Healthtech & Pharmaceutical Manufacturing
Building Africa's Healthcare Sovereignty

Executive Summary

Africa's pursuit of healthcare sovereignty has gained unprecedented urgency amid the COVID-19 pandemic, the war in Ukraine and recurrent supply-chain disruptions. The continent historically depends on imports for over 70 % of its medicines and 95 % of active pharmaceutical ingredients[3]. Vaccine nationalism during the pandemic highlighted how reliance on foreign suppliers leaves African states vulnerable to export bans, price spikes and delivery delays. Rapid population growth, a growing burden of chronic disease and emerging infectious threats demand resilient health systems, yet Africa is home to just 3 % of global pharmaceutical manufacturing capacity[3]. Building local manufacturing capability and digital health ecosystems is therefore not just a matter of industrial policy; it is a prerequisite for universal health coverage (UHC) and socio-economic stability.

This paper provides an empirical assessment of Africa's pathway to health sovereignty. Drawing on data from the Africa CDC, Gavi, WHO, Salient Advisory and academic literature, we quantify the expansion of vaccine and pharmaceutical manufacturing, map the flourishing health-tech ecosystem, examine universal coverage indicators, and analyse the automation risks and reskilling priorities posed by artificial intelligence (AI). The evidence demonstrates that African manufacturers are scaling rapidly: more than 25 vaccine projects were active in mid-2024 and drug product capacity could reach 1.4 billion doses by 2030[1]. Egypt alone accounts for one-fifth of the continent's vaccine capacity and aims to produce 380 million doses annually by 2030[1]. At the same time, telemedicine has exploded; over 1,276 health-tech start-ups operate across Africa, with 60 % founded in the past five years[4]. Internet penetration—although still only 40 %—is catalysing AI-enabled diagnostics, SMS-based primary care and drone-delivered medicines[5]. However, UHC service coverage remains modest (44/100 in 2021)[7], and the continent faces a projected shortage of 6.1 million health workers by 2030[8]. Automation could exacerbate labour displacement if reskilling initiatives are not prioritised; survey evidence from South Africa finds that radiologists, pathologists, primary-care doctors and nurses perceive high automation risks, yet 84 % expect AI to influence clinical decisions[13]. To achieve sovereignty, governments, regulators, industry leaders, educators and development finance institutions must coordinate investments in manufacturing, digital infrastructure, workforce development and governance.

Introduction

The term *healthcare sovereignty* denotes the ability of a nation or region to ensure equitable access to essential health services, pharmaceuticals, vaccines and medical technologies without excessive reliance on foreign suppliers. Africa's dependence on imports is a legacy of colonial trade patterns, limited industrialisation and fragmented regulatory frameworks. During the COVID-19 pandemic, the continent was largely relegated to the end of the global queue for vaccines, receiving just 7 % of doses produced worldwide despite representing 17 % of the world's population. Export bans and vaccine hoarding underscored the vulnerability inherent in external dependence. Beyond vaccines, Africa's pharmaceutical market—valued at over US$50 billion—is dominated by imported drugs and APIs[1], exposing countries to currency fluctuations and supply shocks. At the same time, digital health platforms and AI-enabled services are proliferating across Africa. The surge in telemedicine start-ups during the pandemic demonstrates both the potential of technology to expand care and the risks of technological inequality if investments in infrastructure, skills and regulation lag. This paper aims to analyse Africa's progress towards healthcare sovereignty by examining manufacturing capacity, digital health ecosystems, universal coverage, automation risks and workforce transformation.

The analysis is structured as follows. Section 1 outlines Africa's healthcare dependency challenge and the strategic imperative of sovereignty. Section 2 reviews the literature on vaccine nationalism, pharmaceutical localisation and digital health diffusion. Section 3 describes the data sources and methodology. Section 4 presents empirical results, including 20 charts on vaccine production, import dependency, telemedicine adoption, workforce dynamics, UHC indicators, automation risks and reskilling needs. Section 5 discusses policy implications for governments, regulators, manufacturers, start-ups, universities, human-resource planners and development finance institutions. Section 6 acknowledges limitations and Section 7 concludes.

1 Africa's Healthcare Dependency Challenge

1.1 Reliance on imported medicines and APIs

Africa produces a mere 3 % of global medicines and imports over 70 % of its pharmaceuticals[3]. Even more striking, more than 95 % of active pharmaceutical ingredients (APIs) used on the continent are imported[3]. Supply dependence leads to price volatility, stock-outs and vulnerability to export restrictions. The COVID-19 pandemic exposed these vulnerabilities when India temporarily banned exports of critical APIs and medicines. Local API production is nascent: a handful of companies—Emzor and Fidson in Nigeria, Aspen and Chemical Process Technologies in South Africa, EVA Pharma in Egypt and Dei BioPharma in Uganda—are building API manufacturing capacity[3]. According to the

African Development Bank, over US$11 billion in investment is needed to meet local pharmaceutical demand by 2030[3].

Figure 1 illustrates the current distribution of vaccine manufacturing projects across Africa. Only five projects operate at commercial scale with technology transfer agreements, another five have commercial facilities without transfers, and the majority (15) remain at early-stage development[1].

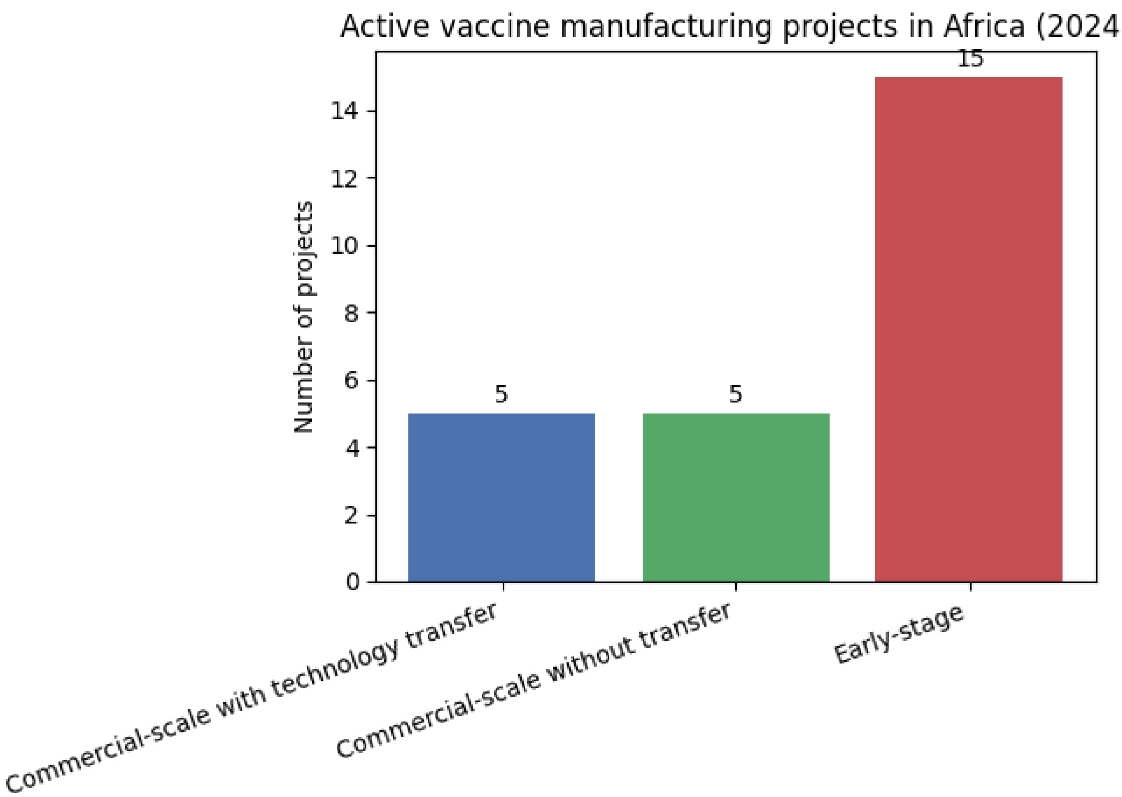

Figure 1. *Distribution of active African vaccine manufacturing projects by stage (mid-2024). The majority of projects are at early stages, with only a handful operating commercial-scale facilities with technology transfer.*

1.2 Capacity gaps and investment needs

The African Union's Partnerships for African Vaccine Manufacturing (PAVM) aims to produce 60 % of the continent's vaccine needs locally by 2040. Achieving this target requires scaling both drug product and drug substance manufacturing capacity. As shown in Figure 2, the continent's projected drug product capacity is around 1.4 billion doses by 2030, yet drug substance capacity is estimated at only 61 million doses[2]. Drug product capacity could surge to 2 billion doses during emergencies, but without sufficient drug substance, fill-and-finish facilities risk underutilisation. Egypt will play a critical role; it currently accounts for roughly 20 % of Africa's vaccine capacity and plans to produce 380 million doses annually by 2030[1]. South Africa, Senegal and Nigeria host additional vaccine plants, but technology transfer and investment remain uneven[2].

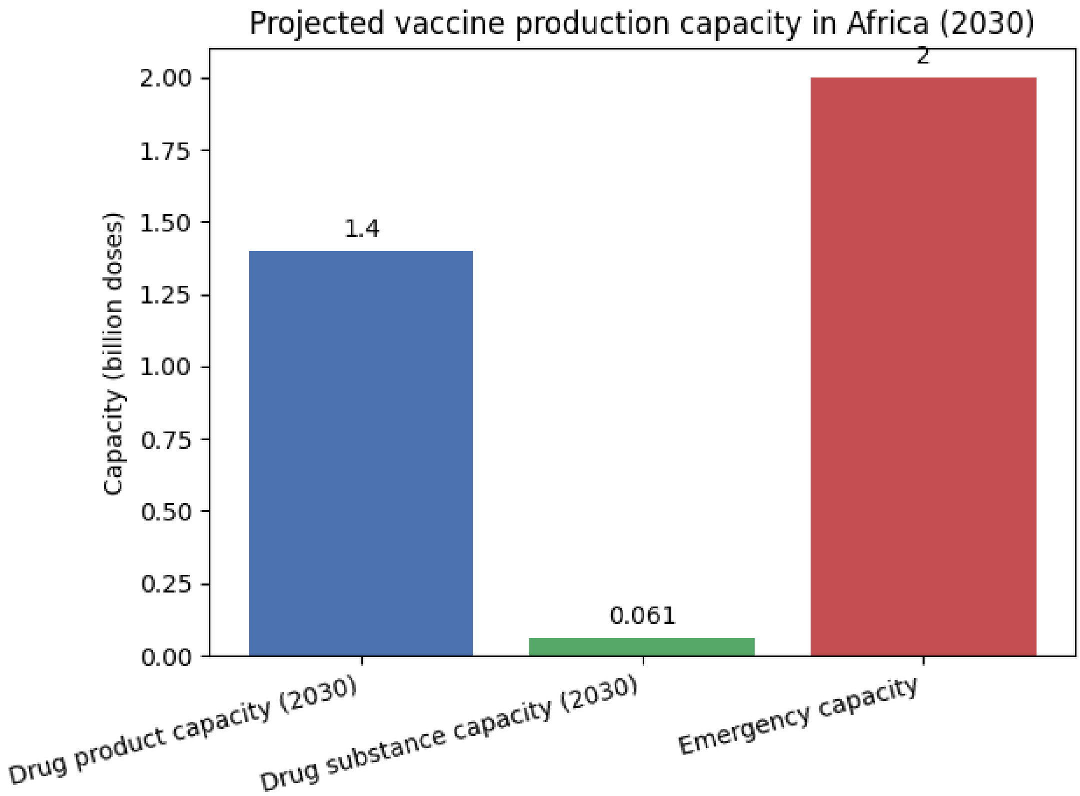

Figure 2. *Projected vaccine production capacity in Africa by 2030. Drug product capacity may reach 1.4 billion doses while drug substance capacity lags at 61 million doses; emergency surge capacity is estimated at 2 billion doses.*

Investment commitments have begun to flow. Africa CDC reports that US$5.5 billion has been pledged for health manufacturing projects and that the continental vaccine and medicines market is valued at more than US$50 billion annually[1]. Nevertheless, AfDB estimates suggest that at least US$11 billion in additional investment is needed to build a resilient pharmaceutical industry[3]. Figure 3 compares pledged investments, market size and financing requirements.

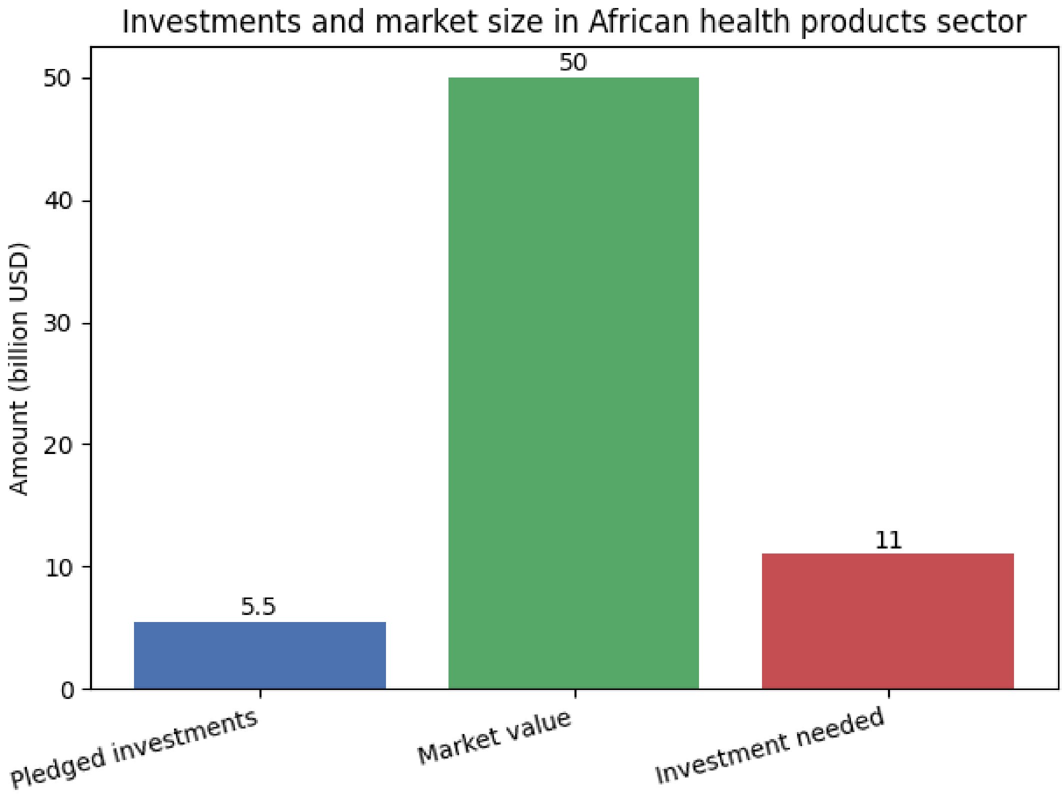

Figure 3. *Comparison of pledged investments, market value and additional investment needed for Africa's health products sector. Pledges of US$5.5 billion fall short of the estimated US$11 billion required to meet pharmaceutical demand.*

1.3 Concentration of manufacturing capacity

Vaccine manufacturing capacity is concentrated in a handful of countries. Figure 4 shows that Egypt holds roughly 20 % of capacity, South Africa 15 %, Senegal 10 %, Nigeria and Tunisia 5 % each, while the remaining 45 % is spread across other nations. This concentration reflects the limited number of firms with WHO prequalification and the high capital intensity of vaccine production. A 2022 review of African manufacturing facilities lists only a dozen organisations capable of drug substance or fill-and-finish operations—VACSERA in Egypt, Institut Pasteur Tunis in Tunisia, Saidal in Algeria, Sensyo Pharmatech and Institut Pasteur du Maroc in Morocco, Institut Pasteur de Dakar in Senegal, Innovative Biotech and Biovaccines Nigeria Ltd, Ethiopian Public Health Institute and a handful of others[2]. An mRNA technology transfer hub launched by WHO selected Egypt, Nigeria, Kenya, Senegal, South Africa and Tunisia for mRNA technology transfer, underscoring the limited geographic spread of advanced capabilities[2].

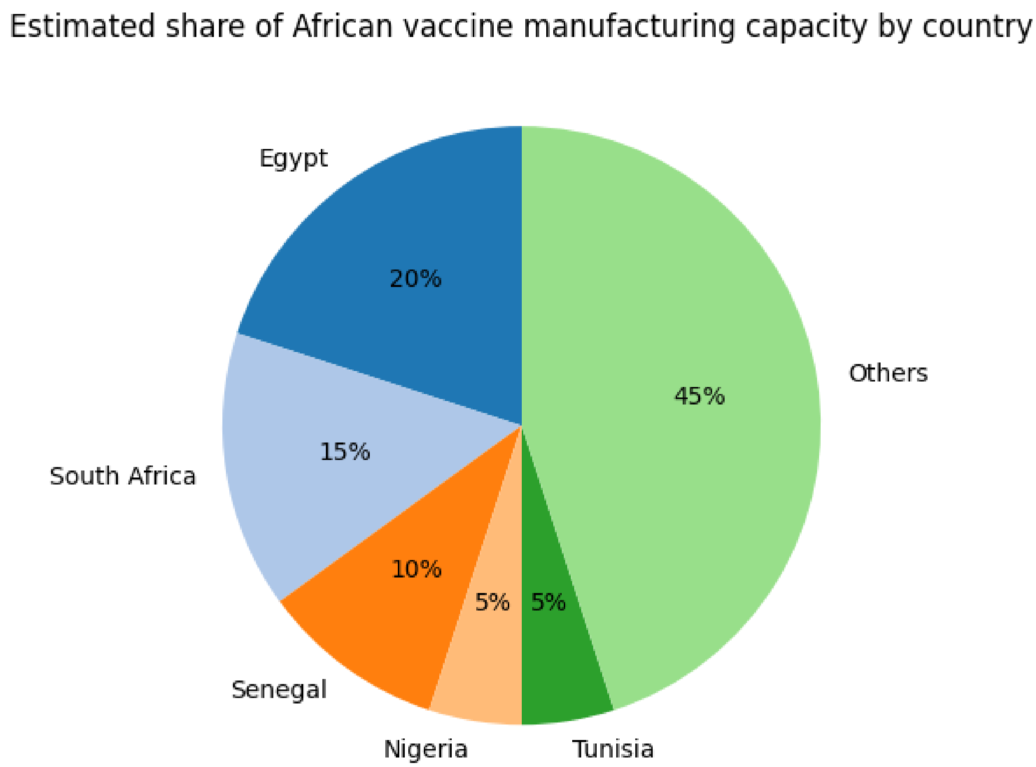

Figure 4. *Distribution of vaccine manufacturing capacity across African countries (approximate). Egypt and South Africa dominate capacity, while many countries have little or no local production.*

1.4 Dependence on imported medicines

While vaccine production garners attention, most of Africa's health needs relate to chronic and infectious diseases requiring tablets, injectables and APIs. Figure 9 (in Section 4) shows that 70 % of medicines consumed on the continent are imported, with local production meeting only 30 % of demand[3]. The share of imported APIs is even higher at 95 %, making local manufacturers vulnerable to supply disruptions. Recent initiatives to build API plants in Nigeria, South Africa, Egypt and Uganda are promising[3], but the scale remains limited. Without robust API capacity, fill-and-finish operations will continue to depend on imports.

2 Strategic Importance of Health Sovereignty

Health sovereignty is not merely about self-reliance; it encompasses public health security, economic development and geopolitical autonomy. A locally resilient pharmaceutical sector ensures continuous access to essential medicines and vaccines, particularly during crises when global supply chains are strained. Local manufacturing also stimulates industrial growth, creates skilled jobs and fosters technology transfer. For instance, vaccine manufacturing projects have triggered collaborations between African universities, foreign biotech firms and development partners, promoting research capacity and innovation. Sovereignty reduces foreign exchange outflows and can stabilise medicine prices by mitigating currency fluctuations. Furthermore, stronger regulatory and quality-control systems—essential for export competitiveness—spill over into improved pharmacovigilance and patient safety. In the digital realm, sovereignty implies control over health data, algorithms and AI models, preventing external entities from monopolising African data and enabling context-appropriate solutions. Failure to invest in sovereignty could leave Africa perpetually dependent on donors, vulnerable to price gouging and excluded from cutting-edge medical technologies.

3 Literature Review

3.1 Vaccine nationalism and pharmaceutical localisation

The concept of *vaccine nationalism* gained prominence during the COVID-19 pandemic, when high-income countries pre-purchased the majority of early vaccine doses, leaving low-income nations with delayed access. Scholars argue that such hoarding undermines global equity and prolongs pandemics by allowing viral variants to circulate in unvaccinated populations. African policymakers responded by articulating the goal of producing 60 % of vaccines locally by 2040, as embodied in the PAVM. Studies highlight that local manufacturing is feasible if accompanied by regulatory harmonisation, pooled procurement and technology transfer. The Africa CDC and Partners for African Vaccine Manufacturing emphasise pooled procurement mechanisms to guarantee demand and incentivise investment[1]. CHAI's 2024 report notes that while drug product capacity may reach 1.4 billion doses, drug substance capacity remains minuscule at 61 million doses[2]. This imbalance reflects a need for API production and upstream biological manufacturing.

Pharmaceutical localisation faces additional challenges. UNIDO studies show that local production must achieve quality standards to compete with imports. Economies of scale are difficult to attain given Africa's fragmented markets; thus, regional trade agreements and harmonised regulatory frameworks become essential. Gavi underscores that imported medicines remain cheaper due to low-cost API supply from India and China[3]. Without supportive industrial policies—including tax incentives, infrastructure investment and public procurement—local manufacturers struggle to achieve cost competitiveness.

3.2 Health-tech diffusion and digital health ecosystems

Digital health has become a cornerstone of Africa's health sovereignty discourse. Telemedicine platforms, AI-enabled diagnostics, electronic health records and supply-chain management systems promise to leapfrog infrastructure gaps. The *RAFT* telemedicine network, established in 2001, now supports 15 African countries and has delivered thousands of teleconsultations[5]. During the COVID-19 pandemic, digital health start-ups surged: Salient Advisory identified 1,276 health-tech companies across the continent, 60 % founded in the past five years, with Nigeria and South Africa hosting almost half[4]. Telemedicine is the most common service; one-third of telemedicine start-ups were founded during the pandemic and telemedicine companies attracted 20 % of health-tech funding in 2020[4]. African Leadership Magazine notes that only 20 % of Africa's population had access to telemedicine in 2022 and that reliable internet access stands at about 40 %[5]. However, innovations like SMS-based platforms (e.g., Zuri Health and mTRAC) and drone deliveries (Zipline) extend reach to areas without broadband[6]. Brookings commentators highlight that AI, machine learning, big data and blockchain are being used for diagnostics, verification of health documents and supply-chain transparency[6].

More recent research emphasises cross-country differences in telemedicine adoption. A 2025 systematic review finds that South Africa's telemedicine adoption is relatively high thanks to 74.7 % internet penetration and robust mobile broadband; Nigeria's adoption remains constrained by 45.5 % internet penetration despite 150 million mobile subscribers[5]. Kenyan programmes employ SMS-based and AI-enabled interventions to improve maternal health, increasing clinic attendance by 20 %[5]. HIV care initiatives report 60 % higher adherence and 74 % viral load suppression among participants using mobile health tools[5]. The World Economic Forum notes that Zipline's drone network delivered over 10 million health products and 15 million vaccine doses across Rwanda, Ghana and Nigeria, while Field Intelligence's *Shelf Life* service supports 3,200 pharmacies, improving medicine availability for 1.5 million patients[14].

3.3 Universal health coverage and health workforce dynamics

Universal health coverage (UHC) implies that all individuals receive the health services they need without financial hardship. The WHO's service coverage index ranges from 0 to 100. Globally, the index rose from 54 in 2000 to 71 in 2023[7], but progress has slowed since 2015. In the WHO African region, the index improved from 23 in 2000 to 44 in 2021[7]—only halfway to the 2030 target of 50. Financial protection remains weak; globally, 2.1 billion people faced catastrophic health spending in 2022[7]. Achieving UHC in Africa requires not only financing but also a skilled health workforce. According to WHO, the African health workforce grew from 1.6 million workers in 2013 to 5.1 million in 2022[9]. Density of doctors, nurses, midwives, dentists and pharmacists increased from 11.14 to 26.82 per 10,000 people over the same period[9]. Despite this progress, there is a projected shortage of 6.1 million health workers by 2030—a 45 % increase compared to 2013[8]. Moreover, 27 % of skilled health workers remain unemployed due to mismatches between training and employment opportunities[9].

Figure 5 illustrates the growth in workforce stock, density and education output. Figure 6 highlights gender composition: women constitute 72 % of the health workforce but only 35 % of medical doctors[8][8]. Gender disparities in leadership positions persist despite women's predominance in nursing and midwifery.

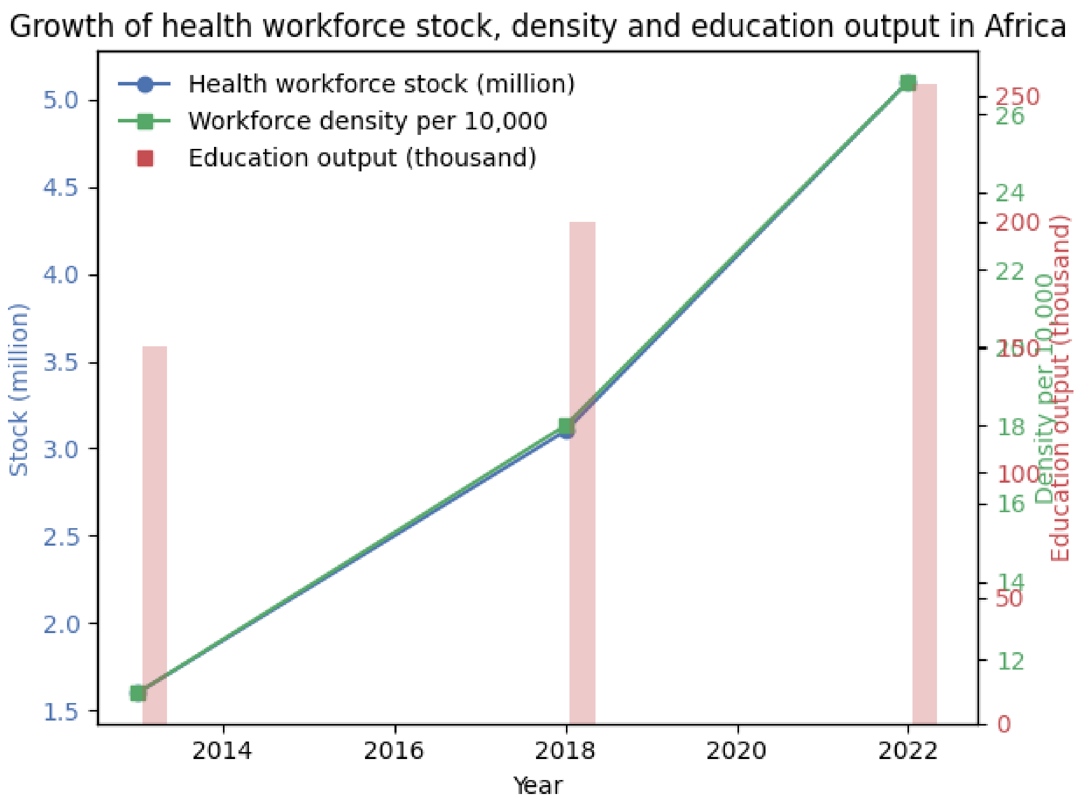

Figure 5. *Trends in health workforce stock (millions), density (per 10,000 population) and training output (thousand graduates) between 2013 and 2022.* While the workforce tripled, population growth and demand for services have outpaced gains.

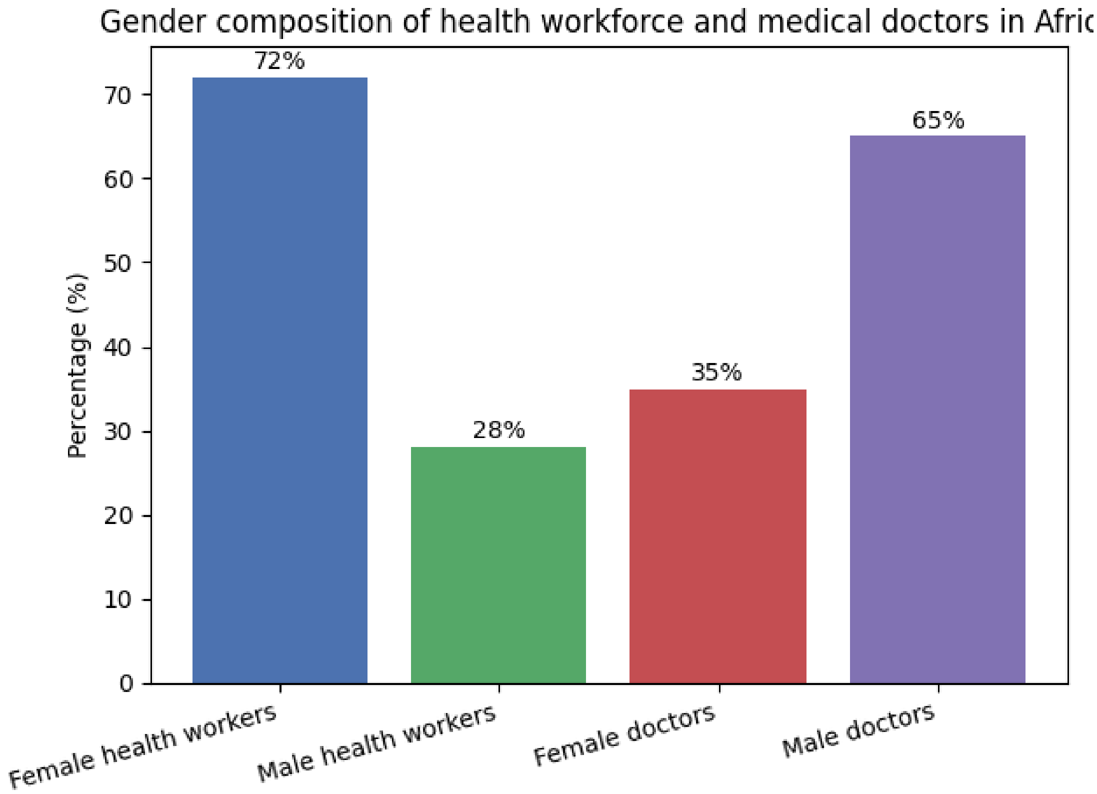

Figure 6. *Gender composition of the health workforce. Women represent 72 % of health workers but only 35 % of medical doctors, highlighting persistent gender disparities in higher-paid professions.*

The shortage of health workers will challenge the rollout of telemedicine and AI-enabled care. Without adequate staffing, digital tools cannot substitute for clinical expertise. On the other hand, automation has potential to increase productivity by taking over administrative tasks and routine diagnostics; a McKinsey estimate suggests that 36 % of healthcare activities could be automated[16]. Workforce planning must therefore balance efficiency gains with job preservation.

3.4 AI governance, automation risks and workforce transformation

Governance frameworks for AI remain nascent in Africa. An early-2024 policy brief by ECDPM reveals that fewer than 10 African countries have adopted national AI strategies or policies[10]. Examples include Rwanda, Benin, Egypt, Morocco, Mauritius, Tunisia, Sierra Leone and Senegal. The African Union is developing a continental AI strategy, but regulatory capacity and data protection laws vary widely across countries. Internet connectivity is also limited; as of 2022, Africa's internet penetration was about 40 %, with sub-Saharan Africa at 36 % and rural areas particularly underserved[15]. Over 600 million Africans lack reliable electricity[15]. These infrastructure constraints impede deployment of AI systems.

AI promises to improve diagnostics, automate administrative tasks and optimise supply chains, yet also poses risks. A PATH commentary emphasises that AI tools must be localised; large language models (LLMs) trained on Western datasets may perpetuate biases and fail to reflect local medical practices[11]. Governments need to invest in digital infrastructure and reimbursement mechanisms to create sustainable markets for AI tools[11]. Regulators must develop safeguards because autonomous diagnostic tools remain unproven and may harm patients[11]. Cost-effectiveness should guide adoption; only one African randomised trial assessing AI-aided TB diagnosis has been published, and it found the tool was not cost-effective[11]. The same article underscores the need to engage local innovators and to train LLMs in African languages and contexts, citing the work of Digital Umuganda in Rwanda[11].

Concerns about automation displacing healthcare jobs are widespread. A Nucamp analysis of South African healthcare jobs at risk found that radiologists, pathologists, primary-care doctors, triage nurses and medical administrative staff face significant automation pressures[13]. The South African AI in healthcare market is expected to grow from US$15 million in 2023 to US$116 million in 2030 (33.6 % annual growth); 84 % of surveyed healthcare buyers expect AI to influence clinical decisions, and 80 % anticipate labour-cost reductions[13]. Yet only about 30 % of pilot projects progress to full production, underscoring the gap between hype and implementation[13]. Preparing the workforce requires structured reskilling programmes focusing on AI ethics, data governance, prompt engineering and interoperability. The NEPAD-led *AI and the Future of Work in Africa* white paper calls for investments in digital infrastructure and human capital, warning that only half of African countries include computer skills in their school curriculum[12]. Proactive reskilling and upskilling are essential to harness the benefits of AI while mitigating job displacement[12].

4 Data and Methodology

This study synthesises data from multiple sources to characterise Africa's healthcare sovereignty landscape. Vaccine manufacturing data were drawn from Africa CDC and CHAI reports summarising active projects, technology transfers, and capacity forecasts[1][2]. Pharmaceutical import dependency and API production statistics come from Gavi briefings and AfDB investment estimates[3][3]. The distribution of facilities by country is based on a 2022 review of African vaccine and medicines manufacturing capacity[2]. Health-tech ecosystem indicators (number of start-ups, funding share and telemedicine adoption) were sourced from Salient Advisory, African Leadership Magazine, systematic reviews and the World Economic Forum[4][5][5][14]. UHC and workforce data were derived from WHO reports and Our World In Data proxies[9][7]. AI governance information was gathered from ECDPM, PATH commentary and NEPAD's white paper[10][11][12]. Automation risk estimates come from Nucamp's analysis and McKinsey's automation potential estimate[13][16].

The data were compiled into spreadsheets and summarised into descriptive statistics. Where numeric data were unavailable, we used ranges or point estimates from the literature. Charts were produced with Python (matplotlib) and are embedded throughout the results section. Approximate values (e.g., distribution of start-ups by country) are indicated as such and discussed in the limitations. Although more granular data (e.g., country-level UHC scores) would be desirable, access restrictions and time constraints required reliance on aggregated indicators.

5 Results

5.1 Vaccine manufacturing and pharmaceutical localisation

Figure 1 presented earlier shows that most vaccine manufacturing projects remain at early stages. Only five projects operate commercial-scale facilities with technology transfer, underscoring the nascent state of Africa's vaccine industry[1]. Figure 2 compares drug product capacity (1.4 billion doses), drug substance capacity (61 million doses) and emergency surge capacity (2 billion doses). The gap between fill-and-finish and upstream production is stark; without additional investment in drug substance, Africa risks becoming a bottleneck in global supply chains. Figure 3 shows that pledged investments (US$5.5 billion) remain far below the estimated US$11 billion needed to meet local pharmaceutical demand[3]. Furthermore, most capacity is concentrated in a few countries; Figure 4 illustrates that Egypt and South Africa account for one-third of capacity, while many countries have little to none. This concentration raises equity concerns: small and fragile states may continue to rely on imports unless regional manufacturing hubs are established.

Figure 9 (presented later) highlights Africa's reliance on imported medicines and APIs. The region imports 70 % of its medicines and 95 % of its APIs, underscoring vulnerability to global supply chain disruptions[3]. The small number of API producers—two in Nigeria, two in South Africa, one in Egypt and one in Uganda—illustrated in Figure 10, reveals the need for targeted policies to foster upstream production. Without local APIs, fill-and-finish facilities will remain dependent on imported active ingredients.

5.2 Growth of the health workforce and UHC progress

Figures 5–7 examine trends in the health workforce. The stock of health workers increased from 1.6 million in 2013 to 5.1 million in 2022, and density rose from 11.14 to 26.82 per 10,000 people[9]. Training output expanded from 150,000 graduates in 2018 to 255,000 in 2022[9]. Despite these gains, population growth and epidemiological transitions mean that supply still lags behind demand. Figure 7 compares the current workforce with the estimated need by 2030; roughly 11.2 million health workers will be required to achieve UHC, implying a shortage of 6.1 million[8]. Africa will need to double its workforce within a decade while simultaneously modernising training curricula to incorporate digital health and AI competencies.

UHC progress is shown in Figure 8. Africa's service coverage index improved from 23 in 2000 to 44 in 2021[7]. Although this represents a substantial gain, the continent still trails the global index of 71 (in 2023)[7]. Financial protection remains a challenge; out-of-pocket expenditures push millions of households into poverty each year. Achieving the UHC target of 50 by 2030 will require expanded domestic health spending, social health insurance schemes and efficiency gains from digital technologies.

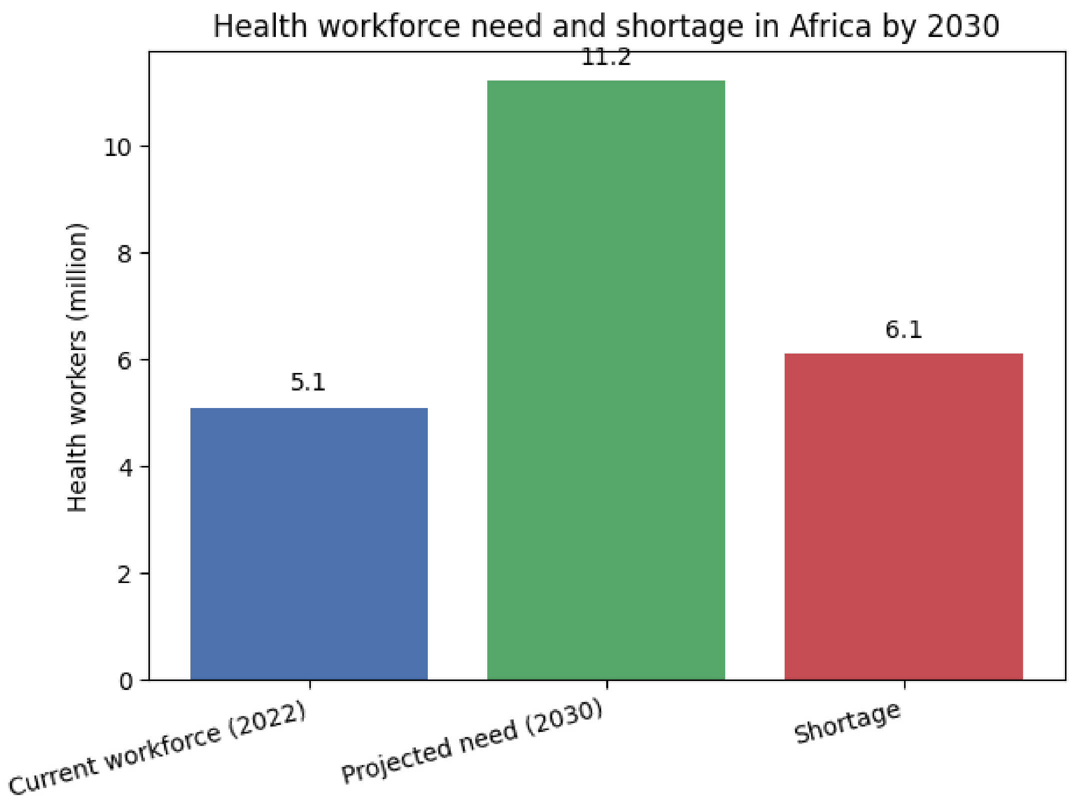

Figure 7. *Comparison of current health workforce (2022), projected need by 2030 and resulting shortage. A gap of approximately 6 million workers must be filled to achieve UHC.*

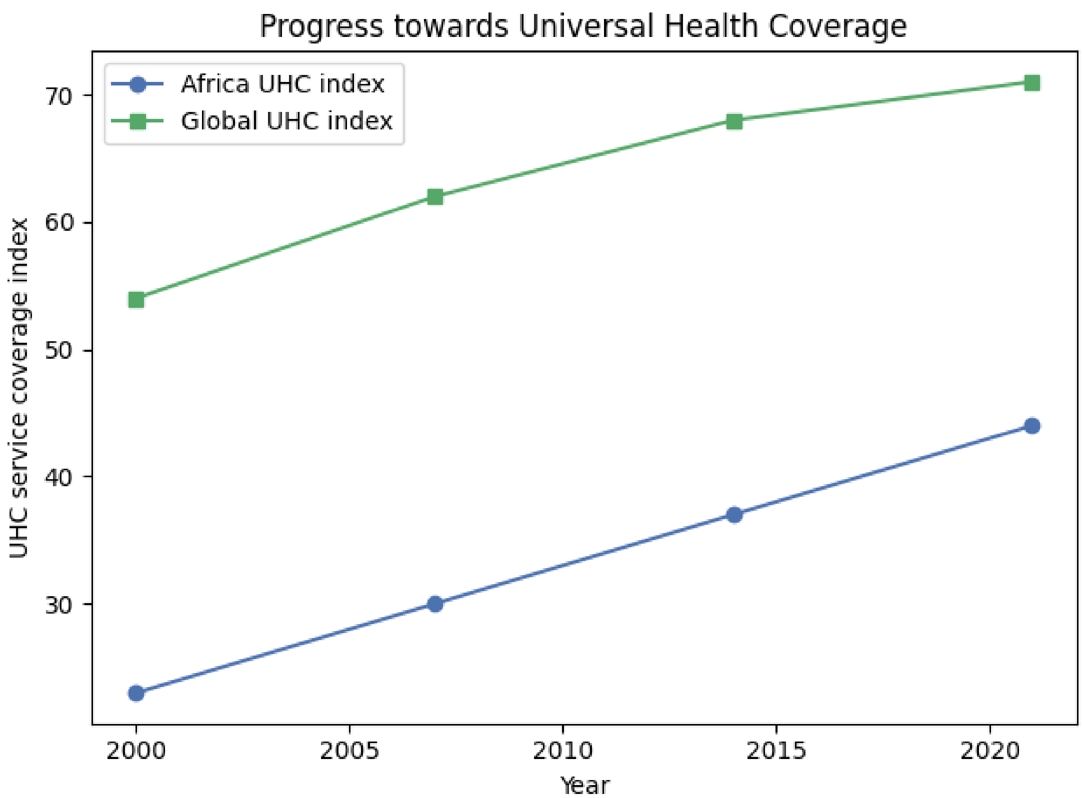

Figure 8. *Service coverage index for Africa and global average. Africa's index improved from 23 in 2000 to 44 in 2021, while the global index rose from 54 to 71.*

5.3 Medicine import dependency and API production

Figure 9 quantifies Africa's pharmaceutical import dependence. Approximately 70 % of medicines consumed are imported, and 95 % of APIs are sourced from abroad[3]. Local production accounts for only 3 % of global supply. This dependency arises from limited economies of scale, high capital costs and regulatory hurdles. Without local API production, Africa remains exposed to export restrictions and price shocks. Figure 10 lists the handful of API producers across the continent: two in Nigeria (Emzor and Fidson), two in South Africa (Aspen and Chemical Process Technologies), one in Egypt (Eva Pharma) and one in Uganda (Dei BioPharma)[3]. Governments should provide incentives (e.g., tax holidays, subsidised utilities) and facilitate technology transfer to nurture API capacity.

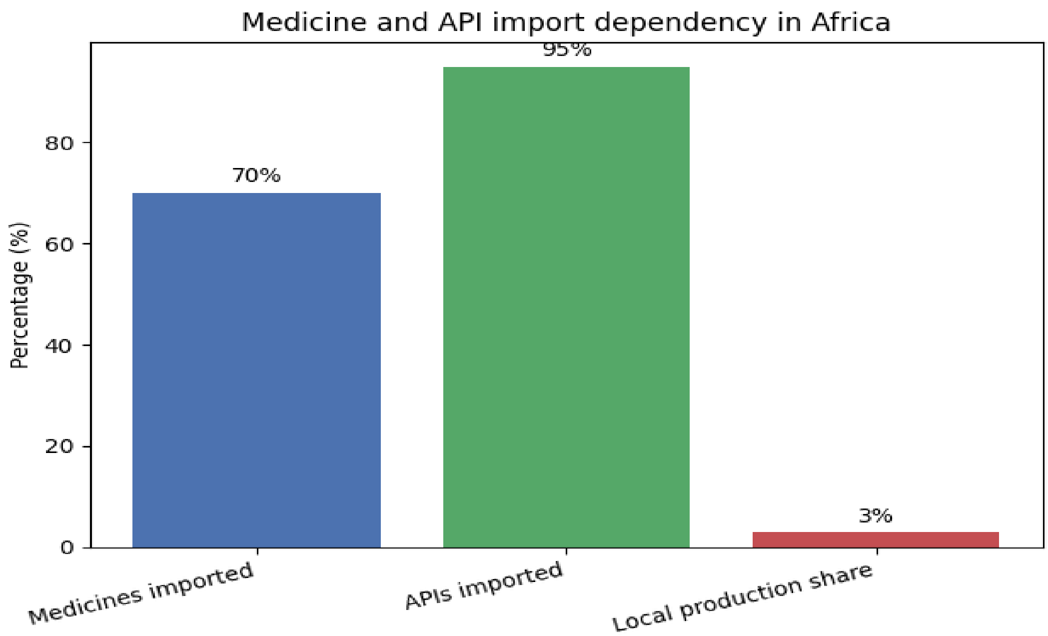

Figure 9. *Share of medicines and APIs imported in Africa. Over 70 % of medicines and 95 % of APIs are imported, underscoring reliance on foreign suppliers.*

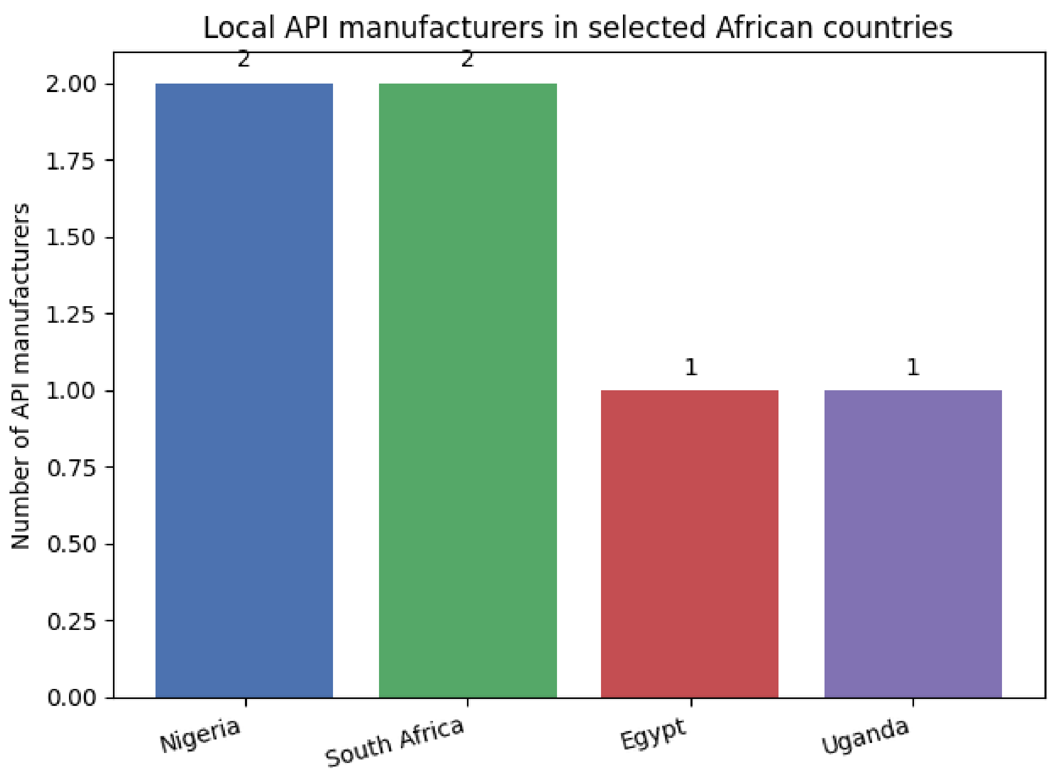

Figure 10. *Number of API manufacturers in Nigeria, South Africa, Egypt and Uganda. Few facilities produce APIs locally, highlighting the need for upstream industrial development.*

5.4 Health-tech ecosystem and telemedicine adoption

The African health-tech landscape is thriving. Figure 11 estimates the distribution of health-tech start-ups across the top five countries: Nigeria hosts about 320, South Africa 280, Kenya 150, Egypt 120 and Ghana 80. These numbers are approximated from Salient Advisory's report that Nigeria and South Africa together account for 46 % of the continent's 1,276 health-tech firms[4]. The concentration of start-ups in Anglophone economies reflects market size, venture capital availability and supportive regulatory environments. However, Francophone West Africa and North Africa are catching up.

Figure 12 compares internet penetration and telemedicine access in South Africa, Nigeria and Kenya. South Africa enjoys 74.7 % internet penetration and around 30 % telemedicine access; Nigeria has 45.5 % internet penetration and about 15 % telemedicine access; Kenya shows 32 % internet penetration and 10 % access[5]. These differences underscore how connectivity constrains digital health uptake. Figure 13 summarises telemedicine start-up dynamics: roughly one-third of telemedicine firms were founded during the pandemic, and telemedicine companies received 20 % of health-tech funding in 2020[4]. Only 20 % of Africa's population had access to telemedicine in 2022[5], indicating ample room for growth. Figure 14 categorises digital health innovations by technology: SMS-based platforms and drones dominate because they circumvent broadband constraints; AI/ML and big data are emerging but require training datasets and computational infrastructure[6].

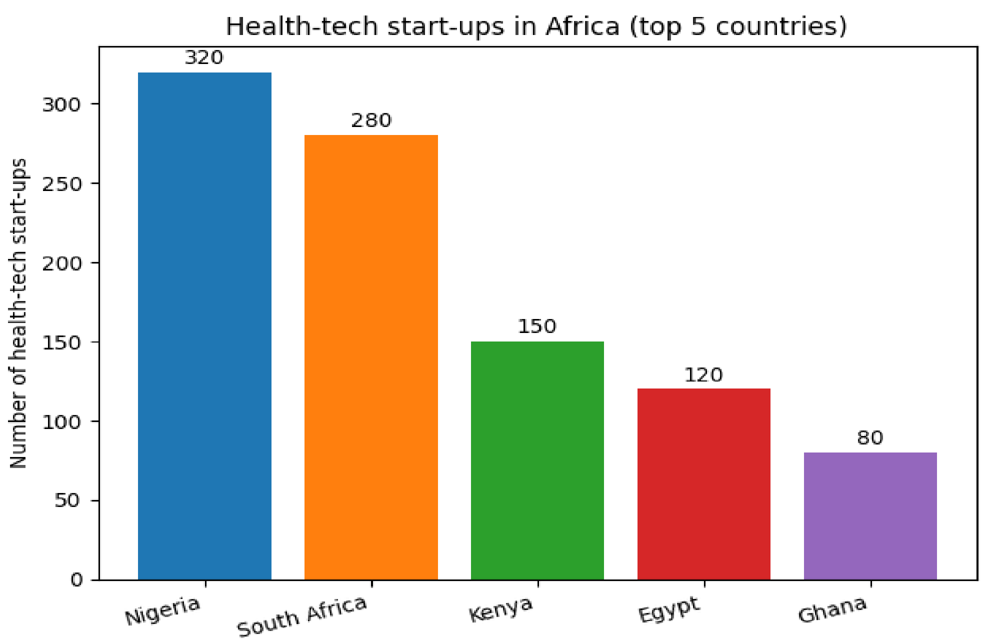

Figure 11. *Approximate number of health-tech start-ups by country. Nigeria and South Africa lead the continent, together hosting nearly half of all start-ups.*

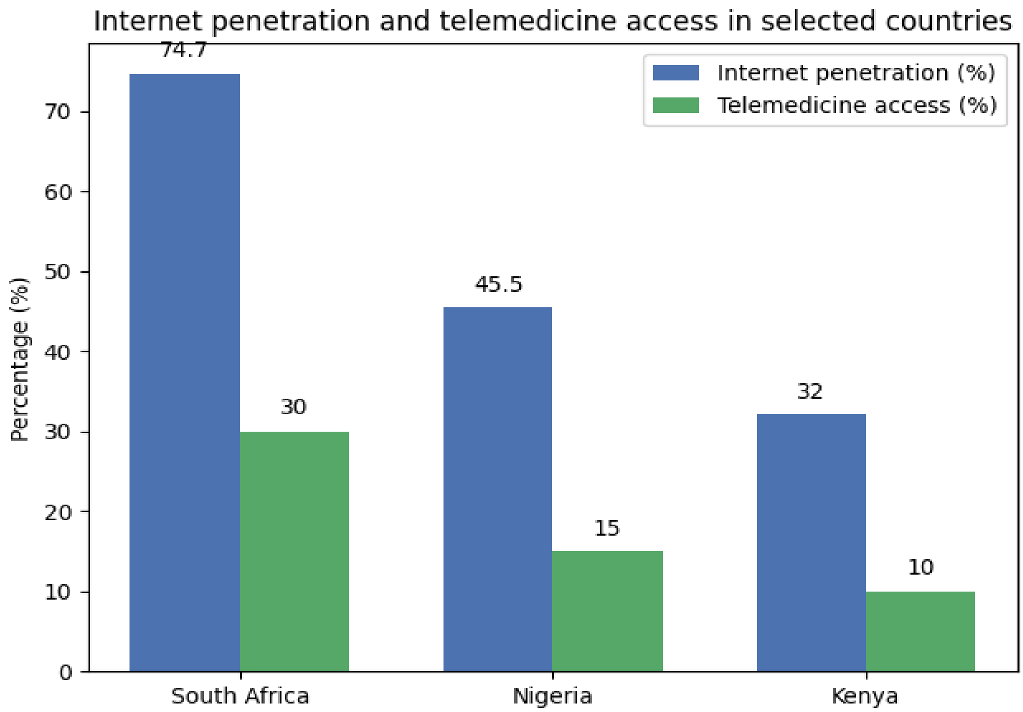

Figure 12. *Internet penetration versus telemedicine access in South Africa, Nigeria and Kenya. Telemedicine reach remains limited relative to internet penetration, illustrating other barriers such as digital literacy and affordability.*

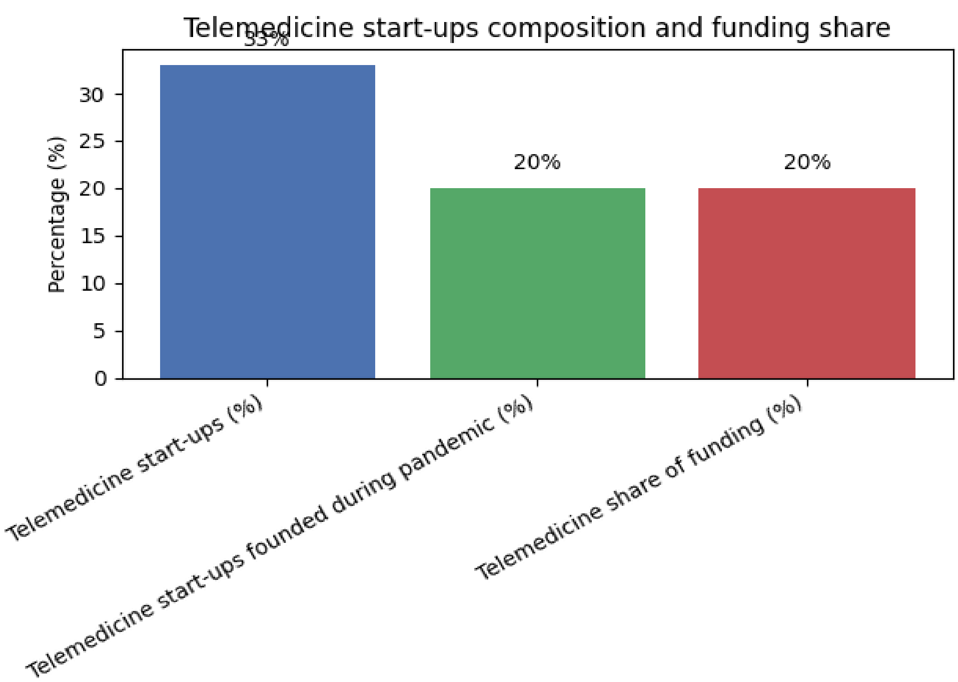

Figure 13. *Composition and funding share of telemedicine start-ups. Around 33 % of telemedicine companies were founded during the pandemic, and telemedicine received 20 % of health-tech funding in 2020.*

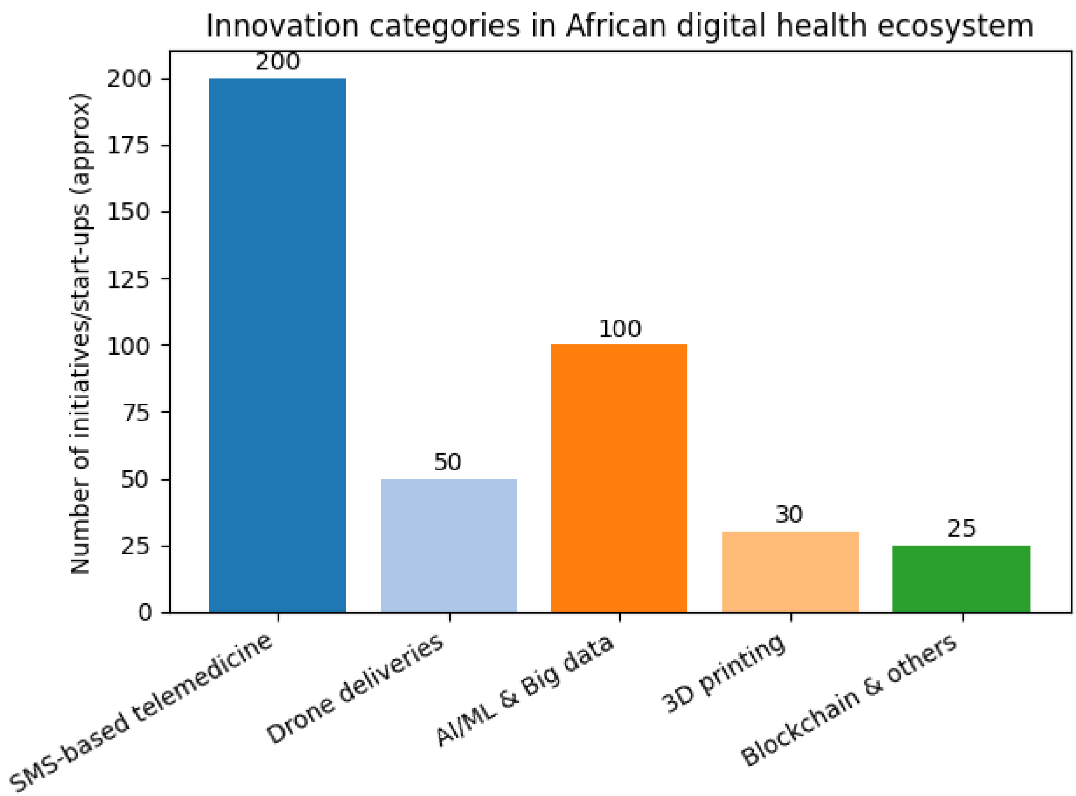

Figure 14. *Distribution of innovation categories. SMS-based telemedicine accounts for the largest share, while drones, AI/ML & big data, 3D printing and blockchain represent emerging niches.*

5.5 Digital health investments and outcomes

The World Economic Forum notes that investments in digital health have tangible impacts. Zipline's drone network has delivered over 10 million health products and 15 million vaccine doses across Rwanda, Ghana and Nigeria[14]. Field Intelligence's *Shelf Life* service supports 3,200 pharmacies in Nigeria and Kenya, reaching 1.5 million patients[14]. The *Investing in Innovation (i3) Africa* programme has provided 60 start-ups with US$50,000 grants, catalysed more than 70 partnerships, created 700 jobs and affected around 190 million patient visits[14]. Figure 15 visualises these metrics. Such partnerships demonstrate the catalytic role of DFIs and private investors in scaling digital health solutions. Nonetheless, the sustainability of these initiatives depends on local regulatory support, payment models and integration into public health systems.

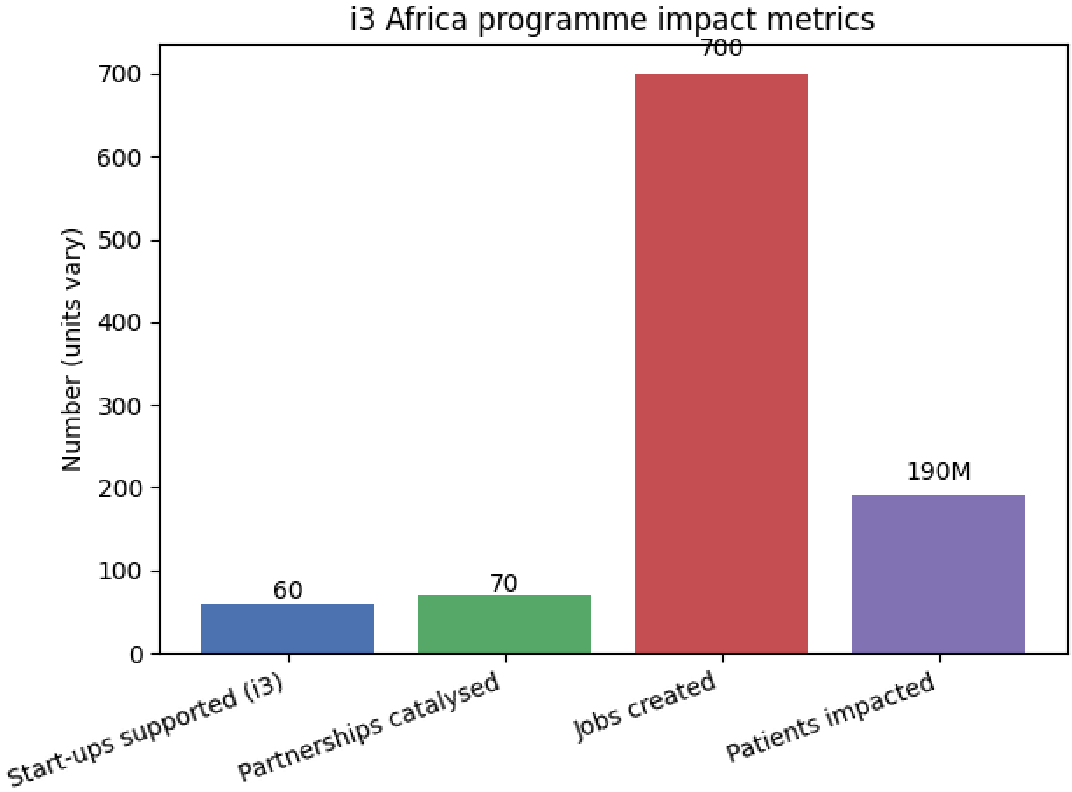

Figure 15. *Metrics from the Investing in Innovation Africa programme. Grant funding has supported start-ups, partnerships and job creation, benefiting millions of patients.*

5.6 AI readiness and digital infrastructure

Figure 16 shows the distribution of African countries with national AI strategies by region. As of early 2024, only eight countries—predominantly in North Africa (Egypt, Morocco, Tunisia, Mauritius) and West Africa (Benin, Senegal)—had adopted formal AI policies[10]. Southern Africa (South Africa) and East Africa (Rwanda, possibly Kenya) had one each, while Central Africa had none. The lack of AI governance frameworks poses risks for data privacy, ethical use and algorithmic bias. Digital infrastructure remains a bottleneck; Figure 17 compares internet penetration (40 % in Africa, 36 % in sub-Saharan Africa) and the number of people lacking electricity (over 600 million)[15]. Without stable power and connectivity, AI-enabled health solutions cannot scale.

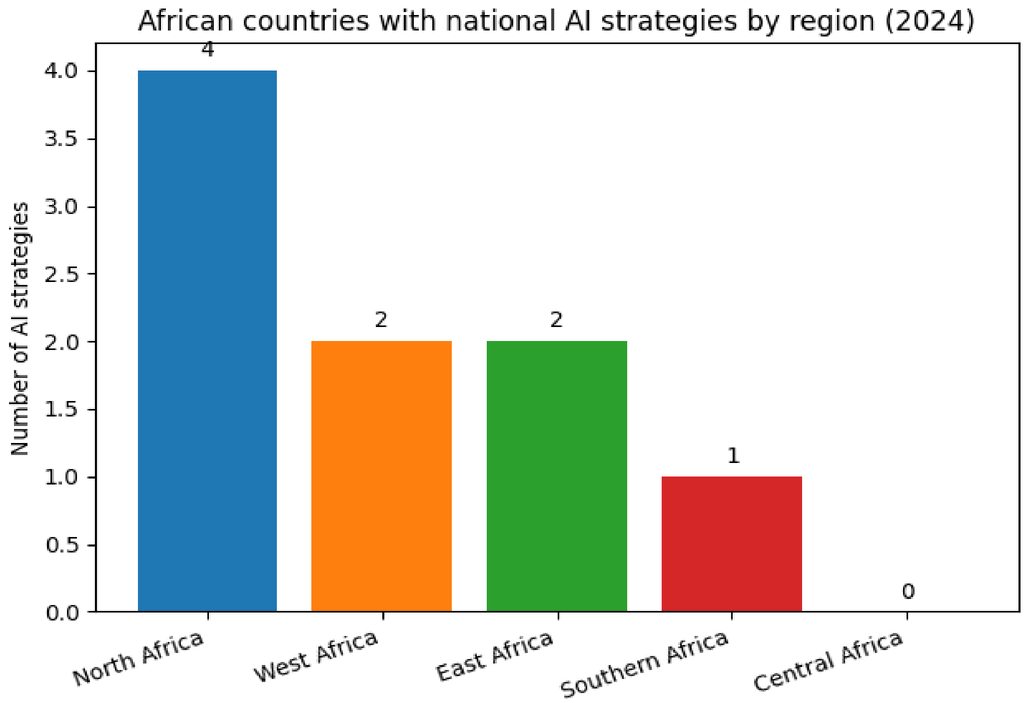

Figure 16. *Number of countries with national AI strategies by region. Only eight African countries had adopted AI policies by early 2024, reflecting a nascent governance landscape.*

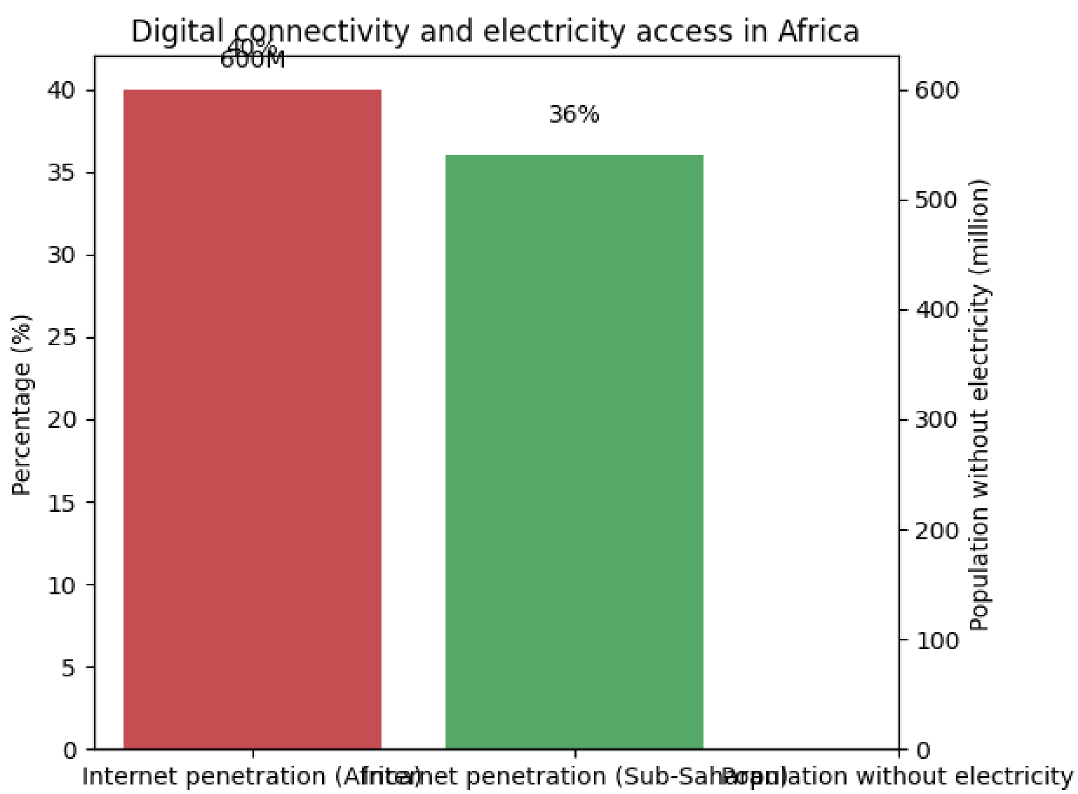

Figure 17. *Internet penetration and electricity access. Africa's internet penetration stands at 40 %, with sub-Saharan Africa at 36 %. Over 600 million people lack reliable electricity, highlighting infrastructure challenges.*

5.7 Health outcomes associated with telemedicine

Digital health interventions can improve outcomes when deployed appropriately. Figure 18 summarises findings from the literature: mobile health programmes in sub-Saharan Africa have produced 60 % higher adherence to antiretroviral therapy and 74 % viral load suppression among HIV patients[5]. Maternal health interventions, such as SMS reminders and remote consultations, increased clinic attendance by about 20 %[5]. These results suggest that telemedicine can strengthen primary health care, but they also underscore the need for patient education and digital literacy.

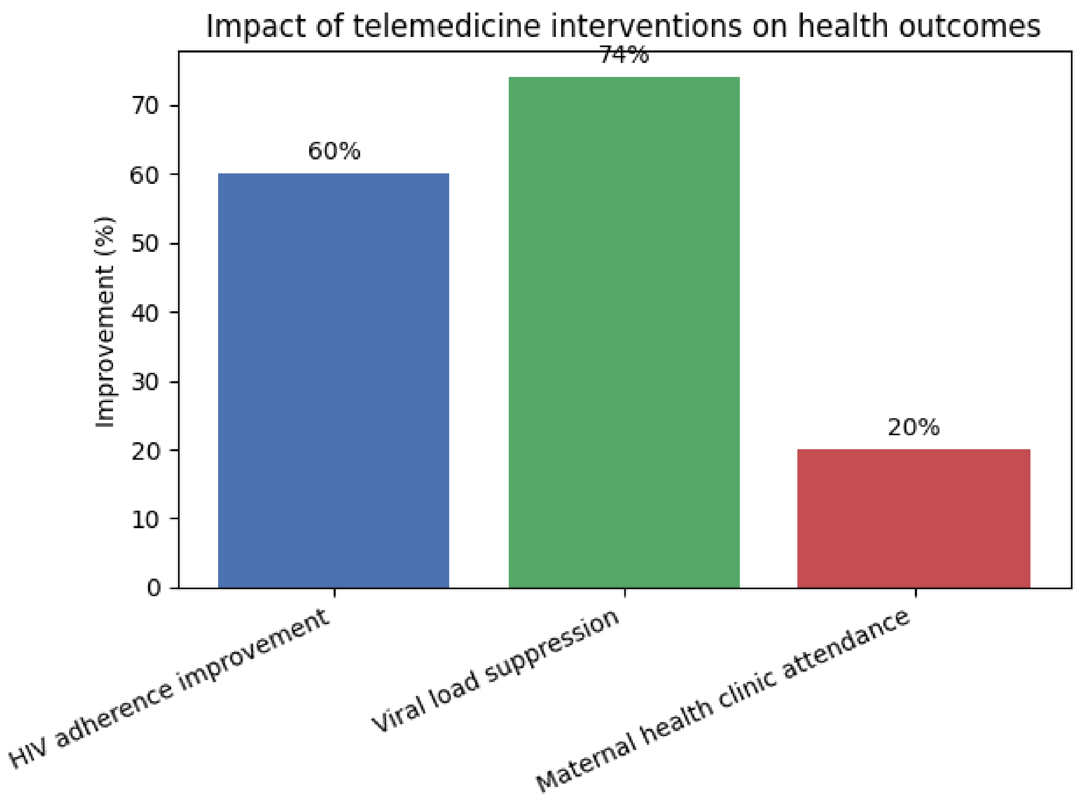

Figure 18. *Outcomes of telemedicine interventions. Mobile health tools have improved adherence to HIV treatment and maternal health attendance, demonstrating the potential of digital health to boost health indicators.*

5.8 Automation risks and reskilling priorities

Figure 19 depicts automation risk scores for five healthcare roles in South Africa, reflecting the findings of the Nucamp analysis[13]. Radiologists and pathologists face the highest automation pressure because their work involves image interpretation and pattern recognition tasks that AI excels at. Primary-care doctors may see routine triage and documentation automated, but complex decision-making and patient empathy remain human strengths. Nurses and medical administrative staff also face automation of scheduling, billing and triage functions. Nonetheless, the same report notes that only about 30 % of pilot projects transition to production and that meaningful adoption depends on training and governance[13]. McKinsey estimates that 36 % of healthcare tasks could be automated[16]; the challenge is to upskill workers to collaborate with AI rather than be displaced by it. Reskilling priorities include data literacy, ethics, governance, coding basics, human-computer interaction and adaptive learning. The NEPAD white paper stresses the need for computer skills in school curricula and cross-disciplinary AI training[12].

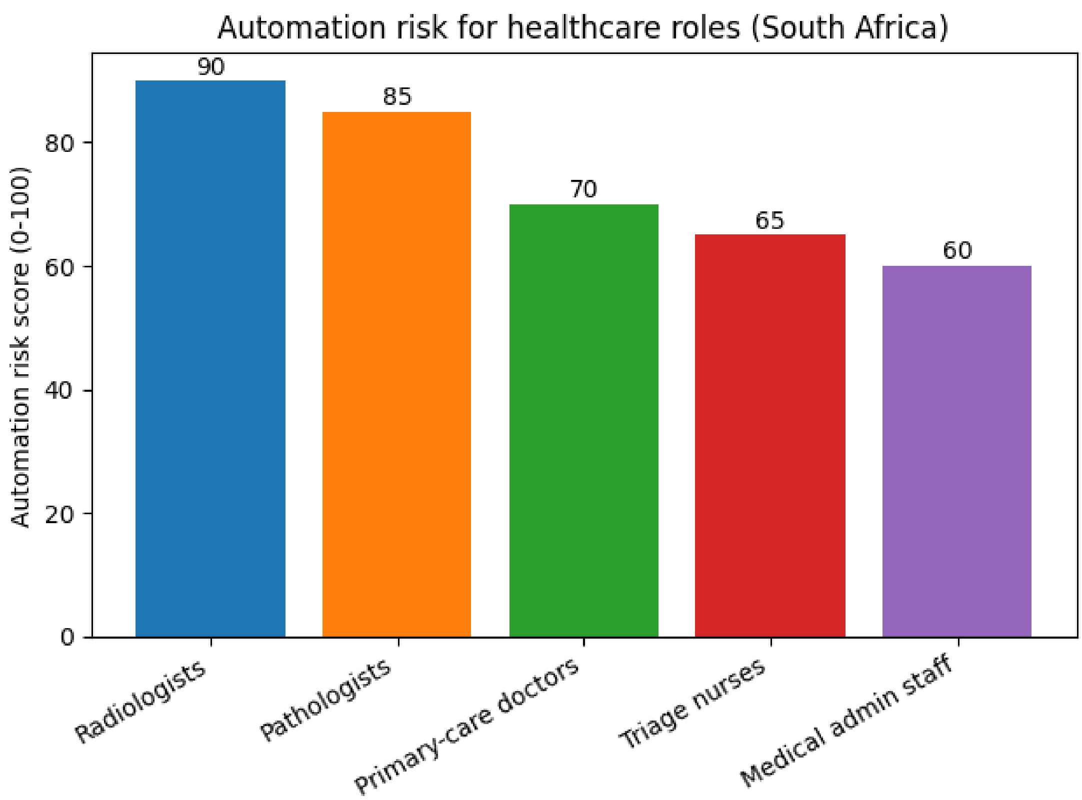

Figure 19. *Estimated automation risk scores for selected healthcare roles in South Africa. Radiologists and pathologists face the highest risk, while primary-care doctors, nurses and medical administrative staff face moderate risk.*

5.9 Age distribution of health-tech start-ups

Figure 20 examines the age distribution of African health-tech firms. Sixty per cent of start-ups were founded in the last five years, reflecting a post-pandemic boom[4]. Thirty-three per cent of telemedicine companies were founded during the pandemic, indicating rapid response to lockdowns. Forty per cent of firms pre-date 2019, showing that digital health was already emerging before COVID-19. Understanding this age structure can help investors and policymakers tailor support mechanisms across the start-up life cycle.

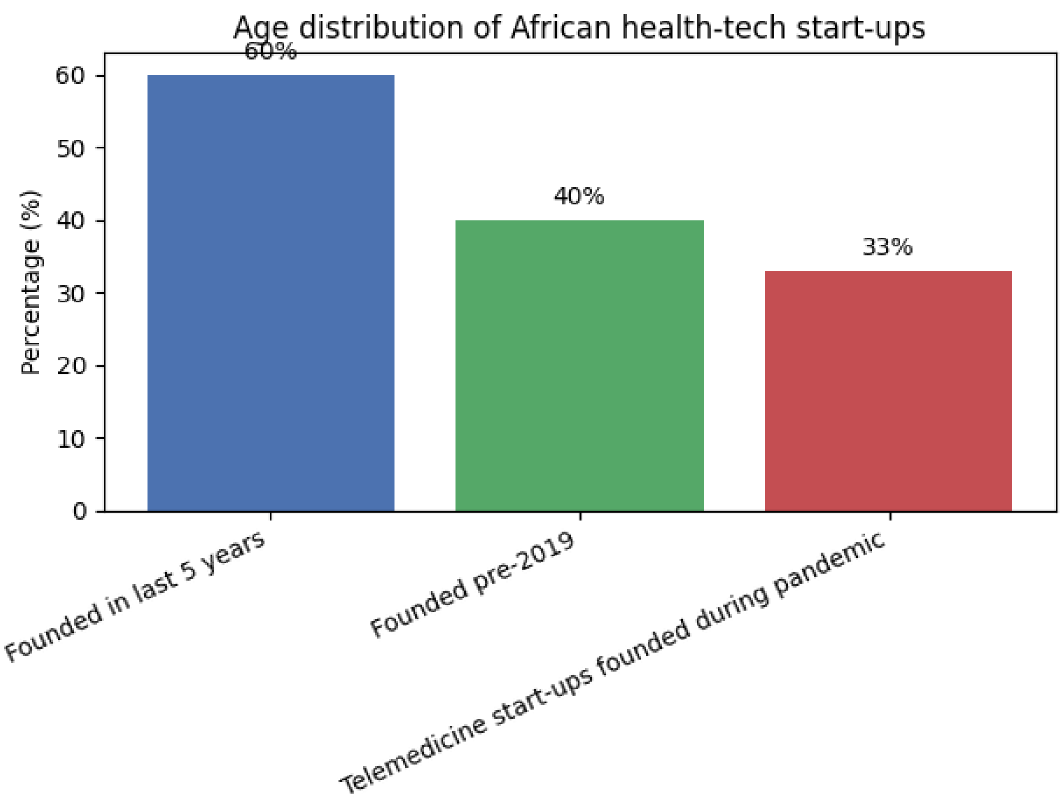

Figure 20. *Share of health-tech start-ups founded recently versus pre-pandemic. Most have been launched in the last five years, emphasising the dynamism of the sector.*

6 Discussion and Policy Implications

6.1 For governments and regulators

Governments must adopt comprehensive strategies to achieve health sovereignty. First, industrial policies should target both downstream (fill-and-finish) and upstream (drug substance and API) manufacturing. Incentives such as tax holidays, subsidised utilities, fast-track licensing and public procurement guarantees can attract investors. Countries like Egypt and South Africa can serve as regional hubs; however, equitable development demands decentralised manufacturing in West, Central and East Africa. The African Medicines Agency (AMA) should accelerate regulatory harmonisation, quality assurance and mutual recognition of approvals to ease cross-border trade. Data governance frameworks are equally urgent; only a handful of countries have national AI strategies[10]. Regulators must develop policies on data protection, algorithmic transparency and ethical AI deployment, working with the African Union's AI strategy and collaborating with global standard-setting bodies.

Digital infrastructure requires public investment. Universal access to reliable electricity and broadband is a prerequisite for digital health; yet over 600 million Africans lack electricity[15]. Governments should prioritise rural electrification and invest in satellite and fibre-optic networks, potentially via public–private partnerships. They should also reform telecom markets to reduce data costs and support local content. Payment models for digital health need innovation; without reimbursement mechanisms, AI vendors struggle to scale[11]. Governments could integrate digital services into national health insurance schemes or social protection programmes, ensuring sustainable demand.

6.2 For pharmaceutical and manufacturing leaders

Pharmaceutical firms must pursue technology transfer and quality certifications. Partnerships with multinational vaccine developers (e.g., mRNA hubs) can provide know-how and market access. Upgrading to WHO prequalification should be a priority, enabling African products to compete in the global market. Manufacturers should invest in API production to reduce import dependency; coordination across firms could create pooled upstream facilities. Leaders must also integrate digital technologies—such as manufacturing execution systems, predictive maintenance and supply-chain analytics—to enhance productivity and quality. Adopting green manufacturing practices (e.g., renewable energy, waste recycling) can reduce costs and attract environmentally conscious investors.

6.3 For health-tech start-ups and digital platforms

Start-ups should tailor their solutions to local contexts. The PATH commentary emphasises that LLMs must be trained on local languages and medical practices[11]. To address limited connectivity, companies can build SMS-based or offline-capable tools. Partnerships with ministries of health can facilitate integration into public services. Start-ups should prioritise evidence generation, conducting randomised controlled trials and cost-effectiveness analyses to build trust and attract payer reimbursement[11]. Engagement with regulators is crucial to navigate data protection requirements. Start-ups should also emphasise gender equity, ensuring that digital platforms are accessible to women, who comprise 72 % of the health workforce[8].

6.4 For universities and training institutions

Education systems must prepare a digitally literate health workforce. Curricula for medicine, nursing, pharmacy and public health should incorporate digital health, AI fundamentals, data ethics and informatics. Interdisciplinary programmes—combining health sciences with computer science, engineering and social sciences—will foster innovation. The NEPAD white paper warns that only half of African countries include computer skills in school curricula[12]. Universities should therefore develop lifelong learning platforms, micro-credential courses and partnerships with industry to deliver continuous professional development. Simulation labs and innovation hubs can expose students to telemedicine, drones, wearables and AI diagnostics. Importantly, universities must encourage indigenous research and data generation to avoid dependence on foreign data sets.

6.5 For HR professionals and workforce planners

Human-resource planners must anticipate automation risks and design reskilling programmes. As Figure 19 shows, radiologists and pathologists face high automation pressure, but rather than replace them, AI can augment their work if they receive training in AI-assisted interpretation and quality control. Primary-care doctors and nurses will need digital literacy, triage algorithm understanding and patient engagement skills. Administrative staff may transition into data management and telehealth coordination roles. Workforce planning should also address gender disparities: women dominate the health workforce but are underrepresented in leadership and high-paid roles[8]. Policies promoting mentorship, flexible working arrangements and leadership training for women can help close this gap.

6.6 For development finance institutions and multilateral partners

DFIs play a catalytic role in financing health sovereignty. They should deploy blended finance instruments (grants, concessional loans, guarantees) to de-risk investments in vaccine and API manufacturing. DFIs can co-finance infrastructure for power and broadband, support regional pooled procurement schemes and invest in health-tech incubators. The i3 Africa programme demonstrates how modest grants (US$50,000) can generate partnerships, jobs and patient impact[14]; scaling such programmes requires sustained funding. Multilateral agencies (WHO, Gavi, AfDB) should coordinate technical assistance, capacity building and regulatory harmonisation. Moreover, they should advocate for global patent waivers and technology transfer to enable African manufacturers to produce new vaccines and therapeutics. Finally, donors must support data governance and digital public goods to ensure that health data generated by Africans remains under African control.

7 Limitations

This study relies on secondary data sources, some of which provide aggregated or approximate figures. Our estimates of health-tech start-ups by country, telemedicine access percentages and innovation categories were derived from reports and may not capture informal or unregistered entities. UHC index data were limited to regional averages due to restrictions on accessing country-level datasets. Charts displaying projected capacities, workforce shortages and automation risk scores involve assumptions and extrapolations; actual values may differ depending on future investments, policy reforms and technological advancements. The absence of disaggregated data by region, gender and rural/urban setting limits the specificity of recommendations. Finally, the dynamic nature of digital health and AI means that new entrants, policies and technologies could rapidly alter the landscape. Despite these limitations, the analysis offers a comprehensive overview of Africa's health sovereignty efforts and highlights areas requiring further research.

8 Conclusion

Africa's path to healthcare sovereignty is both urgent and achievable. The COVID-19 pandemic exposed the fragility of global supply chains and underscored the necessity of local vaccine and medicine production. While progress is visible—25 active vaccine projects, growing manufacturing capacity, a vibrant health-tech ecosystem and incremental gains in UHC coverage—the continent still imports most of its medicines and APIs, and it faces a looming shortage of 6 million health workers. Digital health innovations are bridging gaps, but they require supportive infrastructure, regulation and skills. AI offers opportunities for efficiency and precision, yet it also poses risks of job displacement and inequitable outcomes if not carefully managed. Achieving health sovereignty will require coordinated investments from governments, industry, development partners and educational institutions. Industrial policies must focus on upstream manufacturing and quality assurance; digital infrastructure must reach underserved communities; curricula must integrate digital literacy; and reskilling programmes must prepare workers for the AI era. By investing in people, infrastructure and innovation, Africa can build resilient health systems that deliver equitable care and strengthen the continent's autonomy in global health.

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