web-based systems for tracking commodities (later unified under a national logistics information platform). Simultaneously, there was reduced reliance on external procurement systems, such as the Supply Chain Management System (SCMS), shifting responsibility to EPSS and national staff (65). As Ethiopia scales up digital health systems such as eCHIS and the Dagu community platform, community engagement is increasing. Health Extension Workers (HEWs) can now record stock consumption digitally, feeding data into the woreda-level (i.e. district level) LMIS. This enhances the visibility of HIV test kit utilization, condom distribution and essential medicine availability. However, implementation remains in its early stages and progress varies across regions (66, 67, 68, 69).

● **Governance and policy reform.** By 2020, Ethiopia had a unified national supply chain resilient enough to avoid ART disruptions during COVID-19 (70). In 2024–2025, reforms were reinforced through a revised EPSS proclamation and a new government procurement directive (71).

The directive modernized procurement, promoted electronic systems and clarified roles across government bodies to improve accountability and efficiency (72).

● **Emergency logistics during conflict.** During the Tigray and northern Ethiopia conflict, the regular EPSS (formerly PFSA) supply chain system could not function due to blocked transport corridors, facility destruction and loss of communication systems. As a result, the government, with support from partners, shifted into an emergency logistics model. This pivot involved four major components, including establishment of temporary hub-and-spoke distribution models, partner led distribution of essential HIV health-related products, re-routing of transport corridors, leveraging humanitarian corridors, convoy-based, military-cleared routes and airlifts for certain products, with a planned and

executed restoration phase for gradual return to government-led functions after the conflict (62, 73, 74, 75, 76).

● **Health extension workers (HEWs) as a backbone PHC.** HEWs serve as core community-level supply chain actors, particularly in last-mile stock management, commodity distribution and routine data reporting (77, 78, 79). Networks of people living with HIV and other community-based organizations (CBOs) played a critical role in sustaining ART distribution, particularly during periods of crisis, including the Tigray conflict (80), the COVID-19 pandemic and other transport or security disruptions. These groups operated as Community ART Distribution Points (CADPs), monitored stock levels and reported shortages, which helped accelerate replenishment and minimize treatment interruptions (81, 82)

■ Political leadership and commitment

Over the past 18 years, Ethiopia has transformed its HIV-related procurement and supply chain systems by strengthening financing, governance, forecasting, warehousing, distribution and Capacity Building. The government shifted from a fragmented, donor-led model to nationally led systems aligned with health sector goals (55, 83). Key reforms included decentralizing procurement, introducing digital tools such as the Health Commodities Tracking System (HCTS) and Committed Demand and Supply System (CDSS), and expanding multivendor strategic sourcing (MVS) and civil society engagement, particularly around prevention of vertical transmission and key population services. Strategic plans such as the 2021–2030 PSTP-II and 2024–2034 Supply Chain Roadmap emphasized governance and workforce Capacity Building (84). Regulatory changes as recent as the 2024 EPSS Proclamation and 2025 Directive No. 1066/2025 continue to drive the transformation, including granting

EPSS autonomy and establishing a transparent, tech-enabled procurement system—bolstering domestic leadership and strengthening public–private collaboration (71, 72).

Ethiopia strengthened its supply chain and digital transformation unified systems and streamlined operations. These reforms enhanced forecasting, reduced stockouts, and increased efficiency delivering medicines



■ Transformation in action

Ethiopia's supply chain reform prioritized route optimization, resource efficiency and support for logistics-driven health programmes. Strategic planning with clearly defined roles and targets was embedded in joint government work plans. The SCMS facilitated stakeholder coordination through regular meetings, promoting shared accountability (55).

Through SCMS and GHSC-PSC collaboration, logistics data were used to make evidence-based decisions and improve warehouse and commodity management (85). Quality assurance improved via local supplier assessments and in-country testing. Facilities using the IPLS system saw better availability of medicine (86). SCMS also supported EPSS in distributing HIV-related technologies, advancing progress toward the 95–95–95 goals and enhancing overall health system resilience and sustainability.

Ethiopia's implementation of the Systems, Applications, and Products in Data Processing Suite 4 High-Performance Analytic Appliance (SAP S/4HANA) and enterprise resource planning (ERP) systems at EPSS marked a major digital transformation, replacing over 40 legacy systems with a 'control tower' model centralizing procurement, warehousing, HR, finance and distribution. This integration improved transparency, automated key processes, cut manual reporting by 95% and reduced the procure-to-pay cycle from 294 to 120 days. The system's advanced planning tools enhanced forecasting and inventory management, resulting in a 40% reduction in stockouts and better inventory turnover. Overall, the ERP upgrade significantly boosted EPSS's efficiency, responsiveness, and ability to deliver essential medicines, including HIV products (87).

Financing

By 2014, Ethiopia had significantly expanded ART coverage, but international HIV funding declined sharply—from over \$1.3 billion (2010–2012) to under \$800 million (2016–2018). This raised concerns about the sustainability of the national HIV response and highlighted the urgent need to transition to domestic financing. Historically, Ethiopia relied heavily on donor funding, particularly from PEPFAR and the Global Fund, which initially operated through parallel systems before gradually integrating with national structures (88). PEPFAR was the largest contributor, funding systems like SCMS, IPLS and HCTS, which improved efficiency and reduced per-patient costs (89). Although the Ethiopian Government contributed \$33 million in 2018, this underscored the difficulty of fully shifting financial responsibility to domestic sources (90). The 2024 EPSS Proclamation marked a major step toward sustainability by establishing EPSS as an autonomous body with a dedicated Pharmaceutical Fund to finance procurement, infrastructure and last-mile delivery—reducing dependency on external aid (71).

Capacity Building

Ethiopia's Capacity Building efforts in public health supply chain management were comprehensive, system-wide and geared toward long-term sustainability. The GHSC-PSM initiative played a key role by standardizing curricula, institutionalizing training programmes and developing a national human resources strategy for supply chain management. Over 9000 health professionals were trained in various aspects of logistics, with a strong focus on the management of HIV products (55). Specialized workshops, including advanced warehouse and distribution training facilitated by Imperial Health, equipped professionals from EPSS and SCMS with practical skills (65). To ensure sustainable local expertise, a domestic training facility with customized curricula was established, reducing reliance on international training. SCMS also adopted the build, operate, transfer, optimize model, transitioning from an activity-based to a results-driven and demand-responsive system. This included upgrading information systems for data-driven decision-making, forecasting and distribution, alongside equipping purpose-built pharmaceutical warehouses with advanced infrastructure such as cold rooms, forklifts and vertical racking. Additionally, SCMS provided 74 delivery vehicles, including 19 with mobile cold rooms, and supported more than 2000 health facilities through training, technical assistance and supportive supervision to enhance product management, data collection and reporting (55).

Nigeria

Background

Nigeria's HIV prevalence peaked at 5.8% in 2001 among adults aged 15–49; with Nigeria classified as having one of the largest epidemics in the world (91, 92). In 2018, the Nigeria AIDS Indicator and Impact Survey (NAIIS) revised the prevalence of HIV (15–49 years) to 1.3%, lowering estimates of people living with HIV to 1.9 million (93, 94). Nigeria's HIV pharmaceutical supply chain is well-established at secondary and tertiary facilities, but most primary health centres (PHCs)—despite comprising 85% of all health facilities—do not stock HIV products (95). ART services have been decentralized using a hub and spoke model since 2011. Recently, the model has evolved to support differentiated service delivery (DSD), including the distribution of HIV products. This decentralized distribution model is widely used in global supply chains and has proven to enhance efficiency, reduce costs, ensure timely delivery, and support sustainability through lower carbon emissions and stable pricing (96). Task-shifting policies were introduced in 2014 to expand service delivery, allowing lower cadres of health-care workers to provide care and treatment using differentiated ART models (97, 98). An analysis of the Health Service Delivery Indicator (SDI) data collected by the World Bank in Nigeria between 2013 and 2014 revealed that most health-care facilities did not meet the minimum standards required for effective primary health-care service delivery (99).

Since 2014, Nigeria has worked to unify its HIV supply chain into a single, government-led system supporting pooled procurement and harmonized distribution (96, 100, 101). The National Supply Chain Integration Project (NSCIP), launched in 2015, expanded integration to other health areas, including HIV, malaria, TB, vaccines and family and reproductive health (102). From 2022, Nigeria's HIV Quantification Team adopted digital tools to improve forecasting and planning (103). Despite these efforts, HIV supply chain management remains fragmented and heavily reliant on donor support (9). Barriers such as stigma, limited clinic hours, long wait



times and distance continue to hinder access to services, especially for key and vulnerable populations (104). To sustain progress and improve investment efficiency in Nigeria's HIV response, ensuring consistent access to HIV products for treatment, diagnosis and prevention is essential (105). With limited prospects for additional funding, improving efficiency through community-based and private sector delivery models offers a cost-effective opportunity to expand access and reduce the burden on public secondary and tertiary health facilities (106). There is limited publicly available evidence that Nigeria's LMIS explicitly incorporates community-based distribution. While the NSCIP blueprint identifies last-mile distribution and LMIS integration as core pillars, the approach remains largely strategic rather than operational, lacking a detailed roadmap for integrating community-based distribution points, capturing community-level stock or consumption data, or digitizing non-facility delivery points (107).

■ Systems Innovation and Structural Design

Nigeria began piloting innovative community and private sector-based distribution models for HIV services since 2013. This included private for-profit pharmacies for: ART distribution starting in 2013; community ART models for on-site treatment initiation and referral, from 2014 to 2016; and later HIV self-testing distribution with CBOs. The aim was to improve access beyond traditional public health systems for HIV-related products. With support from global and local stakeholders, the approach focused on scaling access to HIV treatment as well as prevention tools—such as PrEP, HIV self-testing (HIVST) and condoms—through a three-part strategy: education; outreach; and restocking. These models address both supply and demand barriers, enhance access to HIV services and reflect a shift toward decentralized, community-driven service delivery in Nigeria's HIV response (106).

Key initiatives included the following.

● **The private sector engagement model.**

Developed in response to overcrowding in public health facilities and other barriers to access, private for-profit pharmacies were strategically leveraged as refill points for ART. Initially piloted in Akwa Ibom, Cross River, Lagos and the Federal Capital Territory (FCT), the model was supported by PEPFAR through the Sustainable Financing Initiative (SFI). Early evaluations showed promising results, including high client satisfaction, strong retention rates and treatment outcomes comparable to those in public sector programmes. With the rollout of Nigeria's

national DSD framework, the model has been scaled to include licenced private pharmacies to be the 'spokes' in a hub-and-spoke system. These pharmacies now dispense ARVs to stable patients, provide adherence counselling, conduct follow-ups and participate in multimonth dispensing (MMD) initiatives. Importantly, this approach also contributes to sustainability by enhancing private sector partnership, in alignment with the National (Nigeria) HIV sustainability roadmap. Part A: the new business model (108, 109, 110, 111, 112, 113).

● **Community-based models.** Similarly, between 2016 and 2017, Nigeria piloted a range of community-based ART models in selected high burden states—Akwa Ibom, Benue, Cross River and Lagos—with support from PEPFAR and the Global Fund. These pilots aimed to advance the scale-up of DSD approaches by decentralizing HIV services, decongesting health facilities and improving access for underserved and key populations. The models utilized a trained community-based workforce to distribute HIV commodities, provide adherence support, conduct symptom screening and facilitate referrals. Key interventions included community ART refill groups, community ART management teams, drop-in centres, outreach and satellite events and community-to-facility referral systems. These approaches significantly improved linkage to care and treatment initiation, particularly among men, adolescents and key populations. In 2018, the Federal Ministry of Health formally adopted community ART models

into Nigeria's National HIV Treatment and Care Guidelines, integrating them into the national DSD framework. The models are also noted for nationwide scaling through the National (Nigeria) HIV sustainability roadmap—Part A: the new business model, reinforcing their role in expanding access and promoting long-term sustainability.(96, 104, 114, 115, 116, 117, 118).

● **Rural outreach model.** This is older than the private sector and community-based models. Early expansion of HIV treatment was concentrated in urban tertiary hospitals. Recognizing the urban–rural disparity in access, the rural outreach pilot programmes were launched in 2006. The pilots focused on states with high prevalence but low health service coverage—including Benue, Cross River, Nasarawa and Taraba. It brought HIV prevention, testing, treatment, and care services directly to underserved and hard to reach rural communities via mobile outreach teams targeting local institutions and offering education, free testing and counselling on-site, with growing community acceptance. Two key features of this programme included integration of HIV services with other primary health-care services and strengthening of partnerships with local community structures and rural health systems. The National HIV and AIDS strategic framework 2010–2015 adopted this model for national scale-up (119, 120, 121, 122, 123, 124, 125, 126).

Despite the progress across the various models, several challenges persist. These include the need for robust quality assurance systems, enhanced patient safety monitoring, seamless

real-time data exchange between private and public sectors, and integrating private-sector reporting and community-level consumption into national systems. Sustainable financing remains a critical concern for maintaining and sustaining continuity of services—particularly for transportation infrastructure and logistics, key components of national PSCM structures. Additionally, equity issues continue to affect rural populations, who often face limited access to facilities and services compared to urban populations.

Nigeria expanded HIV access through community and private sector distribution models, leveraging pharmacies and community actors to overcome system barriers, decentralize service delivery, address supply and scale treatment and prevention nationwide effectively

”

■ Political leadership and commitment

Nigeria's HIV treatment delivery depends largely on public secondary and tertiary level health facilities, which limits access for patients in remote areas due to the increased risk of stockouts, transportation challenges and other infrastructure issues (104). To address these gaps, there is growing support for adopting

community-based and private sector distribution models. While community-based delivery has been used historically for other health issues like malaria, it is not yet well integrated into HIV policies (113). The National HIV strategic plan 2023–2027 supports strengthening community and private sector systems through innovative, complementary service delivery models (127).

Currently, national stewardship for PSCM is shared across the Federal Ministry of Health, National Agency for the Control of AIDS (NACA) and National Primary Health Care Development Agency (NPHCDA) (128), leading forecasting, financing and distribution strategies. While procurement is centralized for ARVs, diagnostics and testing kits, it remains heavily facilitated and financed by external partners, such as the Global Fund and PEPFAR. A 2018 technical assessment identified key weaknesses in Nigeria's HIV supply chain and recommended using existing initiatives, like the Nigeria Supply Chain Integration Project and National Health Insurance Scheme, to support alternative delivery models (129). In response, the Federal Ministry of Health launched reform efforts, including forming a technical working group to develop state level HIV supply chain plans. The National Supply Chain Integration Project (NSCIP), led and initiated by the government

in 2014, sought to strengthen the management of health supply chains across multiple disease areas, including HIV, TB, malaria, reproductive health, immunization, and maternal and child health. While not explicitly endorsing community integration, the recommendations emphasized the need for accessible, safe, timely and cost-effective services closer to the communities. Integrating community and private sector models into the national supply chain could address some of the challenges noted above and improve distribution of HIV products overall and promote more equitable access to services (9). Notably, the National HIV and AIDS strategic framework (2021–2025) calls for enhancing domestic systems to “[i]ntegrate parallel procurement and supply chain systems” under the programmatic reform agenda linking it to the broader goal of the Nigeria National HIV sustainability roadmap—Part A: the new business model (109, 110, 111, 112, 113, 130, 131).

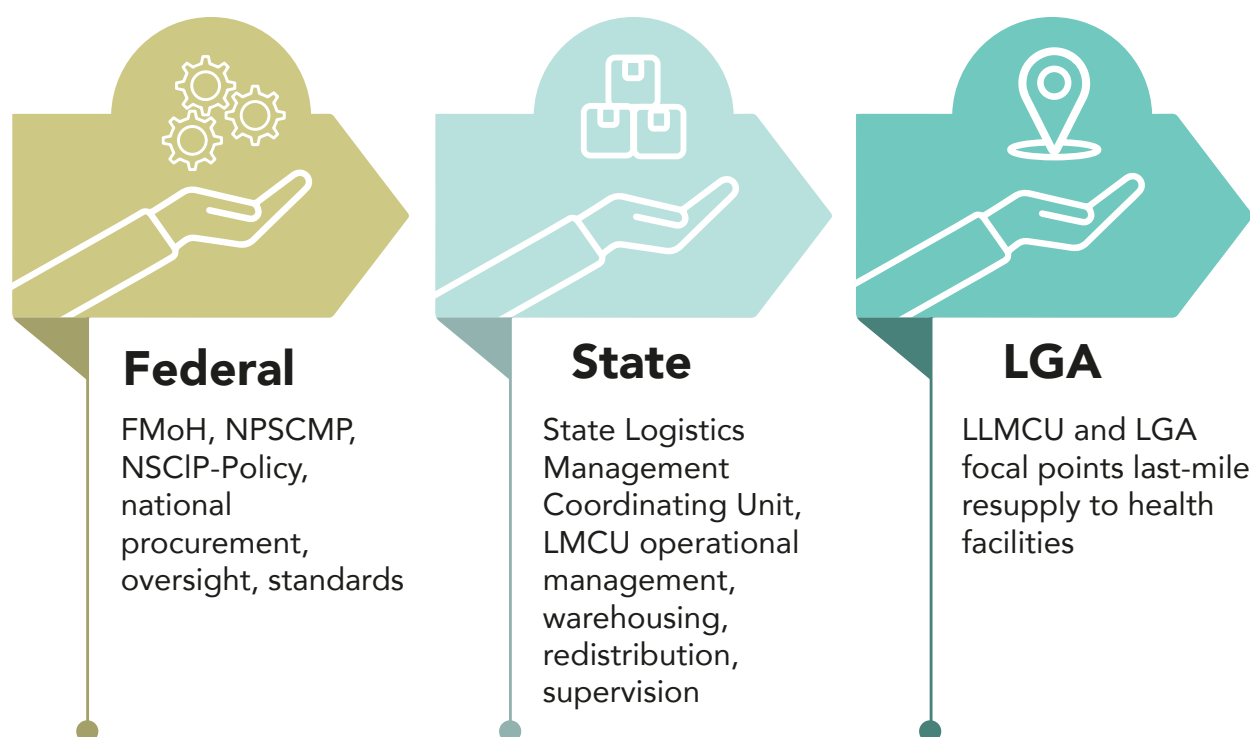
Transformation in action

A key outcome for Nigeria would be a sustainable care pathway that integrates all levels of the health system and includes roles for both community and private sector actors. Community-based and private sector HIV service delivery models are expanding, but broader adoption requires addressing existing challenges and leveraging lessons from past efforts. The hub and spoke approach aims to support a sustainable model for ensuring last-mile solutions to reach community ‘spokes’ (PHCs, pharmacies, community ART points, mobile units and satellite sites) (96). Integrating these models with government supported facilities is seen as a promising approach to ensure sustainability (104).

To support this, Nigeria developed key performance indicators (KPIs) to monitor product availability, usage at outpatient departments and the efficiency of the supply chain. A feedback mechanism tracks performance using data from production, warehousing, distribution and stakeholder interactions (129). Scaling up will require intensified state level efforts, formal support and phased planning for new partners and regions (132).

A core strategy of the NSCIP was the establishment of state level Logistics Management Coordination Units (LMCUs) as the convening and coordinating body at the state level (see Fig. 4). Real-world coordination across levels remains inconsistent, largely due to funding constraints, limited mandates and capacity at the LGA level, entrenched vertical programme silos and persistent gaps in data visibility. Addressing these challenges will require stronger political commitment, clearer accountability frameworks and harmonized systems to ensure effective implementation (192, 133).

Fig. 4 The NSCIP three-tier coordination architecture



Key to the success of the NSCIP is the integration of digital systems to enhance efficiency, accountability and improve aggregate forecasting across donors and government (135). Under this initiative, Nigeria extended its DHIS2 platform to include logistics modules, improving end to end visibility of health related stocks. With DHIS2 as a backbone for logistics and programme data integration, enabling integrated programme decision-making can become a reality (136). In addition, the quantification analytics tool (QAT) was introduced to support national forecasting and supply planning—initially for HIV related products but now applied across malaria, family planning, maternal and newborn health and other essential medicines (137). Plans included deployment of these tools to states to strengthen coordination and decision-making at the subnational levels, which would help to achieve more accessible, safe, timely and cost-effective services closer to the communities. While NSCIP has achieved significant progress in integrating digital data systems and improving supply chain performance, full integration across all disease programmes and states remains a complex, long-term undertaking requiring sustained investment and stakeholder collaboration. For instance, despite the integration goal, parallel supply chains still exist and some disease programmes (including HIV and TB) continue to use separate storage and distribution systems (138).

Financing

Government health expenditure in Nigeria remains among the lowest globally, accounting for just 0.5% of the national GDP. This translates to approximately \$14 per capita, with less than 20%—around \$2.62 per capita—allocated specifically to primary health care (PHC) (139). According to the Nigeria National AIDS Spending Assessment 2019–2021, international financing accounted for 96% of HIV expenditures in 2021, with domestic public financing at just 4% (140). The PSCM for health and HIV in Nigeria is financed by

a mix of domestic government allocations, bilateral and multilateral donor contributions and increasingly domestic private investments (131). Nigeria is the top country recipient of USAID supply chain funding, receiving \$117.4 million for Fiscal Year (FY) 2023 and FY 2024 average (141). A 2020 strategic review of the Global Fund indicated an investment of \$20 million in Nigeria to support supply chain integration (142). While historically PSCM has been largely donor financed, recent shifts indicate a move towards domestic investments. However, last mile and community level continuity continues to be the most vulnerable, particularly in the transition from partner financed pilots to national scale-up (143). In the World Bank 2024–2025 packages for Nigeria, new approvals and pipelines for local manufacturing and value chain investments are promising developments for strengthening domestic procurement capacity (139). In Nigeria, the Federal Ministry of Health provides laboratory inputs to Federal and some state health facilities; however, there is limited financing for community based programmes from government sources. HIV-related health products distributed by civil society organizations are sourced through service-level agreements with Principal Recipients of the Global Fund, or with support from other international development partners (68). Additionally, user fees or cost-sharing mechanisms have been explored as potential funding for cannabidiol (CBD) programmes. Improving budgeting and financial sustainability for HIV-related health products, particularly for prevention, is essential for increased service provision (9).

In early 2025, the Nigerian Government committed approximately \$1.07 billion to health-care sector reforms under the Human Capital Opportunities for Prosperity and Equity (HOPE) programme, alongside a (Nigerian Naira) 4.8 billion (about \$3.3 million) allocation for HIV treatment. This investment represents a significant step toward strengthening health system governance, expanding primary health-care services and safeguarding continuity of HIV treatment (144, 145). There is increasing momentum for private sector engagement through the HIV Trust Fund, signalling a shift toward shared responsibility and sustainable financing for HIV programmes. This approach aligns with national priorities to diversify funding sources and strengthen public–private partnerships in the health sector (146). Additionally, Nigeria has proposed a roadmap for transitioning from a predominantly donor-funded HIV response toward greater country ownership, integrated service delivery and financial sustainability. This two-phase plan looks at both programmatic and financial restructuring, including reforming HIV service delivery. While the new business model includes PSCM reforms as part of the programmatic restructuring, details of the transformation or the implementation plan has not yet been published.

Capacity Building

In Nigeria, indigenous non-governmental organizations (NGOs) are significant players in the implementation of many health programmes. This participation promotes country and community ownership and sustainability. Integrating a community-based model supports the long-term sustainability of health service delivery. This required strengthening government health personnel and reducing foreign oversight into these government-initiated health programmes. Proper HIV supply chain management skills are suboptimal at the

subnational and health facility levels. To close this gap, investment in training and capacity development is needed to ensure robust and capable programming and systems to manage purchasing, stock and distribution tracking and data management. The Federal Ministry of Health should adopt and distribute CBD templates to State governments and partners for oversight and sustained use (129).

Zambia

Background

Zambia has been heavily impacted by the HIV epidemic since the first reported case in 1985. In 1986, the country established the National AIDS Control Programme with a short-term emergency plan from 1988 to 1992. Zambia was one of the first countries to develop a multisectoral and decentralized response by creating provincial councils to fight the epidemic, with the establishment of the *Zambian National HIV/AIDS/STI/TB Council (NAC)* in 2002. Zambia has advanced its response, supported by HIV funding from the United States Government. Recent reductions in U.S. funding have exposed Zambia's high dependence on external HIV financing, disrupting service delivery and increasing the risk of epidemic resurgence. Strengthened sustainability and resilience planning is critical to guide the integration of HIV-related health product management and service delivery at subnational levels (147).

In 2024, an estimated 1.4 million [1.3–1.5 million] people were living with HIV/AIDS in Zambia, with an estimated adult prevalence of 9.4% [9.1–9.7%]. Zambia is close to attaining the 95–95–95 targets: 95–98–97 (148, 149). To sustain the gains, Zambia's focus is on prioritizing a minimum package for sustainable HIV testing, prevention and treatment service delivery with service integration, including integrating HIV into national PSCM system. The Integrated Pharmaceutical Logistics Management Policy and the Integrated Pharmaceutical Logistics Management Guidelines were approved in 2021 to guide pharmaceutical logistics best practices. The policy outlines guidance on logistics management and captures the overarching goal and objectives for the domestic structures, operations, workforce, funding and awards of logistics management at all levels.



■ Systems Innovation and Structural Design

In Zambia, from 2019 to 2021, the country piloted the integration of HIV-related health products into its national PSCM to improve sustainability. These reforms strengthened Zambia's ability to manage HIV products within its broader health infrastructure and addressed three major challenges:

● **Managing HIV products (non-ARV).**

The management of items such as viral load testing equipment, condoms and lubricants was improved. Procurement was centralized to reduce delays and costs, boosting diagnostic services and HIV prevention (150). To accelerate the delivery of HIV health-related products to testing laboratories, Zambia adopted strategies that minimized intermediate warehouse storage (151). A key innovation was the integration of laboratory and logistics planning, which strengthened cold-chain capacity through the use of refrigerated trucks and the establishment of regional hubs—ensuring reliable transport of laboratory reagents and controls (152). Additionally, to streamline distribution, HIV prevention products such as condoms and lubricants were integrated into the national supply chain, replacing previously separate social marketing channels (153, 154, 155). In early 2025, the system adaptability was demonstrated when, with support from the United Nations Population Fund (UNFPA), large trucks were rapidly deployed to distribute HIV products during donor funding suspensions and logistical disruptions (156). However, this also underscored the system's vulnerability to shifting donor priorities. To further expand access, Zambia is piloting digital platforms for community-level distribution of 'prevention kits'—which include HIV self-test kits, condoms, lubricants and educational materials—targeting underserved populations. This novel approach is helping to diversify and broaden the reach of prevention product portfolios.

● **Distribution and stock management.**

Zambia enhanced inventory control, decentralized supply chains to local governments and ensured last-mile delivery to reduce

stockouts (157, 158). The Zambia Medicines and Medical Supplies Agency (ZAMMSA) serves as the country's central medical stores, responsible for the procurement, storage and distribution of essential medicines and medical supplies nationwide. To optimize supply chain efficiency and improve access, ZAMMSA operates through seven regional hubs that function as strategic distribution centres (159). These hubs support over 200 service delivery points, ensuring that health facilities across Zambia receive timely and reliable access to critical health related products. The adoption of a hub and spoke distribution model, commonly used in other countries and contexts, has proven effective in addressing supply chain inconsistencies, enhancing the availability of essential medicines, and strengthening overall health-care delivery throughout the country.

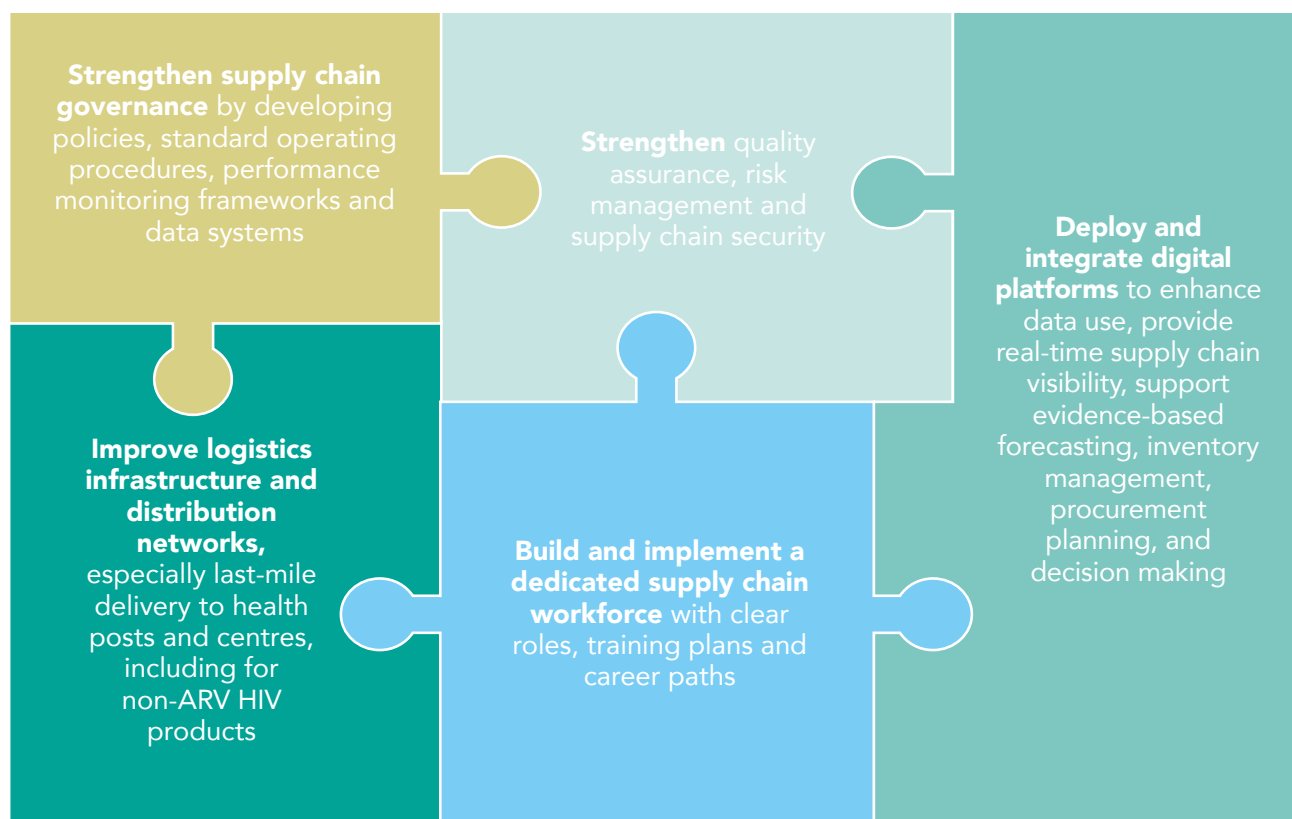
● **Digitalization of data systems.** In the past, manual and fragmented data systems led to high stockout rates. The Ministry of Health, with financing and technical support from external partners, including USAID, the Global Fund and the World Bank, introduced integrated digital tools and dashboards for better planning, accountability and real-time tracking of HIV-related medicine stock levels (160). The tools enabled improved visibility of consumption and stock data and quantification for better forecasting for ARVs, viral load (VL) reagents and other HIV health-related products. This also made it easier to plan multimonth dispensing (MMD) and stock community ART points and pharmacy spokes from nearby hubs. The implementation of the consumption anomalies detection (CAD) tool allowed for faster detection of anomalies and reduced stockouts by identifying unexpected consumption patterns or stock discrepancies before facility stockout events (161). Despite this progress, there are still challenges to overcome, including interoperability and fragmentation, with multiple systems still requiring robust integration and sustained governance to avoid siloed data. Additionally, many rural and community spokes with connectivity and capacity challenges (159).

■ Political leadership and commitment

Zambia established a strong health-related supply chain before integrating HIV services combining all HIV and non-HIV procurements under one entity (162, 163). Successful integration relied on full support from the Ministry of Health, donors and partners, achieved through extensive stakeholder engagement and a clear understanding of the political and operational contexts. For HIV non-drug technologies, Zambia created a policy framework outlining roles, forecasting, procurement, logistics, monitoring and resource mobilization, with operationalizing this framework and addressing challenges remaining a top priority (164, 165).

In 2024, a study in Zambia examined its integrating national supply chain along 11 functional areas of effective supply chains (159). The assessment used a capability maturity model (CMM) and KPIs at the national and subnational levels. The assessment found that while foundational elements are in place, it is still well below optimal capability, particularly at the subnational levels. A number of priority areas for investment and strengthening emerged, including:

■ Fig. 5 Priority areas identified for investment and strengthening



Strengthen supply chain governance: Since 2024, the Government of Zambia has taken significant steps to strengthen the system by focusing on policy reform, improving medicine availability and enhancing coordination and institutional mechanisms. A key milestone was the development of the Zambia pharmaceutical manufacturing strategy 2024–2028: implementation plan (166). To improve coordination across the supply chain, the National Supply Chain Coordination Unit (NSCCU) was established under the Ministry of Health (167). Additionally, medicine availability at the central warehouse increased to approximately 70% (168), driven by a three-pronged procurement and distribution strategy that includes mop-up exercises to address stock imbalances, health centre kits to standardize essential supplies at primary care level, and government-to-government bulk procurement to ensure consistent supply of critical medicines.

■ Transformation in action

Zambia updated its guidelines for stock-related data management and reporting by incorporating best practices from its HIV and health product supply systems (7, 169). Key logistics and distribution strategies—such as transportation planning, inventory management, product consolidation, quality assurance and performance monitoring—were integrated to support the country’s HIV supply chain integration. Performance benchmarks, inventory checks and regular audits (funded by GAVI, The Vaccine Alliance and the Global Fund) informed improvements and guided Zambia’s move toward a fully local supply chain system (165). To support integration efforts in Zambia, a monitoring and evaluation (M&E) framework was developed to track implementation and strengthen accountability within the health and HIV response. The framework defines key indicators, data sources, baselines, and reporting mechanisms to assess outcomes and inform decision-making. It is complemented by system-level investments aimed at improving logistics management of essential medicines and strengthening institutional capacity for integrated service delivery (134).

Key lessons from Zambia include:

- **Improve logistics infrastructure and distribution networks.** To address energy instability—particularly in rural and off-grid areas—Zambia has strengthened its cold chain infrastructure by installing solar powered storage units at provincial hubs and smaller rural clinics. This solar solution ensures the integrity of temperature-sensitive health commodities, such as certain HIV drugs and laboratory reagents, even during power outages (160). The Zambia Medicines and Medical Supplies Agency (MSL/ ZAMMSA) significantly expanded its storage infrastructure in recent years, including a central warehouse extension in Lusaka, the establishment of five additional regional distribution hubs across

provinces and the installation of 16 prefabricated storage units in facilities with limited space. (170, 171, 172)

- **Outsourcing logistics to improve efficiency.** Zambia is shifting toward an outsourced logistics model by leveraging third-party logistics (3PL) providers and adopting dynamic routing tools. This approach reduces the operational burden on public agencies, injects private sector efficiency and enhances distribution reliability—critical for ensuring uninterrupted delivery of HIV commodities and continuous treatment. However, sustaining this model will require strong contract management, robust data systems and ongoing oversight (173, 174, 175, 176).

- **Managing HIV products (non-ARV).** Integrate prevention and diagnostic commodities into national systems and improved reliability of supply and reduced cost through economies of scale. However, the bulkiness of prevention commodities remains a challenge and is often deprioritized relative to higher value or priority items. Additionally, quality assurance and adaptive logistics for must be included for resilience in supply chain management for HIV-commodities beyond ARVs (159).

- **Deploying and integrating digital platforms.** Deploy an electronic LMIS, but prioritize early investment in interoperability and a national digital supply chain architecture. Integrate systems like SmartCare and laboratory information to improve forecasting. Use tools for anomaly detection, consumption forecasting and dashboards to turn raw data into actionable decisions. Ensure that offline capable tools, user-friendly dashboards and training are available at district and community levels to extend benefits to service delivery points (177). Zambia’s HIV sustainability roadmap prioritizes expanding its electronic LMIS to provide real-time supply chain visibility and support the migration to locally managed warehouse software (178).

■ Financing

Zambia’s National AIDS Spending Assessment (2019–2021) shows that approximately 92% of HIV/AIDS expenditures were financed by international sources, while the Zambian Government contributed only about 7.8%. The two largest external funders—PEPFAR and

the Global Fund—accounted for the bulk of spending during this period, with PEPFAR providing roughly 76% and the Global Fund about 17% (179). The Zambia HIV Response Sustainability Roadmap noted a 2022 HIV programme budget of about \$557 million, with PEPFAR contributing \$406.3 million, the Global Fund \$101.8 million and domestic resources only \$49.3 million (around 8.8%). Looking ahead, Zambia anticipates a widening HIV funding gap as available resources from PEPFAR, the Global Fund, and domestic sources fall short of the projected needs outlined in the National Strategic Plan. The gap is expected to grow from 1.68% in 2023 to 28.39% by 2026, assuming domestic contributions remain unchanged. While the roadmap signals an intent to rethink the HIV financing architecture, domestic funding levels remain relatively flat even as financing needs rise—making the translation of this vision into predictable, sustainable funding a significant challenge (178).

Zambia has been the recipient of longstanding financial support for its PSCM system for health technologies from the Global Fund and PEPFAR. Implementation of robust sustainability plans, particularly for financing and ownership to transition from donor-supported hosting, maintenance, analytics and capacity for integrated PSCM remains a challenge. One key strength of the Zambia model is the early investment in health supply chain infrastructure, building a robust national supply chain system before integrating HIV services (180). A coordinated supply chain assessment revealed that millions of dollars of HIV medicines were being wasted due to poor management, use and incorporation of the supply chain into health systems. Joint procurement arrangements across all diseases was proposed as a key cost effectiveness strategy. Currently, Zambia spends over \$100 million per annum procuring HIV drug and non-drug HIV products (181). Despite falling treatment prices globally, 70% of ARVs in the Zambian public market are still supplied by a single source, using pre-Global Fund contracts. Channelling these resources into a technologically based, accountability-driven demand of service process may present an opportunity for disruption-free, effectiveness-eluding procurement.

Capacity Building

Integrating procurement and supply chains was key to ensuring timely, uninterrupted and sustained access to HIV products. This required adjustment in organizational culture, processes, regulations, and national information systems to align procurement decisions, manage transaction costs, improve supplier and product portfolios and enhance efficiency and effectiveness. Zambia's transition to integrated public-sector procurement and supply chain management reflected a deliberate policy shift away from parallel HIV commodity systems toward unified national structures. This approach has the potential to strengthen sustainability and expand local supplier participation, but it also brings important policy considerations, including managing resistance from entrenched suppliers and ensuring that the inclusion of HIV-related health technologies into general health supply chains does not weaken programme performance or accountability (147). A comprehensive analysis of potential approaches to supplier capacity development was carried out, including mapping capabilities and identifying areas for enhancement. The proposed approaches included training local suppliers in the procurement process, training in technical proposal writing, delivering presentations, and attention to proper documentation; and building credibility in its fairness, and publication of all suppliers' bids and wins to validate the process. Through a partnership with the University of Zambia, a new cadre of supply chain professionals is being trained to strengthen capacity at national and subnational levels. This initiative is helping to professionalize supply chain management and improve critical functions such as forecasting, inventory control and distribution planning (182).



Lessons and Recommendations

Integration stands as an invaluable strategy in advancing HIV supply chain management. The four countries in this case study demonstrated that varied but effective pathways to strengthen HIV supply chains through national leadership, legal reforms and strategic partnerships can support the achievement of the high-level outcome of integrating HIV products into national supply chains. All the case studies emphasize the importance of government ownership, integration with broader health systems and reducing donor dependence. Approaches varied; while Brazil prioritized legal and financial sovereignty, countries like Zambia and Ethiopia focused on strategic reforms and institutional strengthening. The Nigerian case study focused on leveraging more inclusive distribution models, given that the delivery of HIV services relies on public secondary and tertiary facilities, which creates access challenges in hard to reach areas and populations. This summary captures the core strategies and lessons across cases and may be useful to governments, partners and communities beyond the countries featured in the studies.

Key lessons	Priority Recommendations
Political leadership and commitment. Strong political will and sustained investment enabled countries to transition from donor-dependent HIV systems to nationally owned, decentralized and sustainable supply chains. Ethiopia shifted procurement and distribution to nationally managed systems, while Brazil relied on legal, institutional and rights-based frameworks. Nigeria emphasized community and private sector models in line with its HIV strategy, and Zambia achieved smooth integration through government-stakeholder alignment and phased implementation.	1 Establish a unified, government-led supply chain to enable smooth delivery of health and HIV products from national warehouses to service points.
	2 Engage government, community, private sector stakeholders and partners to foster ownership, acceptance and sustainability of integrated HIV supply chains.
	3 Implement robust quality assurance frameworks to ensure standardized, consistent quality throughout the supply chain.
Systems innovation and structural design. Brazil ensured universal access through coordination across the three levels (Federal, state and city) and community involvement. Ethiopia developed a nationally led, digitized and integrated logistics system. Zambia centralized procurement, improved stock control and strengthened data use. Nigeria expanded access by piloting community and private sector distribution models.	4 Invest in robust, standardized data systems to enable effective oversight and evidence-based, cost-efficient supply chain management.
	5 Leverage technology to modernize supply chains by improving visibility, efficiency and real-time coordination.

Key lessons	Priority Recommendations
Transformation in action. Brazil adopted an inclusive, system-wide approach for a resilient HIV supply chain. Ethiopia built an efficient, data-driven system that improved transparency, forecasting and responsiveness. Nigeria's community-based distribution shows promise but requires integration, monitoring and coordination. Zambia advanced data-driven decisions to support sustainable, integrated supply chains.	6 Community and private sector partnerships can expand health-care access and improve the efficiency, effectiveness and security of HIV and health product distribution.
Financing and domestic resource mobilization. Brazil struggles with high ARV costs from procurement issues. Ethiopia promotes sustainability via an autonomous EPSS and dedicated procurement fund. Nigeria faces limited financing for community distribution. Zambia relies heavily on donor funding, but seeks cost-effectiveness through joint and tech-enabled procurement.	7 Create medium to long-term plans to ensure sustainability and transition to country ownership.
	8 Cost-saving strategies like supply chain efficiencies and reducing service inequities enhance long-term effectiveness and financial sustainability of HIV supply chains.
Capacity Building and system strengthening. Capacity Building was key to HIV supply chain integration. Brazil advanced workforce development through integrated approaches. Ethiopia institutionalized training with standardized curricula and a domestic facility. Nigeria stressed investment in training and standardized CBD templates for sustainability. Zambia combined integration with supplier development, training on procurement, and promoting transparency to build trust and local participation.	9 Invest in Capacity Building, training and technical assistance to empower stakeholders, strengthen national systems and support sustainable, self-managed supply chains.

The case studies highlight several distinct but complementary strategies to strengthen HIV supply chains adopted by the four countries, which collectively showcase pathways toward sustainable, inclusive and resilient HIV supply chains. The experiences documented in this report offer valuable insights and inspiration for countries seeking to build resilient, equitable and sustainable HIV responses in an era of evolving health challenges and constrained resources. Not all countries are at the same stage and conditions for this transformation.

References

- 1 AIDS, crisis and the power to transform. UNAIDS global AIDS update 2025. Geneva: UNAIDS; 2025 (https://www.unaids.org/sites/default/files/2025-07/2025-global-aids-update-JC3153_en.pdf, retrieved June 2025).
- 2 Oum S, Carbaugh A, Kates J. Funding for key HIV commodities in PEPFAR countries. San Francisco: KFF; 2021.
- 3 Redefining the HIV response in Africa through local production of medicines and diagnostics. Geneva: World Health Organization; 2025 (<https://www.who.int/news/item/31-07-2025-redefining-the-hiv-response-in-africa-through-local-production-of-medicines-and-diagnostics>).
- 4 HIV/AIDS overview. Strong supply chains: a vital link to HIV/AIDS epidemic control. Global Health Supply Chain Program. Washington, DC: United States Agency for International Development; 2021.
- 5 Universal health coverage in Africa: a framework for action. Washington, DC: World Bank; 2022.
- 6 The shift to integrated supply chains in global health. Kisumu, Kenya: Pam Steele Associates; 2025 (pamsteele.org, retrieved June 2025).
- 7 The logistics handbook: a practical guide for supply chain managers in family planning and health programs. Washington, DC: United States Agency for International Development/DELIVER Project; 2006 (https://www.rhsupplies.org/uploads/tx_rhscpublications/DELIVER_Logistics%20Handbook%20-%20Family%20Planning_2004.pdf).
- 8 The logistics handbook: a practical guide for the supply chain management of health commodities. Global Health Supply Chain Program. Washington, DC: United States Agency for International Development; 2017 (<https://www.ghsupplychain.org/logistics-handbook>).
- 9 Ibegunam IN. Exploring structural and systemic improvements to promote effective and efficient pharmaceutical supply chain management for HIV/AIDS service delivery in Nigeria. Chapel Hill, NC: Department of Health Policy and Management, Gillings School of Global Public Health; 2019.
- 10 Integrated health systems strengthening. Geneva: World Health Organization; 2025 ([who.int: https://www.who.int/teams/primary-health-care/health-systems-resilience/integrated-health-system-strengthening](https://www.who.int/teams/primary-health-care/health-systems-resilience/integrated-health-system-strengthening), retrieved June 2025).
- 11 Sourcing and management of health products. Results report 2025. Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2025.
- 12 UNAIDS, World Health Organization. Technical guidance note for Global Fund HIV proposals: access to medicines and health technologies and strengthening the pharmaceutical sector component of health systems strengthening funding requests. Geneva: UNAIDS; 2011.
- 13 Impact of the US funding cuts: a snapshot on HIV commodity availability and management risks. Fact Sheet. Geneva: UNAIDS; 2025 (<https://www.unaids.org/en/resources/presscentre/featurestories/2025/may/hiv-commodity-availability-and-management-risks>).
- 14 HIV response sustainability primer. Geneva, Switzerland: UNAIDS 2024 (https://www.unaids.org/en/resources/documents/2024/20240117_HIV_response_sustainability).
- 15 HIV response sustainability roadmap—Part A: Companion guide. Geneva: UNAIDS; 2024 (<https://www.unaids.org/en/resources/documents/2024/hiv-response-sustainability-roadmap-part-a-companion-guide>).
- 16 Brazil. Geneva: UNAIDS; 2025 (<https://www.unaids.org/en/regionscountries/countries/brazil>, retrieved June 2025).
- 17 do Lago RF, Costa Nd. Antiretroviral manufacturers and the challenge of universal access to drugs through the Brazilian National STD/AIDS Program. Cadernos de Saúde Pública; 2009. doi:10.1590/s0102-311x2009001000017.
- 18 Chaves GC, Hasenclever L, Osorio-de-Castro CG, Oliveira MA. Strategies for price reduction of HIV medicines under a monopoly situation in Brazil. Rev Saude Pub. 1 March 2016 (<https://pmc.ncbi.nlm.nih.gov/articles/PMC4687827/>, retrieved 2025).
- 19 Rodriguez Bastos LB, Barbosa MA, Rosso FC, de Almeida Cavalcante Oliveira LM, Ferreira IP, de Sena Bastos, DA, et al. Practices and challenges on coordinating the Brazilian unified health system. Rev Saude Pub. 2020;54:25. doi:<https://doi.org/10.11606/s1518-8787.2020054001512.20>.
- 20 Imperatriz MM, Barreto L. Interoperability in healthcare in Brazil: trends and challenges. São Paulo; 2024 (<https://www.ibanet.org/health-care-trends-challenges-brazil#:~:text=Interoperability%20of%20health%20information%20faces%20significant%20challenges%20in,system%2C%20a%20complex%20regulatory%20framework%2C%20and%20socio-economic%20issues>, retrieved in 2025).
- 21 Benzaken AS, Pereira GF, Costa L, Tanuri A, Santos FA, Soares MA. Antiretroviral treatment, government policy and economy of HIV/AIDS in Brazil: is it time for HIV cure in the country? AIDS Res Ther. 2019;6–19. doi:10.1186/s12981-019-0234-2.
- 22 Galvão J. Brazil and access to HIV/AIDS drugs: a question of human rights and public health. Am J Pub Health. 2005;95:7 (doi:10.2105/AJPH.2004.044313).
- 23 Presidency of the Republic. Lei nº 9.313, de 13 de novembro de 1996. Brasília: Government of Brazil; 1996 (https://www.planalto.gov.br/ccivil_03/leis/19313.htm).
- 24 Gómez EJ. What the United States can learn from Brazil in response to HIV/AIDS: international reputation and strategic centralization in a context of health policy devolution. Health Pol Plan. 2010;25:6;529–541. doi: 10.1093/heapol/czq047.
- 25 Homedes N, Ugalde A. Improving access to pharmaceuticals in Brazil and Argentina. Health Pol Plan. 2006;21:2;123–131. doi:10.1093/heapol/czj011.
- 26 Ordinance GM/MS No. 6,324, 26 December 2024. Brasília: Ministry of Health; 2024 (https://bvsmms.saude.gov.br/bvs/saudelegis/gm/2024/prt6324_30_12_2024.html#:~:text=Estabelece%20a%20Rela%C3%A7%C3%A3o%20Nacional%20de%20Medicamentos%20Essenciais%20-,Rela%C3%A7%C3%A3o%20Nacional%20de%20Medicamentos%20Essenciais%20-%20Rename%202022).
- 27 Relação nacional de medicamentos essenciais. Rename 2024. Brasília: Ministério da saúde; 2024 (https://bvsmms.saude.gov.br/bvs/publicacoes/relacao_nacional_medicamentos_2024.pdf).
- 28 Brazil: report prepared by the Joint UN Team on AIDS. Geneva: UNAIDS; 2020 (retrieved in 2025; https://open.unaids.org/sites/default/files/documents/Brazil_Country%20Report_2020_formatted_EN.pdf).

- 29 Observatório de Políticas de HIV/Aids Relatório 2021. Rio de Janeiro: Fiocruz; 2021.
- 30 Nota Técnica No. 12/2019-DCCI/SVS/MS. Brasília: Ministério da Saúde; 2019.
- 31 SICLOM—Sistema de Controle Logístico de Medicamentos. Brasília: Ministério da Saúde; 2022 (<https://www.gov.br/aids/pt-br/sistemas-de-informacao/siclom>, retrieved 18 November 2025).
- 32 SISCEL—Sistema de Controle de Exames Laboratoriais. Brasília: Ministério da Saúde; 2022 (<https://antigo.aids.gov.br/pt-br/gestores/sistemas-de-informacao/siscel>, retrieved 18 November 2025).
- 33 Costa MVdaS, Camargos MCS, Viana SMN, Mendes UVdeS. Avanços e desafios da interoperabilidade no Sistema Único de Saúde. *J Health Informatics*. 2025;17:1;1112. doi:10.59681/2175-4411.v17.2025.1112.
- 34 Barbalho IMP, Fernandes F, Barros DMS, Paiva JC, Henriques J, Morais AHF, et al. Electronic health records in Brazil: prospects and technological challenges. *Front Public Health*. 2022;3:10:963841. doi:10.3389/fpubh.2022.963841.
- 35 Nunn AS, Fonseca EM, Bastos FI, Gruskin S, Salomon JA. Evolution of antiretroviral drug costs in Brazil in the context of free and universal access to AIDS treatment. *PLoS Med*. 2007;4:11. 36.
- 36 Estratégia de Saúde Digital para o Brasil 2020-2028 (ESD28). Brasília: Ministério da Saúde; 2020.
- 37 Decreto No. 11.358, de 1º de janeiro de 2023—aprova a estrutura regimental do Ministério da Saúde e cria a SEIDIGI. Brasília: Ministério da Saúde; 1 January 2023.
- 38 OPAS e Ministério da Saúde do Brasil assinam acordo para qualificar transformação digital no setor saúde. Brasília: OPAS/Ministério da Saúde do Brasil; 11 December 2023.
- 39 Rede Nacional de Dados em Saúde (RNDS). Brasília: Ministério da Saúde; 2025 (<https://www.gov.br/saude/pt-br/composicao/seidigi/rnds>, retrieved 18 November 2025).
- 40 Rede Nacional de Dados em Saúde (RNDS)—Estrutura do projeto. Brasília: Ministério da Saúde; 2025 (<https://www.gov.br/saude/pt-br/composicao/seidigi/rnds/estrutura-do-projeto>, retrieved 18 November 2025).
- 41 Abbate MC. Overcoming access barriers to HIV prevention commodities in São Paulo, Brazil. Geneva: Differentiated Service Delivery, International AIDS Society; 2024 (<https://www.differentiatedservicedelivery.org/resources/overcoming-access-barriers-to-hiv-prevention-commodities-in-sao-paulo-brazil-dec-2024/>, retrieved in 2025).
- 42 Alves AM, dos Santos AC, Kumow A, Sato AP, de Santa Helena ET, Nemes MI. Beyond access to medication: the role of SUS and the characteristics of HIV care in Brazil. *Rev Saúde Púb*. 2023. doi:<https://doi.org/10.11606/s1518-8787.2023057004476>.
- 43 Plano Diretor de Logística Sustentável: ciclo 2024–2026. Brasília: Ministério da Saúde; 2024.
- 44 Portaria SE/MS No. 463, de 26 de março de 2024, que aprova o Plano Diretor de Logística Sustentável—PLS (ciclo 2024–2026). Brasília: Ministério da Saúde; 2024.
- 45 Sistemas de informação para o tratamento do HIV no Brasil: SISCEL, SICLOM e SISGENO no contexto do Conjunto Mínimo de Dados (CMD). *J Health Inform*. 2022;14:1;19–25.
- 46 da Silva JOS, Jerônimo TB, de Aquino JT, de Sousa JV, de Melo FJC. Aplicação do SSM na cadeia de distribuição de medicamentos antirretrovirais. *Gestão.Org—Rev Eletrôn Gestão Org*. 2022;20. doi.org/10.51359/1679-1827.2022.241346.
- 47 Meiners C, Sagaon-Teyssier L, Hasenclever L, Moatti JP. Modeling HIV/AIDS drug price determinants in Brazil: is generic competition a myth? *PLoS One*. 2011;6:8 (<https://pmc.ncbi.nlm.nih.gov/articles/PMC3156239/>, retrieved in 2025).
- 48 Strategic fund annual report 2021: Prioritizing access to medicines and supplies for health security and universal health. PAHO/HSS/SF/22-0020. Washington, DC: Pan American Health Organization; 2022.
- 49 Lopes LMN, Scopel CT, Hallal RC, Andreoli GLM, Barreira D, Freire MV, et al. Price as a challenge to the sustainability of the universal access policy to antiretrovirals in the SUS: the case of dolutegravir. *Cien Saude Colet*. 2025 (<https://www.scielo.org/article/csc/2026.v31n1/e14102025/en/>).
- 50 Carvalho DS, Nascimento EPL, Carmona SAMLD, Barthmann VMC, Lopes MHP, Moraes JC. Planning and sizing of the health workforce in Brazil: advances and challenges. *Saúde em Debate*. 2022;46:135:1215–1237. doi.org/10.1590/0103-1104202213519.
- 51 Relatório do Observatório de Políticas de HIV/Aids, 2020. Rio de Janeiro: Fiocruz; 2020.
- 52 52, Loch PA, Rocha SQ, Fonsi M, de Magalhaes Caraciolo JM, Kalichman AO, Souza RD, Improving the continuum of care monitoring in Brazilian HIV healthcare services: an implementation science approach. *PLoS One*. 2021. doi:<https://doi.org/10.1371/journal.pone.0250060>.
- 53 Project appraisal document on a proposed loan in the amount of US\$ 67 million to the Federative Republic of Brazil for the AIDS-SUS project (national AIDS program—National Health Services). Washington, DC: World Bank; 2010 (<https://documents1.worldbank.org/curated/en/953641468228273906/pdf/540600PAD0P1131e0only10R20101009111.pdf>, retrieved 2025).
- 54 Divino F, Nacher M, Pereira RD, Peiter P. Vulnerability of the HIV cascade of care in an Amazonian town: a qualitative study. *Front Pub Health*. 2023. doi:10.3389/fpubh.2022.1110330. PMID: 36761327; PMCID: PMC9905674.
- 55 Tadesse D, Jamieson D, Cochrane L. Strengthening public health supply chains in Ethiopia: PEPFAR-supported expansion of access and availability. *Dev Pract*. 2015 ;25:7;1043–1056.
- 56 Ethiopia. Geneva: UNAIDS; 2025 (<https://www.unaids.org/en/regionscountries/countries/ethiopia>).
- 57 Ethiopia: development news, research data. Washington, DC: World Bank; 2025 (<https://www.worldbank.org/en/country/ethiopia/overview>).
- 58 Impact of US funding cuts on HIV programmes in Ethiopia. Geneva: UNAIDS; 2025 (https://www.unaids.org/en/resources/presscentre/featurestories/2025/march/20250314_Ethiopia_fs#:~:text=The%20recent%20US%20cuts%20to%20foreign%20assistance%20pose,who%20rely%20on%20them%20facing%20an%20uncertain%20future).
- 59 Conflict in northern Ethiopia severely disrupts HIV services, putting lives at risk. Geneva: UNAIDS; 2021 (https://www.unaids.org/en/resources/presscentre/featurestories/2021/december/20211221_ethiopia).

- 60 Weledegebriel MG, Nigusse AT, Gebru T, Haftu H, Gebrehiwet T, Tsegay N. Outcome of HIV patients on ART during the war and siege in a tertiary hospital in northern Ethiopia: a cross-sectional study. *Sci Rep*. 2025;21:15(1):6434. doi:10.1038/s41598-025-90848-w.
- 61 Weledegebriel MG, Abebe HT, Gidey K, Bisrat H, Gebru T, Tsegay N, Abera BT, Gebremeskel H, Asmerom D, Gebreweld A, Miruts F, Wasihun AG, Hagos K, Gebrehiwet TG. The impact of war on HIV/AIDS service provision: In rural health facilities of Tigray, northern Ethiopia, a cross-sectional study. *PLoS One*. 2023 May 2;18:5:e0278976. doi: 10.1371/journal.pone.0278976. PMID: 37130130.
- 62 Weledegebriel Z, Mohammed H, Assefa Y, Aregay A. The impact of war on HIV/AIDS service provision in rural health facilities of Tigray, northern Ethiopia. *BMC Health Serv Res*. 2023;23:517. <https://doi.org/10.1186/s12913-023-09471-w>
- 63 Gesesew H, Berhane K, Siraj ES, Siraj D, Gebregziabher M, Gebre YG, et al. The impact of war on the health system of the Tigray region in Ethiopia: an assessment. *BMJ Global Health*. 2021;6:e007328. <https://doi.org/10.1136/bmjgh-2021-007328>.
- 64 Nigatu W, Dires T. Integration of maternal newborn and child health commodities into IPLS, Ethiopia. 19th general membership meeting of the Reproductive Health Supplies Coalition. Kathmandu: Reproductive Health Supplies Coalition; 2019; p.21.
- 65 Cochrane L. Warehouse operations management SCMS training. Training report. 2013.
- 66 Ethiopia digital health blueprint: a national strategic document for digital transformation of the health sector. Addis Ababa: Federal Ministry of Health; 2020.
- 67 Evaluation of the electronic community health information system (eCHIS): implementation progress, challenges, and lessons learned. Addis Ababa: Federal Ministry of Health Ethiopia, John Snow, Inc. (2022).
- 68 Electronic community health information system (eCHIS) midline evaluation report: data use, system performance, and scale-up readiness. Addis Ababa: Federal Ministry of Health Ethiopia, University of Gondar; 2023.
- 69 eCHIS scale-up and performance assessment: national implementation review. Addis Ababa: Federal Ministry of Health Ethiopia, UNICEF; 2024.
- 70 Mekonen ZT, Fenta TG, Nadeem SP, Cho DJ. Global health commodities supply chain in the era of COVID-19 pandemic: challenges, impacts, and prospects: a systematic review. *J Multidiscipl Healthc*. 2024;1523–1539.
- 71 Ethiopian Pharmaceuticals Supply Service and Fund Establishment Proclamation No. 1354, 2024. Addis Ababa: Ethiopian Pharmaceuticals Supply Service; 2025 (<https://epss.gov.et/wp-content/uploads/2025/07/doc02106520250626125021.pdf>).
- 72 Centrally procured pharmaceuticals and medical equipment by the Ethiopian Pharmaceutical Supply Service. Procurement Directive 1066/2025. Addis Ababa; Ministry of Finance; 2025 (https://www.mofed.gov.et/media/filer_public/d5/87/d587adce-9bf0-4a87-bf11-cec-c7e70b3fe/1066_yateyopheyaa_madexaanite_aqeraabi_agalegelote_yamadexaanite_ena_yahekemenaa_masaariyaawoce_yagezhe_af-atzaatzame_mamariyaa.pdf).
- 73 Ethiopia: northern Ethiopia humanitarian update—Situation Reports 2021–2022. New York: United Nations Office for the Coordination of Humanitarian Affairs; 2023.
- 74 Northern Ethiopia emergency operations updates: 2022–2023. Geneva: World Health Organization; 2023.
- 75 ICAP in Ethiopia revitalizes HIV laboratory services in post-conflict Tigray. New York: Columbia University Mailman School of Public Health–ICAP; 2024.
- 76 Conflict in Ethiopia: impact on health systems. Field reports: 2021–2022. Geneva: Médecins Sans Frontières; 2023.
- 77 Health extension program implementation guidelines. Addis Ababa: Federal Ministry of Health Ethiopia; 2010.
- 78 Health sector development programme IV (HSDP IV), 2010/11–2014/15. Addis Ababa: Federal Ministry of Health Ethiopia; 2015.
- 79 Audit of Global Fund grants to the Federal Democratic Republic of Ethiopia. Global Fund Office of the Inspector General (GF-OIG-19-012). Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2019.
- 80 Tiruye G, Mulugeta T, Kebede B, Berhanu D, Alemayehu Y. Community-based HIV service delivery during conflict and public health emergencies in Ethiopia: lessons from differentiated service delivery models. *AIDS Res Ther*. 2023;20:1:1–12.
- 81 Differentiated service delivery for HIV treatment in Ethiopia: program progress and lessons learned. Addis Ababa: Federal Ministry of Health Ethiopia, U.S. Centers for Disease Control and Prevention; 2021.
- 82 Community ART delivery models and continuity of HIV treatment during public health emergencies: program review report. Addis Ababa: Federal Ministry of Health Ethiopia, U.S. Centers for Disease Control and Prevention; 2023.
- 83 Multi-month HIV prescriptions benefiting patients and health workers. Washington, DC: USAID Global Health Supply Chain Program; 2022 (<https://ghsupplychain.org/news/multi-month-hiv-prescriptions-benefiting-patients-and-health-workers>).
- 84 Pharmaceuticals supply transformation plan II (PSTP II) 2020/21–2029/30. Addis Ababa: Ethiopian Pharmaceutical Supply Agency; 2020 (<https://epss.gov.et/wp-content/uploads/2022/06/PSTP-II-fina-ASK.pdf>).
- 85 Ethiopia country profile. Washington, DC: USAID Global Health Supply Chain Program; 2025.
- 86 Mekonnen BA, Worku MC, Terefa BB. Evaluation of logistics management information system and availability of non-program tracer drugs in public health facilities in Bahir Dar City, northwest Ethiopia. *PLoS One*. 2024 (<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0302319>).
- 87 Ethiopia health sector transformation plan (2020/21–2024/25). Addis Ababa. Ministry of Health; 2023 (<https://www.scribd.com/document/799542474/HSTP-II-MTR-final-report?>).
- 88 Assefa Y, Gilks CF, Dean J, Tekle B, Lera M, Balcha TT. Towards achieving the fast-track targets and ending the epidemic of HIV/AIDS in Ethiopia: successes and challenges. *Int J Infect Dis*. 2019;78:57–64 (<https://www.ijidonline.com/article/S1201-9712%2818%2934570-3/fulltext?>, retrieved in 2025).
- 89 Ethiopian National AIDS Spending Assessment (NASA) Report EFY 2004, 2011/12. Geneva: UNAIDS; 2013.

- 90 HIV/AIDS national strategic plan 2021–2025. Addis Ababa: Federal HIV/AIDS Prevention and Control Office; 2025 (<https://www.prep-watch.org/wp-content/uploads/2022/07/Ethiopia-HIV/AIDS-National-Strategic-Plan-2021-25.pdf>).
- 91 National HIV and AIDS strategic framework 2021–2025. Abuja: National Agency for the Control of AIDS; 2025.
- 92 Bashorun A, Nguku P, Kawu I, Ngige E, Ogundiran A, Sabitu K. A description of HIV prevalence trends in Nigeria from 2001 to 2010: what is the progress, where is the problem? *Pan Afr Med J*. 2014;18:1.
- 93 Nigeria HIV/AIDS indicator and impact survey (NAIIS) 2018. Technical report. Abuja: Nigeria Federal Ministry of Health; 2019 (<https://www.ciheb.org/media/som/microsites/ciheb/documents/NAIIS-Report-2018.pdf>, retrieved in 2025).
- 94 Nigeria. Geneva: UNAIDS; 2025 (<https://www.unaids.org/en/regionscountries/countries/nigeria>).
- 95 Bautista-Arrendondo S, Colchero MA, Amanze OO, Hera-Fuentes GL, Silverman-Retana O, Contreras-Loya D. Explaining the heterogeneity in average costs per HIV/AIDS patient in Nigeria: The role of supply-side and service delivery characteristics. *PLoS One*. 2018;13:5 (<https://pmc.ncbi.nlm.nih.gov/articles/PMC5931468/>, retrieved in 2025).
- 96 Rotimi K. Review of public health commodity distribution models in Nigeria. *Future Bus J*. 2024.
- 97 Task shifting and task sharing. Abuja: Development Research and Projects Centre; 2025 (<https://drpcngr.org/task-shifting-task-sharing/>).
- 98 Task-shifting and task-sharing policy for essential health care services in Nigeria. Abuja: Federal Ministry of Health; 2014 (<https://www.advancesfamilyplanning.org/sites/default/files/resources/Nigeria%20taskshifting%20policy-Aug2014%20REVISED%20CLEAN%20Approved%20October%202014.pdf>).
- 99 Oyekale AS. Assessment of primary health care facilities' service readiness in Nigeria. *BMC Health Serv Res*. 2017;17:172. doi.org/10.1186/s12913-017-2112-8.
- 100 Ibrahim ZA, Konlal KD, Moonsoo Y, Kwetishe P, Ryu J, Ro DS. Influence of basic health care provision fund in improving primary health care in Kano state: a descriptive cross-sectional study. *BMC Health Serv Res*. 2023;23:1 (doi:10.1186/s12913-023-09708- 2025).
- 101 Accelerating country ownership. Arlington, VA: Partnership for Supply Chain Management; 2025 (<https://scms10yearreview.pfscm.org/accelerating.html?>).
- 102 National supply chain integration project (NSCIP). Abuja: HSCL; 2017 (retrieved in 2025; hscgroup).
- 103 Nigeria country operational plan COP 2023: strategic direction summary. Washington, DC: US Department of State PEPFAR; 2023 (retrieved in 2025; <https://www.prepwatch.org/wp-content/uploads/2024/06/Nigeria.pdf>).
- 104 Marqusee H, Schowen R, Amanzi P, Baker S, Egena P, Hijazi M. Engaging the private sector to increase access to HIV services and increase sustainability of the HIV response. *BMC Health Serv Res*. 2025;24:1 (doi:<https://doi.org/10.1186/s12913-025-12530-1>).
- 105 Durosinmi-Etti O, Nwala EK, Oki F, Ikpeazu A, Godwin E, Umoh P, Kalaiwo A.. Willingness to pay for HIV prevention commodities among key population groups in Nigeria. *Glob Health Sci Pract*. 2022;10:5. doi.org/10.9745/GHSP-D-21-00303.8.
- 106 Shahid M, Bharali I, Hecht R, Yamey G. Approaches to improving the efficiency. *BMJ Glob Health*. 2022;7:e010127. doi:10.1136/bmjgh-2022-010127. (<https://gh.bmj.com/content/bmjgh/7/9/e010127.full.pdf>).
- 107 Blueprint for national operational plan for supply chain integration in Nigeria (2021–2024). National Supply Chain Integration Project (NSCIP). Abuja: Federal Ministry of Health Nigeria; 2022 (<https://nscip.gov.ng/wp-content/uploads/2022/09/Blueprint-for-National-Operational-Plan.pdf>).
- 108 Nigeria HIV/AIDS strategic framework 2019–2023. Abuja: National Agency for the Control of AIDS; 2019.
- 109 Sustainable financing initiative (SFI). Nigeria case study. Washington, DC: United States Agency for International Development; 2020.
- 110 Expanding access to HIV services through the private sector in Nigeria. Washington, DC: Chemonics International; 2021.
- 111 Adebisi YA, et al. Private pharmacies and differentiated HIV service delivery in Nigeria: innovations and challenges. *J Pharm Policy Pract*. 2022;15:1:72.
- 112 Community-led HIV service delivery in west and central Africa: innovations in differentiated care. Geneva: UNAIDS; 2023.
- 113 Ekwunife OI, et al. Collaborative design of a care pathway for pharmacy-based PrEP delivery in Nigeria: insights from stakeholder consultation. *BMC Health Serv Res*. 2024;24:1621. doi.org/10.1186/s12913-024-12107-4.
- 114 Avong YK, Aliyu GG, Jatau B, Gurumnaan R, Danat N, Kayode GA. Integrating community pharmacy into community based anti-retroviral therapy program: a pilot implementation in Abuja, Nigeria. *PLoS One*. 2018;13:1 (doi:10.1371/journal.pone.0190286).
- 115 National guidelines for HIV prevention, treatment and care. Abuja: Federal Ministry of Health Nigeria; 2020.
- 116 PEPFAR Nigeria. Country operational plan (COP) 2023. Strategic direction summary. Atlanta: U.S. Centers for Disease Control and Prevention; 2023.
- 117 Community ART models implementation report 2022. Abuja: Institute of Human Virology Nigeria; 2022.
- 118 Differentiated service delivery for HIV treatment: summary of evidence and best practice. Geneva: World Health Organization; 2021.
- 119 National HIV and AIDS strategic framework 2010–2015. Abuja: Federal Ministry of Health Nigeria; 2010.
- 120 National HIV and AIDS strategic framework 2017–2021. Abuja: Federal Ministry of Health Nigeria; 2017.
- 121 Country operational plan 2008 performance report. PEPFAR Nigeria. Atlanta: U.S. Centers for Disease Control and Prevention; 2009.
- 122 Country operational plan 2019 strategic direction summary. PEPFAR Nigeria. Atlanta: U.S. Centers for Disease Control and Prevention; 2019.
- 123 Expanding HIV services to rural Nigeria: outreach and decentralization lessons. Abuja: Institute of Human Virology Nigeria; 2011.
- 124 Rural outreach and community HIV service delivery report 2020. Abuja: Institute of Human Virology Nigeria; 2020.
- 125 Expanding HIV services to rural communities: lessons from the Nigeria rural outreach program. Durham, NC: FHI 360; 2022.

- 126 Communities deliver: strengthening community-based HIV service delivery in Nigeria. Geneva: UNAIDS; 2021.
- 127 National HIV and AIDS strategic plan 2023–2027. Abuja: National Agency for the Control of AIDS; 2023 ([https:// www.naca.gov.ng/wp-content/uploads/2024/02/National_HIV_and_AIDS_Strategic-Plan-2023-2027.pdf](https://www.naca.gov.ng/wp-content/uploads/2024/02/National_HIV_and_AIDS_Strategic-Plan-2023-2027.pdf), retrieved 2025).
- 128 Nigeria: National HIV blueprint for implementation 2021–2025. Abuja: National Agency for the Control of AIDS; 2021; p.10.
- 129 Itiola AJ, Agu KA. Country ownership and sustainability of Nigeria’s HIV/AIDS supply chain system: qualitative perceptions of progress, challenges and pros. *J Pharm Policy Pract.* 2018;11–21.
- 130 National HIV/AIDS strategic framework 2019–2023. Abuja: National Agency for the Control of AIDS, Nigeria; 2019.
- 131 Nigeria HIV sustainability roadmap part A: the new business model. Abuja: National Agency for the Control of AIDS, Nigeria; 2024 (<https://www.naca.gov.ng/wp-content/uploads/2024/06/National-HIV-Sustainability-Roadmap-Part-A-New-Business-Model.pdf>).
- 132 Shediak-Rizkallah MC, Bone LR. Planning for the sustainability of community-based health programs: conceptual frameworks and future directions for research, practice and policy. *Health Educ Res.* 1998;13:1;87–108 (doi:10.1093/her/13.1.87).
- 133 National Supply Chain Integration Project (NSCIP): strengthening HIV commodity logistics and coordination in Nigeria. Abuja: National Agency for the Control of AIDS, Nigeria; 2023 (<https://naca.gov.ng>).
- 134 National Supply Chain Integration Project (NSCIP). Abuja: HSCL; 2017 (hscgroup, retrieved 2025).
- 135 Country operational plan (COP) 2023: strategic direction summary. PEPFAR Nigeria. Atlanta: U.S. Centers for Disease Control and Prevention; 2023.
- 136 Tella-Lah T, et al. Achieving COVID-19 and routine immunization data systems integration on the Electronic Management of Immunization Data system in Nigeria. *Glob Health Sci Pract.* 2024. PMID: 38129122.
- 137 Global Health Supply Chain Program-PSM FY23 Q1 IDIQ report. Washington, DC: United States Agency for International Development; 2023.
- 138 Adeniran A, et al. Assessment of health supply chain governance in Nigeria. *BMC Health Serv Res.* 2023;23:1047.
- 139 Program appraisal document for the Primary Healthcare Provision Strengthening (HOPE-PHC) Program. Abuja: Federal Government of Nigeria; 2024 (https://www.swap.gov.ng/assets/Nigeria%20HOPE-Health%20%28P504693%29_PAD_FINAL%20FINAL%20-CxIjinRO.pdf).
- 140 National AIDS Spending Assessment 2019–2021. Abuja: Federal Government of Nigeria: National Agency for the Control of AIDS; 2021 (<https://www.unaids.org/en/dataanalysis/knowyourresponse/nasacountryreports>).
- 141 Nepomnyashchii L, Baker P, Chovitz B. USAID’s role in global health supply chain programs and implications of aid cuts: a rapid review. Washington, DC: Center for Global Development; 2025. Retrieved from <https://www.cgdev.org/publication/usaids-role-global-health-supply-chain-programs-and-implications-aid-cuts-rapid-review>
- 142 Burns K, Cassels A, Clary T, Dickinson C, Grace C, Henderson S, et al. Strategic review 2020. Vol. 2: annexes. Technical Evaluation Reference Group (TERG). Geneva: Global Fund to Fight AIDS, Tuberculosis and Malaria; 2020 (https://archive.theglobalfund.org/media/10496/archive_terg-strategic-review-2020-position_annexes_en.pdf).
- 143 Ogbuabor D, Olwande C, Semini I, Onwujekwe O, Olaifa Y, Ukanwa C. Stakeholders’ perspectives on the financial sustainability of the HIV response in Nigeria: a qualitative study. *Glob Health Sci Pract.* 2023;11(2):e2200430. doi:10.9745/GHSP-D-22-00430.
- 144 Human Capital Opportunities for Prosperity and Equity (HOPE) program: healthcare sector reform financing announcement. Abuja: Federal Government of Nigeria Press; 2025.
- 145 HOPE program financing and HIV treatment allocation announcement. Abuja: Federal Government of Nigeria Press; 2025.
- 146 Nigeria HIV Trust Fund: mobilizing private sector resources for sustainable HIV response. Abuja: National Agency for the Control of AIDS; 2025 (<https://naca.gov.ng>).
- 147 Muyingo S, Etoori D, Lotay P, Malamba S, Olweny J, Keesler K. The procurement and supply chain strengthening project: improving public health supply chains for better access to HIV medicines, Uganda 2011–2016. *J Pharm Policy Pract.* 2022;15:1.
- 148 AIDSInfo. Geneva: UNAIDS.
- 149 Zambia. Geneva: UNAIDS; 2025 (<https://www.unaids.org/en/regionscountries/countries/zambia>).
- 150 Reimagining the supply chain and building sustainable solutions. Global Health Supply Chain Program. Washington, DC: United States Agency for International Development; 2022 (<https://www.ghsupplychain.org/news/reimagining-supply-chain-and-building-sustainable-solutions#:~:text=In%202020%2C%20the%20USAID%20Global%20Health%20Supply%20Chain,and%20delivered%20to%20testing%20labs%20throughout%20the%20country,retrieved%202025>).
- 151 National Biomedical Laboratory strategic plan 2018–2022. Lusaka, Ministry of Health Zambia; 2018 (<https://policyvault.africa/wp-content/uploads/policy/ZMB459.pdf>).
- 152 Shearer S, et al. Optimizing a sample transport network for scaling up viral load monitoring: results of a geospatial optimization model for Zambia; 2018.
- 153 Zambia case study: Condom market assessment and recommendations. Mann Global Health; 2017 (https://mannglobalhealth.com/wp-content/uploads/2022/12/MGH_Zambia_Case-Study_09.19.17.pdf).
- 154 Van Rossem R, Meekers D. The reach and impact of social marketing and reproductive health communication activities in Zambia. *BMC Publ Health.* 2007;18:7:352. doi: 10.1186/1471-2458-7-352.
- 155 FY2023 comprehensive report on condoms and lubricants. Global Health Supply Chain Program–Procurement & Supply Management. Washington, DC: United States Agency for International Development; 2024.
- 156 Bridging critical supply chain gaps with the power of partnerships. UNFPA Zambia. New York: United Nations Population Fund; 2025

(<https://www.unfpa.org/updates/bridging-critical-supply-chain-gaps-power-partnerships>).

- 157 Zambia sustainability index and dashboard: 2021. Washington, DC: United States Department of State; 2022 (<https://www.state.gov/wp-content/uploads/2022/06/Zambia.pdf>, retrieved in 2025).
- 158 Driving last-mile solutions to ensure access to public health commodities. Washington, DC: USAID Global Health Supply Chain Program; 2022.
- 159 Zambia National Supply Chain Assessment (NSCA 2.0) report. Lusaka: Ministry of Health, USAID Global Health Supply Chain Program–Procurement and Supply Management; 2024 (<https://www.ghsupplychain.org/sites/default/files/2024-12/Zambia%20NSCA%202024%20Report.pdf>).
- 160 Zambia national supply chain assessment report. Lusaka: Ministry of Health; 2024 (<https://www.ghsupplychain.net/sites/default/files/2024-12/Zambia%20NSCA%202024%20Report.pdf>, retrieved 2025).
- 161 Zambia advanced analytics tools, including the consumption anomaly detection tool. Annual report FY 2020. Global Health Supply Chain Program–Procurement and Supply Management. United States Agency for International Development; 2021, p.89 (https://www.ghsupplychain.org/sites/default/files/2021-04/Global%20GHSC-PSM%20Annual%20Report%20FY2020_Sep%202020.pdf).
- 162 Tembo L. Zambia implements centralized medicine procurement system. Lusaka: Efficacy News Africa; 2024 (<https://efficacynews.africa/2024/05/07/zambia-implements-centralized-medicine-procurement-system/>, retrieved 2025).
- 163 Nkole J. Introduction to Zambia supply chain and pipeline. Lusaka: Supply Chain and Pipeline JNK; 2025 (<https://www.scribd.com/document/758102262/SUPPLY-CHAIN-AND-PIPELINE-JNK?>).
- 164 Health sector supply chain strategy and implementation plan 2019–2021. Lusaka: Ministry of Health; 2020 (retrieved in 2025; <http://www.nac.org.zm/ccmzambia/download/health-sector-supply-chain-strategy-and-implementation-plan-2019-2021/>).
- 165 Zambia national supply chain assessment report capability, maturity, and performance assessment. Global Health Supply Chain Program. Washington, DC: United States Agency for International Development; 2024.
- 166 Zambia pharmaceutical manufacturing strategy 2024–2028: implementation plan. Lusaka, Ministry of Commerce, Trade and Industry; 2025 (<https://www.mots.gov.zm/wp-content/uploads/2025/09/Zambia-Pharmaceutical-Manufacturing-IMPLEMENTATION-PLAN-2024-2028-.pdf>).
- 167 Government sets up national coordination unit for medical supply chain. Lusaka Times. 19 January 2023 (<https://www.lusakatimes.com/2023/01/19/government-sets-up-national-coordination-unit-for-medical-supply-chain/>).
- 168 ZAMMSA attains 70% drug availability standard (press release). Lusaka: Zambia Medicines and Medical Supplies Agency; 2024 (<https://zammsa.co.zm/2024/06/13/zammsa-attains-70-drug-availability-standard/>).
- 169 AIDSfree Zambia, electronic logistics management information system endline evaluation report. Washington, DC: United States Department of State, PEPFAR, USAID; 2019 (retrieved 2025).
- 170 Zambia health fact sheet. Global Health Supply Chain Program–Procurement and Supply Management. Washington, DC: United States Agency for International Development; 2024 (<https://www.usaid.gov/sites/default/files/2024-09/GHSC-PSM-2024-fact-sheet.pdf>).
- 171 Strengthening supply chain in health sector in Zambia. New York: United Nations Development Programme; 2025 (<https://www.undp.org/zambia/projects/strengthening-supply-chain-health-sector-zambia>).
- 172 Govt receives 16 medical storage units from USAID. News Diggers; 21 June 2023. <https://diggers.news/local/2023/06/21/govt-receives-16-medical-storage-units-from-usaid/>.
- 173 3PL fact sheet. USAID Program for Advancing Supply Chain Outcomes (PASCO). Washington, DC: Chemonics International; 2023 (https://chemonics.com/wp-content/uploads/2023/09/2023.09.12_PASCO_3PL-Fact-Sheet-Vendors-1.pdf).
- 174 Optimizing last mile distribution in Zambia: case study. Washington, DC: Chemonics International; 2025 (<https://www.chemonics.com/case-study/optimizing-last-mile-distribution-in-zambia/>).
- 175 Dispatch optimization tool: tech brief No. 1. Global Health Supply Chain Program–PSM. Washington, DC: United States Agency for International Development; 2023 (https://www.ghsupplychain.org/sites/default/files/2023-11/00191_GHSCS_DispatchOptimizationTool_Tech-Brief_1.pdf).
- 176 FY24 Q4 annual report: GHSC-PSM. Global Health Supply Chain Program–PSM. Washington, DC: United States Agency for International Development; 2025 (https://www.ghsupplychain.org/sites/default/files/2025-09/GHSC-PSM%20FY24%20Q4_Annual%20Report-Final-re-mediated%20July14.pdf).
- 177 Digital health strategy 2022–2026. Lusaka, Ministry of Health Zambia; 2022; pp. 24–26 (https://extranet.who.int/countryplanningcycles/sites/default/files/public_file_rep/ZMB_Zambia_Digital-Health-Strategy_2022-2026.Pdf).
- 178 Zambia sustainability roadmap and milestones (SRM A): financing and sustainability analysis Geneva: UNAIDS; 2024 (https://sustainability.unaids.org/wp-content/uploads/2024/06/Zambia_SRM_A.pdf).
- 179 Zambia national AIDS spending assessment (NASA) 2019–2021. Geneva: UNAIDS; 2023 (https://www.unaids.org/sites/default/files/NA-SAReport_zambia_2019-2021_en.pdf).
- 180 Proceedings of the National Assembly of Zambia: supply chain infrastructure expansion for health. Statement by the Minister of Health. Parliament of the Republic of Zambia. Lusaka: Government Printer; 2022 (<https://www.parliament.gov.zm/node/10291>).
- 181 National AIDS Spending Assessment (NASA) 2019–2021. Lusaka: National HIV/AIDS/STI/TB Council; 2025 (<https://www.nac.org.zm/?q=content/national-aids-spending-assessment-nasa-2019-2021>).
- 182 School is in session: training up a new generation of health supply chain leaders in Zambia. Global Health Supply Chain Program–Procurement and Supply Management (GHSC-PSM). Washington, DC: United States Agency for International Development; 2024 (<https://www.ghsupplychain.org/news/school-session>).

© Joint United Nations Programme on HIV/AIDS (UNAIDS), 2026

Some rights reserved. This work is available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/>).

Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited, as indicated below. In any use of this work, there should be no suggestion that UNAIDS endorses any specific organization, products or services. The use of the UNAIDS logo is not permitted. If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: "This translation was not created by UNAIDS. UNAIDS is not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition".

Any mediation relating to disputes arising under the licence shall be conducted in accordance with the mediation rules of the World Intellectual Property Organization (<http://www.wipo.int/amc/en/mediation/rules>).

Suggested citation. Transformations driving sustainability and impact: the case of integrated supply chains for HIV-related health technologies. Geneva: Joint United Nations Programme on HIV/AIDS; 2026. Licence: [CC BY-NC-SA 3.0 IGO](#).

Third-party materials. If you wish to reuse material from this work that is attributed to a third party, such as tables, figures or images, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of UNAIDS concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by UNAIDS in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by UNAIDS to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall UNAIDS be liable for damages arising from its use.

UNAIDS/JC3164E



UNAIDS
Joint United Nations
Programme on HIV/AIDS

20 Avenue Appia
1211 Geneva 27
Switzerland

+41 22 595 59 92

unaids.org