State of AI in Healthcare in Sub-Saharan Africa

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Responsible
AI for Africa

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About CEIMIA

In an era of rapid development in artificial intelligence (AI), including the arrival of generative AI, governments are faced with the crucial task of effectively navigating the complexities surrounding the deployment of AI and its impact on society. It is in this context that the International Centre of Expertise in Montreal on Artificial Intelligence (CEIMIA) supports the work of the Global Partnership on Artificial Intelligence (GPAI), a multi-stakeholder initiative aiming to bridge the gap between theory and practice on delivering responsible AI. GPAI does this by supporting cutting-edge research and applied activities on AI-related priorities. Built around a shared commitment to the OECD Recommendation on AI, GPAI brings together engaged minds and expertise from science, industry, civil society, governments, international organizations and academia to foster international cooperation.

With its unique position supporting GPAI, CEIMIA mobilizes international experts and resources (from the academic, private, and civil society sectors) to promote the responsible development and use of AI for the benefit of humanity. CEIMIA is therefore acting as a key player in the responsible development of AI based on human rights, inclusion, diversity, innovation, economic growth and the well-being of society, while seeking to achieve the United Nations' sustainable development goals.

In this shared effort to develop responsible AI, CEIMIA, with the support of the International Development Research Centre (IDRC), has launched a Researcher-in-Residence Program to facilitate the development of links with AI ecosystems in Global South, particularly in Africa, and to identify opportunities for collaboration with GPAI expert groups and the Canadian AI ecosystem. Such a mission would not be possible without knowing the current state of AI in Africa. It is for this reason that CEIMIA, with the support of the researcher in residence, has decided to produce a series of reports on the state of AI in Africa, which will enable us to target priority areas based on the needs of Africa and Africans, when it comes to developing responsible AI.

Acknowledgements

Disclaimer

This report was developed in the context of the Researcher-in-Residence Program at the International Centre of Expertise in Montreal on Artificial Intelligence (CEIMIA), with the support of the International Development Research Centre (IDRC). The report reflects the personal opinions of the Researcher and does not necessarily reflect the views of CEIMIA, IDRC, or reviewers' organizations.

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Acronyms

ABIC	African Bioimaging Consortium
AeHIN	Asia eHealth Information Network
AFD	French Development Agency
AI	Artificial Intelligence
AI4D	Artificial Intelligence for Development in Africa (IDRC program)
AUDA	African Union Development Agency (AUDA)
AUF	Francophone University Association
BMGF	Bill and Melinda Gates Foundation
BMZ	German Federal Ministry for Economic Cooperation and Development
CAMERA	Consortium for Advancement of MRI Education and Research in Africa
CEIMIA	International Centre of Expertise in Artificial Intelligence of Montréal
CSO	Civil Society Organizations
CZI	Chan Zuckerberg Initiative
DEI	Diversity, Equity and Inclusion
EMR	Electronic Medical Record
EWARS	Early Warning, Alert and Response System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GPAI	Global Partnership on Artificial Intelligence
IDRC	International Development Research Centre of Canada
IT	Information Technology
LLMs	Large Language Models
ML	Machine Learning
MRI	Magnetic Resonance Imaging
NEPAD	New Partnership for Africa's Development
ODESS	Observatoire de la e-santé dans les pays du Sud
OECD	Organisation for Economic Cooperation and Development
POCT	Point of Care Testing
Sida	Sweden's government agency for development cooperation
TRL	Technology Readiness Level
UAVs	Unmanned Aerial Vehicles
UB-CeDD	University of Buea –Center for Drug Discovery
UQAM	Université du Québec à Montréal
WHO	World Health Organization

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Executive Summary

The rapid advancement of artificial intelligence (AI) is transforming various sectors across the globe, and its potential to revolutionize healthcare in sub-Saharan Africa is particularly significant. This report, developed under the Researcher-in-Residence Program at the International Centre of Expertise in Montreal on Artificial Intelligence (CEIMIA), with the support of the International Development Research Centre (IDRC), provides an in-depth analysis of the current state of AI in healthcare across sub-Saharan Africa. This report will enable policymakers, developers, researchers, entrepreneurs, and citizens to target priority areas based on the needs of Africa and Africans, when it comes to adopting, developing and implementing responsible AI.

Takeaways

1. **AI Applications in Healthcare**
   - AI is being used to enhance clinical decision-making, improve patient care, and increase access to quality healthcare services;
   - Common AI applications include telemedicine, healthcare operations management, medical imaging, diagnostics, data-driven surveillance, and drug discovery.

2. **Hotspot Countries and Leading Organizations**
   - Kenya, South Africa, Uganda, Nigeria, and Ghana are leading in the development of AI healthcare applications;
   - Private companies are the primary drivers of AI healthcare solutions, followed by academic institutions and civil society organizations.

3. **Main Funding Agencies**
   - Significant funding is provided by organizations such as the IDRC, Sida, the Bill and Melinda Gates Foundation, and the Chan Zuckerberg Initiative;
   - Big tech companies like Google, Facebook, and Microsoft are also investing in AI development in Africa.

Recommendations for the Uptake of Responsible AI

1. **Create an Enabling Local Environment**
   - Support standardized data infrastructures and foster AI entrepreneurship in healthcare;
   - Develop relevant policies and regulations to ensure data privacy and equity in access to AI technologies.

2. **Strengthen Training and Capacity-Building**
   - Develop training programs on AI in health at both academic and professional levels;
   - Raise awareness of AI's benefits and limitations among healthcare sector stakeholders.

3. **Adopt a Collaborative Approach**
   - Encourage interdisciplinary collaboration between developers, clinicians, regulators, and other stakeholders;
   - Foster public-private partnerships and intersectoral collaboration to tailor AI-based solutions to African contexts;
   - Promote South-South cooperation for peer-learning and tackling common challenges.

AI holds significant promise for transforming healthcare systems in sub-Saharan Africa. With the existing challenges of traditional healthcare systems, targeted efforts in creating supportive environments, capacity-building, and fostering collaboration can help realize AI's full potential in improving healthcare outcomes across the region. This report aims to inform and guide stakeholders in leveraging AI to address healthcare challenges and promote sustainable development in sub-Saharan Africa.

Introduction

1. Introduction

The health sector in sub-Saharan Africa is struggling with several critical issues, including insufficient healthcare facilities (hospitals, clinics, medical equipment), limited access to quality care, a shortage of healthcare professionals, and a high burden of disease. Especially in rural areas, access to healthcare services is constrained by inadequate infrastructure, transportation options, and healthcare facilities. Moreover, these challenges were further intensified by the COVID-19 pandemic; highlighting the need for innovative approaches to bolster health systems in Africa (Ansah *et al.,* 2024, Arakpogun *et al.,* 2021), Bockarie, *et al,* 2024, Botes *et al.,* 2023, Ibeneme *et al.,* 2023, Manson *et al.,* 2023). Indeed, in an era marked by technological advances and emerging technologies, artificial intelligence (AI) offers unprecedented opportunities to transform healthcare systems in sub-Saharan Africa.

> *"AI is already playing a role in diagnosis and clinical care, drug development, disease surveillance, outbreak response, and health systems management… The future of healthcare is digital, and we must do what we can to promote universal access to these innovations and prevent them from becoming another driver for inequity."*
> **- Tedros Adhanom Ghebreyesus, WHO Director-General**

Based on the analysis of existing online resources, this report shows the dynamism of the African AI-ecosystem, with local talents and experts who are proactive in applying AI to: enhance clinical decision-making, improve patient care, increase access to quality healthcare services, optimize the management of medical resources, and aid medical practitioners in various aspects of patient care, including administrative tasks.

In sub-Saharan Africa, the deployment of artificial intelligence faces complex challenges as well as disparities among countries when compared to Western contexts. In this report, we present hotspot countries using AI in healthcare systems, highlight areas where AI is widely used, identify the AI techniques in use, discuss the exposure to international funding and share recommendations to facilitate the uptake of AI in health in sub-Saharan Africa.

Methodology

2. Research Approach

This report is the result of an analysis of data gathered through four main platforms: Google Scholar, Lens.org, Google search, and LinkedIn. We did our research in French and English, using:

- **Keywords** such as Africa, health and health-associated words (healthcare, public health, biomedical, etc.), artificial intelligence, machine learning, and deep learning. Among the results obtained, we restricted our selection to the date range from 2018 to 2024.
- **Relevant documents** including books, reports, peer-reviewed papers, and documents from funding agencies were selected. The bibliographic references are available in this Zotero group: CEIMIA - AI in Health in Africa; (note: please feel free to join the group and contribute).

- **A sample of 60 active AI initiatives** in healthcare in Africa (see the annex). We are aware that our research did not cover all existing initiatives of AI in health in Africa. We encourage the reader to complete this form so we can collectively uphold a dynamic repository of AI initiatives in African healthcare.

These resources were then processed and analyzed using Nvivo, a qualitative analysis software programme. The information we present in this report has emerged from this analysis.

Figure 1: The research approach

Online Search	Selection of relevant documents	Documents analysis	Reporting
• Google Scholar • Lens.org • Google • Linkedin.	• Books • Reports • Peer-reviewed papers • Funding agencies documents	• Qualitative analysis with Nvivo software	• Writing • Reviewing • Outreach
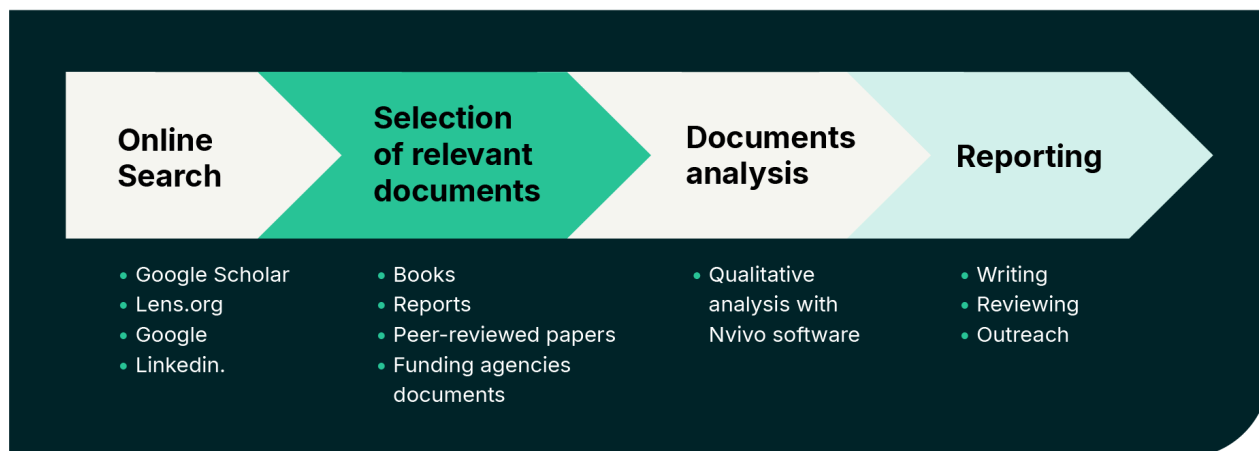
3. Limitations of the Report

- **The lack of linguistic diversity** in the various sources of information used to write this report is a limitation. Indeed, in sub-Saharan Africa, there are English-speaking, French-speaking, Portuguese-speaking and Spanish-speaking countries. However, we only used French and English keywords to gather information for this report.

- **The report focuses on local initiatives.** The information gathered about health in Africa mainly comes from Western countries that work in Africa as a research field, either through African diasporas or collaborations with local researchers. In this report, we aimed to highlight initiatives originating from the continent. Therefore, some globally recognized initiatives based in the West may not be included in this report.

- **Our figures are indicative only**. The representations and breakdowns shown in this report are only reflecting an assessment based on the numbers of initiatives we found.

Applications of AI in Healthcare

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4. Applications of AI in Healthcare

The introduction of AI in health has been enabled by recent advances in access to the Internet, cloud computing, alternate energy sources, smartphones and mobile apps, as well as unmanned aerial vehicles (UAVs) such as drones. These advances have allowed for increasing amounts of data to be collected in healthcare facilities via Electronic Medical Record (EMR), Point of Care Testing (POCT), etc., while advanced AI techniques such as machine learning (ML) and computer vision systems are enabling the use of this data to identify patterns, make predictions and assist in decision making.

Table 1: AI-Techniques and technologies used in healthcare in sub-Saharan Africa

Functions	Technologies	Techniques
Medical data collection	- Internet; - Cloud computing; - Desktops, Laptops, tablets, Smartphones and mobile apps; - Drones.	- Point of Care Testing (POCT); - Electronic Medical Record (EMR); - Chatbots.
Analysis of medical data and decision-making	Early Warning, Alert and Response System (EWARS);	- Machine Learning; - Deep Learning; - Computer vision; - Generative AI; - AI modeling.

While AI solutions developed are at different Technology Readiness Levels (TRL)[1], their applications in healthcare are promising. The following sections list examples of technologies by application categories[2].

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[1] Technology Readiness Levels (TRL) are a type of measurement system used to assess the maturity level of a particular technology (see annex 3). There are nine technology readiness levels (TRLs) in four broader technology development stages: a) Fundamental Research; b) Research and Development; c) Pilot and Demonstration; d) Early Adoption.

[2] Note: The initiatives highlighted here are indicative and geographically representative. Their presence and ordering is not intended to promote any one initiative or to demonstrate its superiority over others.

4.1. Telemedicine and Remote Patient Monitoring

AI-powered telemedicine platforms leverage technologies such as video conferencing, instant messaging, and virtual consultation to connect patients with healthcare providers remotely. Moreover, patient monitoring can be done in real time, collecting and collating patient data inexpensively via smartphones or chatbots.

Health-E-Net, Botswana	www.health-e-net.org
Health-E-Net is a company focused on advancing the scale and impact of African health technologies. It works with forward-thinking sponsors, industry and governments to leverage new technologies to advance healthcare. Its core offering, PaperEMR, is a unique paper-to-digital approach to capturing digital data directly from paper. This user-friendly and accessible technology is used by community health workers, among others, to digitize health information collected on paper and share data on health products distributed, stock balances and replenishment figures with their supervisors. This makes the reporting process easier, faster and enables an efficient procurement process. Data captured on paper can also be used to provide remote services such as telehealth consultations in conjunction with Health-E-Net's Gabriel telemedicine platform. The platform, which can be used both online and offline, allows patients to access consultations and receive medication from listed providers.	

Waspito, Cameroon	www.waspito.com
Waspito is a platform that engages African citizens in conversation and action to provide affordable and accessible quality healthcare across the continent. The platform identifies available doctors who are close to you, for a video consultation. This way, patients can talk face-to-face with a doctor from their phone, avoiding long queues at the hospital. Similarly, patients can pay for their services directly on the app and use the same channel to ask a lab technician to come to their home for basic test samples. There is also a health discussion forum, with many interesting health topics created by doctors. A number of frequently asked questions are addressed and patients can take part in a direct question-and-answer session with doctors.	

Table 2: Non-exhaustive list of telemedicine and remote patient monitoring initiatives

AI Initiatives	Organizations		
	Name	Type	Country
PaperEMR, Gabriel telemedicine, SonoMobile	Health-E-Net	Company	Botswana
Waspito	Waspito	Company	Cameroon
Intron Health	Intron Health	Company	Nigeria
Mboacare	Mboalab	Company	Cameroon
e-same	e-same SA	Company	Cameroon
eHospital	Intellisoft Consulting Ltd.	Company	Kenya
mDaktari	Access Afya	Company	Kenya
BESHTE	University of Embu	Academia	Kenya
Lafiya Telehealth	Lafiya Telehealth	Company	Nigeria
RecoMed	RecoMed	Company	South Africa

AI Initiatives	Organizations		
	Name	**Type**	**Country**
Baobab Circle	Baobab Circle	Company	Uganda

4.2.   Healthcare Operations and Management

With AI-based Electronic Medical Record (EMR) management, hospitals can forecast demand for medical services based on historical data, plan staffing levels and deliver them appropriately.

LifeBank, Nigeria	www.lifebankcares.com

Lifebank is a company focused on revolutionizing Africa's medical supply chains for a sustainable future. It integrates cutting-edge technology, sustainable transport, digital solutions and precise AI for affordable and accessible healthcare. It is a healthcare start-up that facilitates the transmission of blood from laboratories across the country to patients and doctors in hospitals. Some innovative Lifebank solutions include:

- **SkyBank**: uses drones to deliver essential medical products to rural/inaccessible areas. This is an innovative distribution route in areas where a lack of infrastructure has historically prevented access to quality healthcare and vital medical products.

- **AirX**: is a forecasting and prediction tool that revolutionizes oxygen supply management through advanced data science and analysis. AirX ensures that healthcare facilities in Africa have uninterrupted access to vital oxygen supplies. It uses historical data, weather conditions and various inputs to accurately predict oxygen use and demand, ensuring round-the-clock availability.

AfyaRekod, Kenya	www.afyarekod.com
AfyaRekod is a digital health data company that offers various solutions like Universal Patient Portal, Universal Doctor's Portal and Hospital Management Information System. The company specializes in fully automated, real-time access to health data and medical history for patients and healthcare professionals and uses AI and blockchain-based technology. AfyaRekod's mission is to bridge the gap between health care and treatment for healthcare facilities and institutions to access and assist their patients anywhere, anytime, through tools and resources accessible on the platform. In addition to Kenya, it operates in Nigeria, South Africa, Cameroon, and Zambia, with more than 50 hospitals on board its B2B product.	

Table 3: Non-exhaustive list of healthcare operations and management initiatives

AI Initiatives	Organizations		
	Name	Type	Country
Afya Rekod	Afya Rekod	Company	Kenya
SkyBank, AirX	LifeBank	Company	Nigeria
HeliumOS, HeliumDOC	Helium Health	Company	Nigeria, Kenya
Zipline	Zipline	Company	Rwanda
Vula referral and advice, Vula Health mentoring.	Vula Mobile	Company	South Africa
Pocket Clinic	Aviro Health	Company	South Africa
BroadReach Healthcare's Vantage AI	Vantage Health technology	Company	South Africa, USA, Switzerland
ClinicMaster	ClinicMaster	Company	Uganda

4.3. Sexual, Reproductive, Maternal, and Child Health

AI technologies support sexual, reproductive, maternal, and child health by monitoring pregnancy, predicting complications, and offering guidance on family planning. These tools enhance the quality of care for women and children, particularly in regions with limited access to healthcare professionals.

mDoc, Nigeria	www.hash.theacademy.co.ug/mdoc
mDoc, a digital health social enterprise headquartered in Nigeria, provides virtual self-care health coaching to people at risk of, or living with, chronic disease. mDoc harnesses behavioral science, quality improvement methods, data and technology to ensure a healthier, happier and more productive Africa. mDoc plans to enhance its AI-powered chatbot, Kem, to handle STI-related questions in a safe, impartial environment for both women and men. Kem's provision of information on STI awareness, prevention, and treatment enables individuals to make educated choices about their wellbeing. Additionally, Kem links users to expert healthcare providers via mDoc's NaviHealth.ai, offering extra support when necessary. Users can also speak to a health coach through CompleteHealth™ for more support.	

Wekebere, Uganda	www.wekebere.org
Wekebere is a medical company based in Kampala, developing technologies and services, to improve birth outcomes through remote pregnancy care and building digital biomarkers. Their product predicts and manages pregnancy complications early - from conception to the first 100 days. They are designing prenatal care with technologies to help mothers and babies. Combining connected devices and data analytics to both reassure and empower mothers and provide doctors with tools and information to better predict and manage pregnancy outcomes.	
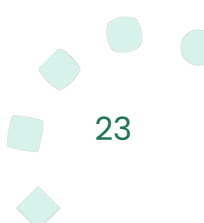
Table 4: Non-exhaustive list of sexual, reproductive, maternal and child health initiatives

AI Initiatives	Organizations		
	Name	**Type**	**Country**
Jakaranda health	Jakaranda health	Company	Kenya
Sexually transmitted disease monitoring and assistance tool design in Ethiopian higher education institute	Addis Ababa Science and Technology University	Academia	Ethiopia
Utilizing AI to Promote Sexual and Reproductive Health Outcomes for Adolescents with Disabilities in Ghana	University of Ghana	Academia	Ghana
Sophie Bot	Sophie Bot	Company	Kenya
Machine Learning for identifying teenage patients at risk of gestational hypertension	Pan African Information communication Technology (PAICTA)	CSO	Namibia
mDoc Healthcare	Mymdoc	Company	Nigeria
Wekebere	Wekebere	Company	Uganda
Prediction of miscarriages among women seeking antenatal care in Uganda: A machine learning approach	Makere University	Academia	Uganda
Using Machine Learning and Artificial Intelligence (AI) modeling to identify high-risk sub-population eligible for PrEP and willing to pay for the services	The medical concierge group	Company	Uganda
Leveraging Artificial Intelligence Techniques To Inform Choice Of Modern Contraceptives Among Adolescent Girls And Young Women	Mbarara University of Science and technology	Academia	Uganda

4.4. Medical Imaging

Image analysis with AI algorithms can accurately detect anomalies, fractures, tumors and other signs of disease. That is why current medical imaging techniques such as X-rays, scans and MRIs make extensive use of AI to analyze images.

Consortium for Advancement of MRI Education in Africa, Nigeria	www.cameramriafrica.org
The Consortium for Advancement of MRI Education and Research in Africa (CAMERA) is a network of African MRI experts and global partners committed to establishing a sustainable MRI training and mentorship program in African countries. CAMERA leverages established connections and partnerships to expand existing resource networks to support underrepresented MRI researchers in African countries and provide them with skills to lead MRI research, create innovative solutions, and rapidly apply the benefits of MRI technology to health care needs in Africa.	

Neural Labs, Kenya	https://neurallabs.africa
Neural Labs Africa Innovation Hub uses Deep Learning and Computer Vision to identify diseases in real time. Their solution, AI algorithm NeuralSight is capable of identifying over 20 respiratory, heart, and breast pathologies which include: pneumothorax, cardiomegaly, benign breast tumor, malignant breast cancer, atelectasis, infiltration, emphysema, mass, nodule, pleural thickening, effusion, consolidation, etc., in real time.	
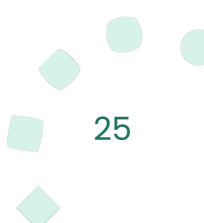
Table 5: Non-exhaustive list of medical imaging initiatives

AI Initiatives	Organizations		
	Name	**Type**	**Country**
Rology Connect	Rology	Company	Kenya
AI algorithm NeuralSight	Neural Labs Africa	Company	Kenya
Strengthening MRI Education & Research in African Countries	The Consortium for Advancement of MRI Education and Research in Africa (CAMERA)	Academia	Nigeria
Reimagining Breast Cancer Screening using AI	Vectorgram Health	Company	Kenya
Screening for tuberculosis using AI	Right to Care	Company	South Africa

4.5. Diagnostics

AI provides healthcare professionals with opportunities for optimizing clinical diagnostics, remote review and audit of clinical decision-making. These AI systems help doctors to make accurate diagnoses, improving the quality of healthcare in limited resource settings. In Africa, this could mitigate the lack of direct access to experienced specialists and tertiary facilities, while delivering quality health care in rural or remote areas. Additionally, AI-powered diagnostics are also facilitated with the growth of rapid point-of-care diagnostic technology.

minoHealth AI Labs, Ghana	www.minohealth.ai
minoHealth Labs is using Artificial Intelligence (AI) to democratize access to quality, affordable healthcare for all. Their AI systems can diagnose, forecast, and prognosticate conditions like breast cancer, pneumonia, and more. They have developed AI systems for automated diagnostics of 14 chest conditions including pneumonia, fibrosis, hernia, and pleural effusion with chest x-rays, and breast cancer with mammograms. They have also developed AI systems towards malaria, the screening of COVID-19 as well as Tuberculosis related damages from chest x-rays.	

Saratani, Tanzania	www.sarataniai.com
Saratani AI is an AI-based cancer screening company. Ensuring that every hospital in Africa has access to fast, accurate and affordable cervical cancer screening. Saratani digitalizes cancer screening and diagnostic services in Africa using artificial intelligence; conducting scientific research to develop, validate and test solutions, producing evidence-based digital solutions for cancer screening and diagnosis.	

Table 6 : Non-exhaustive list of initiatives on diagnostics

AI Initiatives	Organizations		
	Name	Type	Country
minoHealth.ai	minoHealth AI Labs	Company	Ghana
Saratani AI	Saratani AI	Company	Tanzania
mPharma	mPharma	Company	Ghana
Babyl	Babyl Rwanda	Company	Rwanda
Patient Archetypes	Palindrome Data	Company	South Africa

4.6.   Data-Driven Surveillance and Pandemic Resilience

AI models analyze a multitude of data in real time, including climate data, population movements, health data and surveillance data, to identify risk factors and anticipate possible epidemic outbreaks. This constant monitoring enables the early warning signs of a possible epidemic to be detected quickly thus triggers automatic alerts as soon as an anomaly is detected. This is called the Early Warning, Alert and Response System - EWARS, widely used in epidemiological surveillance.

IntelSurv, Malawi	www.intelsurv.com
IntelSurv is an Intelligent Disease Surveillance Data Feedback System. IntelSurv leverages the power of language models to bring custom training to health professionals involved in data collection for disease surveillance. They collected valuable insights from health professionals in Malawi who are involved in disease surveillance in order to understand how they used Case Based Surveillance and Reporting forms, what aspects of the data collection processes were challenging, and what kind of support and training was needed. Based on the information obtained, IntelSurv integrates the knowledge gathered from health professionals with Language Models (LLMs). This integration allows them to offer on-the-ground training and support during disease surveillance and data collection activities. With IntelSurv, health professionals can seek clarifications regarding case definitions for diseases of interest. Additionally, the tool assists in enhancing their understanding of the significance of key data collection fields and their relevance to specific diseases.	

AI for Pandemic & Epidemic Preparedness & Response Network	www.ai4pep.org
The Global South AI for Pandemic & Epidemic Preparedness & Response Network (AI4PEP) addresses existing knowledge and practice gaps in the Global South by establishing a multi-regional network of researchers to deepen the understanding	

of how responsible AI solutions can improve public health preparedness and response.

The Foundation of the A4PEP Network is a combination of SDG3 ("Good Health and Well-being") and SDG5 ("Gender Equality"). It is built around four research themes: early detection, early warning systems, early response, and mitigation and control of developing epidemics with AI being the entry point. These four areas are supported by three pillars: i) timely and reliable data for public health decision-making, ii) resilient, strong, and fair health systems and iii) inclusion and equity for vulnerable groups. One Health is the unifying approach that integrates and combines all these domains (themes and objectives to achieve), that are usually siloed.

Table 7: Non-exhaustive list of initiatives on data-driven surveillance

AI Initiatives	Organizations		
	Name	**Type**	**Country**
An Intelligent Disease Surveillance Data Feedback System	IntelSurv	Academia	Malawi
E-Health Data portal	E-Health Africa	Company	Nigeria
AI Applications in Infectious Diseases in Africa	Cheikh Anta Diop University	Academia	Senegal
Using Artificial Intelligence to Predict Disease Emergence in Uganda	Comzine Tech And Investments Limited	Company	Uganda
AI for Health Equity: Transforming Pandemic Preparedness (HEAL)	Infectious Diseases Institute in Uganda	Academia	Uganda

4.7.   Drug Discovery

University of Buea -Center for Drug Discovery, Cameroon	www.ub-cedd.org
Founded in 2022, UB-CeDD is a community of medicinal chemists, AI/ML experts, microbiologists, biochemists, natural product experts and plant taxonomists whose quest is to discover new therapies for diseases that primarily affect Africans and are based on naturally occurring compounds from African medicinal plants and other African sources. The research center is being set up with seed funding from the Bill & Melinda Gates Foundation.	

4.8.   An Overview of Areas, Countries, and Organizations

An analysis of our various non-exhaustive lists of AI initiatives in sub-Saharan Africa has enabled us to provide an indicative breakdown of the adoption of AI in different fields of healthcare (Figure 2); the most active countries in developing AI solutions in healthcare (Figure 3) and the most active type of organizations (Figure 4).

Figure 2: Areas of healthcare in which AI is widely applied in sub-Saharan Africa (source CEIMIA).
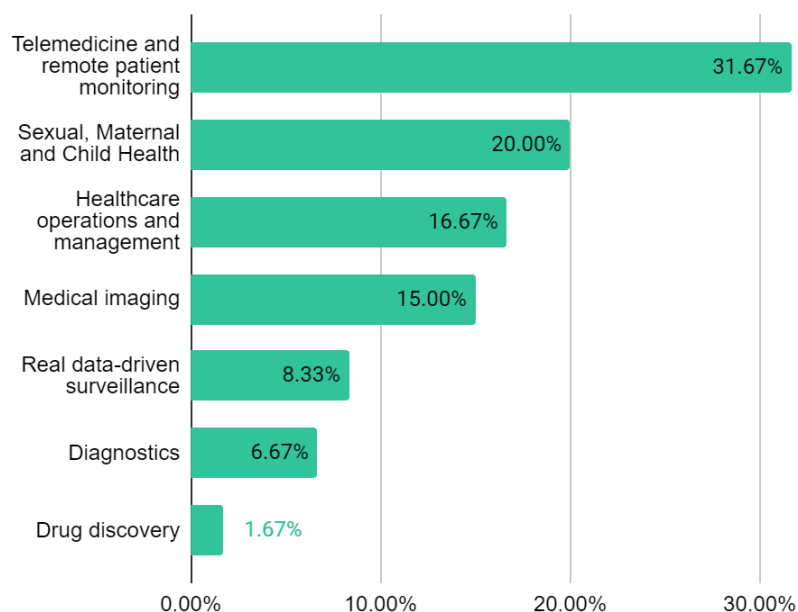
This figure shows an indicative rate of the adoption of AI solutions in the field of telemedicine (31.67%), sexual and reproductive health (20%), healthcare operation (16,67%), medical imaging (15%), data surveillance (8,33%), diagnostics (6,67%) and drug discovery (1,67%).

Figure 3: The hot spot countries for AI in healthcare
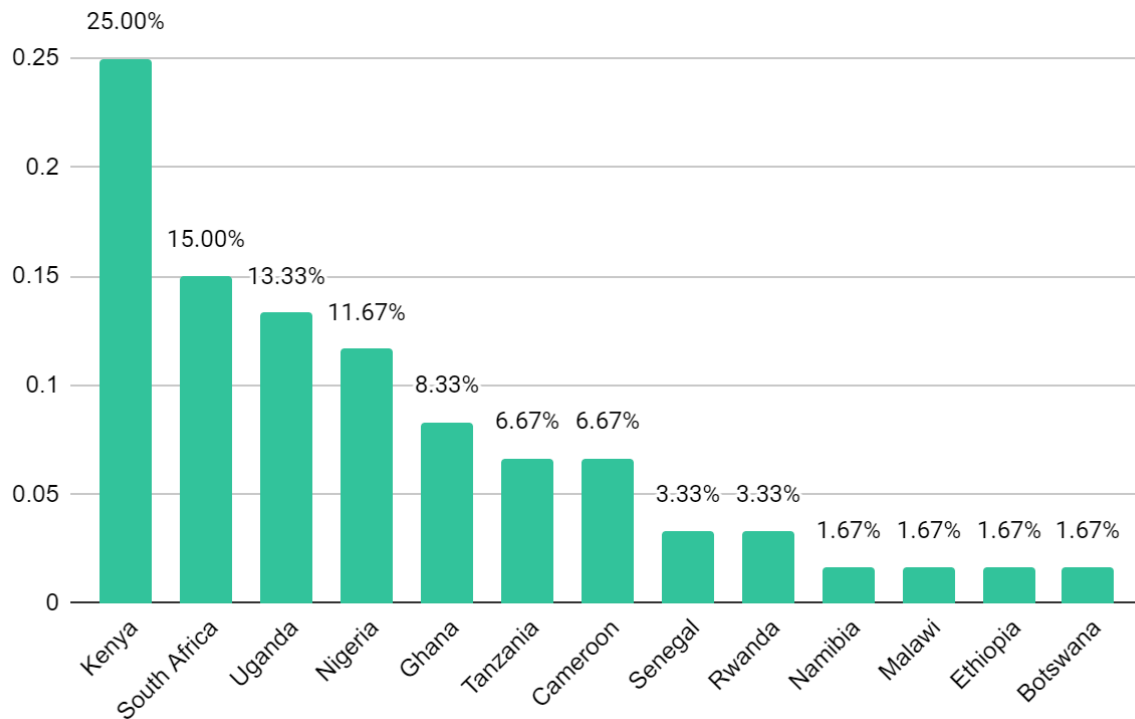
Based on the results we found, this figure shows that Kenya, South Africa, Uganda, Nigeria and Ghana are the most active countries in developing AI solutions in healthcare.

Figure 4: Types of organization leading the development of AI in health in sub–Saharan Africa
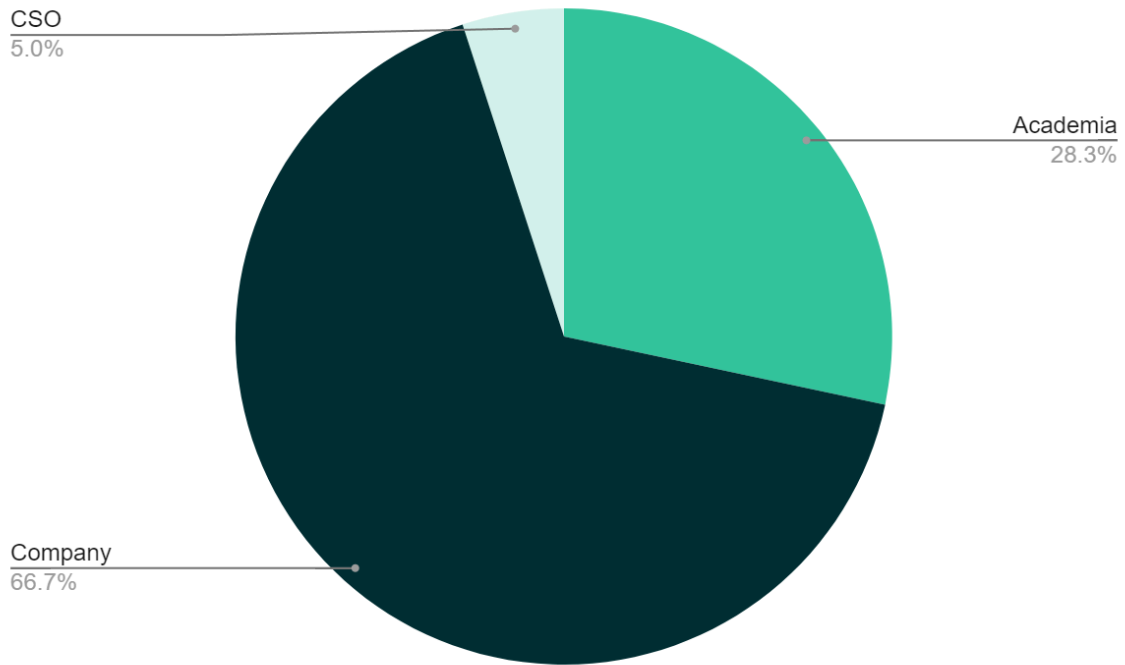
Based on our indicative results, private companies (66.7%) are much more involved in the development of AI solutions applied to healthcare; followed by academia (28.3%), then civil society organizations (5.0%).

Main Funding Agencies

5. Main Funding Agencies

5.1. IDRC & Sida

In 2020, Canada's International Development Research Centre (IDRC) and Sweden's government agency for development cooperation (Sida) launched the Artificial Intelligence for Development in Africa (AI4D Africa) program[3]. This partnership, spanning four years and valued at 20 million (Canadian dollars), is dedicated to a future where Africans across all regions create and use AI to lead healthier, happier, and greener lives. The program promotes excellence in applied research and applying AI technologies in the service of solving development challenges and improving livelihoods for those living in poverty. Some of the initiatives funded under this programme are part of the following hubs: 1) Innovation Hub on Artificial Intelligence for Sexual, Reproductive and Maternal Health in Africa[4]; 2) Building Responsible AI For Global Health[5]. The AI4D program has now grown with combined investments from the United Kingdom's Foreign, Commonwealth and Development office (FCDO), the Bill and Melinda Gates Foundation (BMGF), USAID and IDRC[6].

5.2. Lacuna Fund

Lacuna Fund[7] began as a funder collaboration between The Rockefeller Foundation, Google.org, and Canada's International Development Research Centre, with calls for proposals on underserved languages also supported by the German development agency GIZ on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ). It has since evolved into a multi-stakeholder engagement composed of technical experts, thought leaders, local beneficiaries, as well as end users. The Lacuna Fund is committed to creating and mobilizing labeled datasets that solve both urgent local problems and lead to a step change in machine learning's potential worldwide. In health, the Lacuna Fund supports dataset creation,

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[3] https://africa.ai4d.ai/

[4] https://africa.ai4d.ai/project/innovation-hub-on-artificial-intelligence-for-sexual-reproductive-and-maternal-health-in-africa/

[5] https://africa.ai4d.ai/project/building-responsible-ai-for-global-health/

[6] https://idrc-crdi.ca/en/news/combining-forces-new-phase-ai-development-africa-and-beyond

[7] https://lacunafund.org/

aggregation, and maintenance for the training and evaluation of machine learning models to improve health datasets and outcomes in two tracks:

- Addressing inequities in healthcare outcomes in the United States and in low- and middle-income contexts globally;

- Improving Sexual, Reproductive, and Maternal Health and Rights.

5.3.   The Pierre Fabre Foundation

Recognized as being of public utility since 1999, the Pierre Fabre Foundation works to provide populations in developing countries with better access to medicines and quality care. Its five areas of intervention are: (1) the training of healthcare professionals, (2) the fight against sickle cell disease, (3) access to healthcare for vulnerable populations, (4) e-health and (5) dermatology. The Pierre Fabre Foundation aims to provide access to quality healthcare for people in low and middle income countries.

In 2015, the idea of creating the Global South e-Health Observatory (ODESS) was born. Supported by the French Development Agency (AFD) and the Agence Universitaire de la Francophonie (AUF), the project was officially launched in 2016. The Observatory was later joined by the Future Foundation for Applied Medical Research and the Asia eHealth Information Network (AeHIN). The Observatory was created with the objective of recognizing, analyzing, sharing and supporting digital innovations in the service of the health of the most disadvantaged people. ODESS is a resource center for projects implemented in Africa and Asia, a tool for monitoring and sharing information, and a network of experts and stakeholders in digital health. In 2023, the Foundation ran 35 programs in 21 countries in Africa, South-East Asia, Lebanon and Haiti; 46% of these programmes focused on telemedicine and remote patient monitoring.

5.4.   Bill and Melinda Gates Foundation (BMGF)

The Bill and Melinda Gates Foundation (BMGF) supports the development of AI in healthcare in Africa through Grand Challenges[8]. The Grand Challenges are a family of initiatives fostering innovation to solve key global health and development problems. Each initiative is an experiment in the use of challenges to focus innovation on making an impact. Individual challenges address some of the same problems but from differing perspectives.

5.5.   Chan Zuckerberg Initiative (CZI)

CZI's imaging program[9] aims to drive the development of a suite of new imaging tools capable of observing biological processes across spatial scales at the level of tissues, cells, and proteins; and robust frameworks to quantify, analyze, and share imaging data and share methods and tools.

5.6.   Big Tech Companies

Big tech companies such as Twitter, Google, Facebook, Alibaba Group, Huawei, Amazon, and Microsoft have significantly increased the development and deployment of AI systems in Africa. They have realized the importance of training local workforces in digital skills, leading to the establishment of AI research labs on the continent such as: the Google African AI research Centre in Ghana; the IBM laboratory in Nairobi, etc., which supports the emergence of local AI practitioners and research groups that have formed to address local problems in health.

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[8] https://gcgh.grandchallenges.org/
[9] https://chanzuckerberg.com/science/programs-resources/imaging/

Additional Observations

6. Additional Observations

Three major observations arose from our results:

- Firstly, the hot spot countries (Kenya, South Africa, Nigeria, Ghana, Uganda, Tanzania, etc.) are those that receive the most international funding; they are also mainly English-speaking countries. It should be noted that all these countries have AI policies/strategies available, or that are in the process of being made available; that they have prioritized the setting up of basic infrastructures for the deployment of AI. These factors contribute to building a favoured local ecosystem that is internationally attractive. Jumping to the conclusion that the language barrier is the main obstacle to accessing international funding is simplistic and not entirely fair; the emphasis should rather be on what these countries are doing well. African countries that are lagging behind in the adoption of AI should draw inspiration from these examples in order to set up an enabling local environment.

- Secondly, the main beneficiaries of funding for AI in healthcare are private companies (such as startups and SMEs), followed by universities. The notorious absence of government and the scarcity of civil society organizations in the funding chain is a problem. By playing an active role in AI healthcare initiatives, governments can ensure that AI systems and applications are developed and deployed in a manner that maximises public benefit and aligns with national health priorities;

- Thirdly, while the current enthusiasm surrounding AI in healthcare is commendable, it is important to recognise that most applied AI research in this field primarily aligns with the agendas of funding agencies. Although these agendas may occasionally coincide with government priorities, this is not consistently the case. Hence, there is a need for local governments to provide support in the form of subsidies to the local ecosystem. This would enable them to tackle the problems that are most relevant to their own context and to propose to donors that they work together on these issues. In this context, South-South collaboration should be encouraged in order to tackle common challenges.

Recommendations

7. Pathways to Responsible Uptake of AI in Health

The deployment of artificial intelligence in Africa faces challenges related to infrastructure disparities, limited access to digital health education, and ethical concerns, which have stymied progress in different parts of the continent. Despite these challenges, AI remains a powerful opportunity for transforming healthcare systems in Africa; demonstrated by the wide range of initiatives we have been able to identify in this report. However, for this potential to be fully realized, certain conditions will have to be met. Hence, echoing the vision of the World Health Organization (WHO), we would like to make the following recommendations to governments, funding bodies, healthcare providers, communities, researchers, developers, etc.

> *"WHO envisions a future where AI serves as a powerful force for innovation, equity, and ethical integrity in healthcare. The overall goal is to help Member States take AI to the people to enable enhanced, sustainable, and smarter health care."*
> **-(WHO, 2023)**

Recommendation 1: Create an Enabling Local Environment

The deployment of artificial intelligence must be supported by a favorable ecosystem integrated in the AUDA-NEPAD[10] Artificial Intelligence Roadmap for Africa. To achieve this, local governments should:

- Work with healthcare institutions towards creating a standardized data infrastructure that allows for the secure, efficient, and interoperable exchange of healthcare data. This lack of reliable, high-quality data on health in Africa is an obstacle to the deployment of AI;

- Support AI entrepreneurship in healthcare to foster innovation. Creating dedicated health and AI incubators and accelerators can help start-ups develop and implement their innovative ideas. Such funding efforts can be done jointly with philanthropic organizations, technology companies and industry partners;

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[10]AUDA-NEPAD stands for African Union Development Agency (AUDA) - New Partnership for Africa's Development (NEPAD) https://www.nepad.org/

- Support technology development by investing in research and development centers focused on AI in healthcare, promoting the use of open-source tools and open data platforms, and developing benchmarks and tools required to test the technology to increase the amount of AI development in healthcare;

- Design relevant policies to ensure that the privacy, dignity, autonomy and rights of end users are respected and to address the potential impacts of AI on society. The use of AI in healthcare raises important ethical and legal issues, particularly with regard to data confidentiality and equity in access to AI technologies. The development of appropriate quality standards and regulations is essential to guarantee the safety and effectiveness of AI-based medical technologies. Moreover, through ongoing evaluation of AI-based medical technologies, regulations can also help us generate the clinical evidence needed to demonstrate the health impact of the AI technologies;

- Strengthen the capacity of local regulatory bodies in African countries so that they can regulate AI in health and medical devices.

Recommendation 2: Strengthen Training and Capacity-Building

AI is a complex and multi-disciplinary field, which in the case of health requires knowledge and skills in IT, mathematics, statistics, medicine, ethics, law, and so on. Unfortunately Africa suffers from a shortage of knowledgeable people with 'AI in health' profiles and skills to perform optimal data pre-processing, model selection, tuning, validation, and software deployment. This is why the training of healthcare professionals and researchers is of crucial importance to ensure the ethical and effective use of AI in healthcare. It is therefore necessary to:

- Develop training programmes on AI in health, both at academic and professional levels; it should be noted that AI itself can be a training and capacity-building tool, providing up-to-date information, recommendations and references adapted to the context;

- Raise awareness amongst the various actors in the healthcare sector, such as doctors, nurses, pharmacists, researchers, managers, decision-makers, etc., of the advantages and limitations of AI in healthcare;
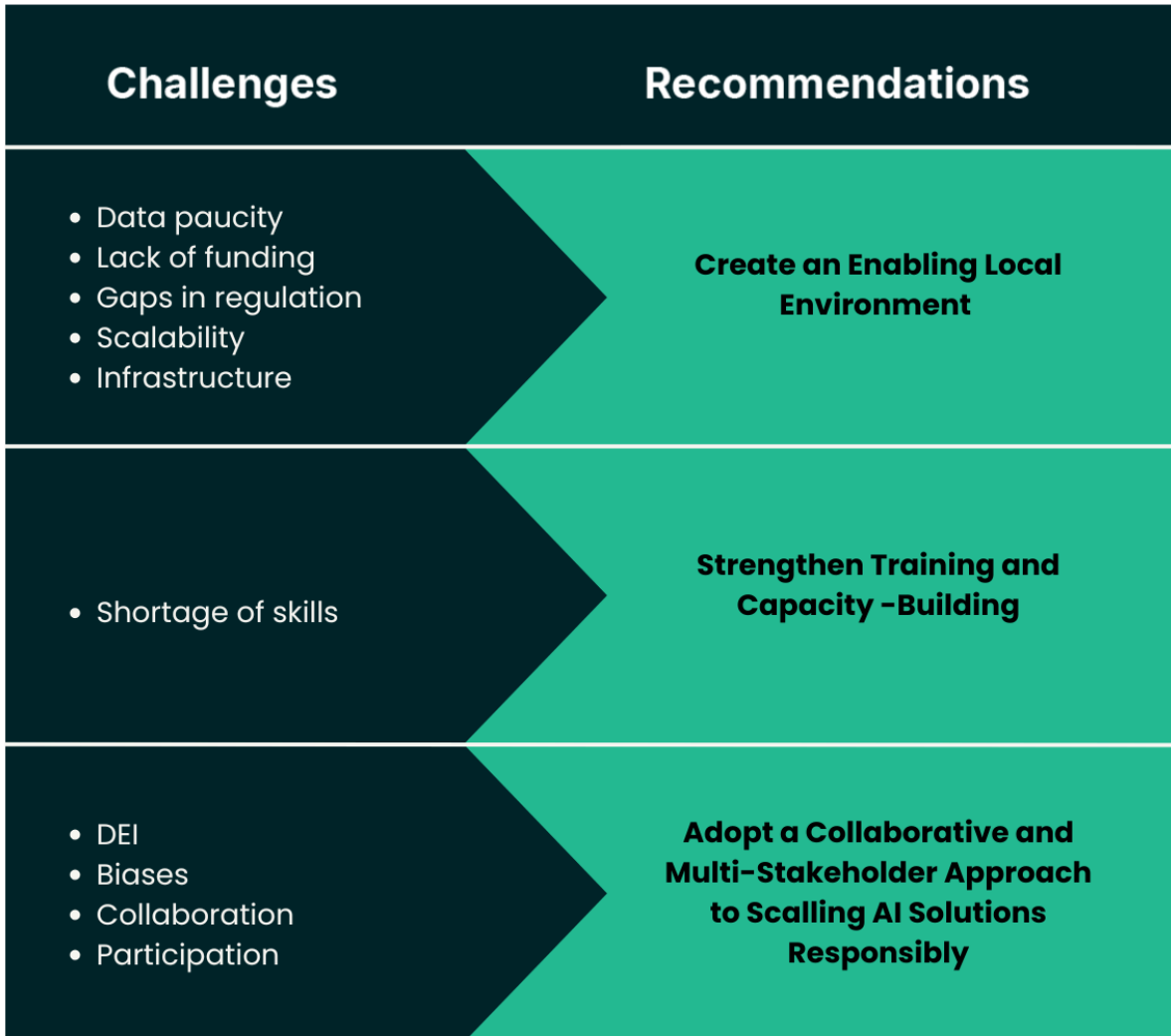
- Establish peer-to-peer learning through collaboration between healthcare staff. AI can be a tool for collaboration and cooperation between doctors, enabling them to share their experience, knowledge and resources.

Recommendation 3: Adopt a Collaborative and Multi-Stakeholder Approach to Scaling AI Solutions Responsibly

A holistic and collaborative approach must be adopted, involving all stakeholders, with the aim to align AI development with the local context, taking into account specific needs, available resources, existing infrastructures and cultural norms. It is observed that many African AI initiatives work in isolation, without collaborating with each other, even at the national level. This is sometimes due to the donor's agenda that needs to be respected, or because these initiatives are competing for funds. This is why we have formulated collaboration-driven recommendations aimed at carrying a vision that would allow initiatives to interconnect in order to solve local problems:

- Interdisciplinary collaboration. The development and deployment of artificial intelligence in the medical field requires close collaboration between developers, clinicians, regulators, patients and other stakeholders. Interdisciplinary teams are better able to tackle the complex, multidimensional problems that characterize the healthcare field.

- Public-Private partnerships. Partnerships between the public and private sectors play a major role in stimulating innovation in AI in healthcare.

- Intersectoral collaboration between academia, industry, and government bodies to foster the exchange of knowledge, technology transfer, and the localisation of AI-based solutions tailored to African contexts.

- South-South cooperation. Engage in Pan-African peer-learning on AI policies, exchanging insights and best practices will immensely benefit Policymakers, AI practitioners, entrepreneurs, and investors looking for scalable solutions.

Figure 5 : Challenges and recommendations

Challenges	Recommendations
• Data paucity • Lack of funding • Gaps in regulation • Scalability • Infrastructure	**Create an Enabling Local Environment**
• Shortage of skills	**Strengthen Training and Capacity -Building**
• DEI • Biases • Collaboration • Participation	**Adopt a Collaborative and Multi-Stakeholder Approach to Scaling AI Solutions Responsibly**

Conclusion

8. Conclusion

The "State of AI in Healthcare in Sub-Saharan Africa" report elucidates the substantial progress and persistent challenges in the integration of AI within the healthcare sector of the region. As demonstrated in this report, the potential of AI to revolutionize healthcare delivery in Sub-Saharan Africa is immense - AI applications are already making significant impacts in areas such as telemedicine, healthcare operations management, medical imaging, diagnostics, data-driven surveillance, and drug discovery by enhancing clinical decision-making, improving patient care, and increasing access to quality healthcare services.

Countries like Kenya, South Africa, Uganda, Nigeria, and Ghana are at the forefront, driven by robust ecosystems supported by international funding and innovative local enterprises. Nevertheless, the path toward widespread AI adoption in healthcare is fraught with challenges, including infrastructure disparities, limited access to digital health education, and ethical concerns related to data privacy and equity. To surmount these obstacles and fully harness AI's transformative potential, a multifaceted approach is essential. Governments must foster enabling environments by developing standardized data infrastructures, supporting AI entrepreneurship, and implementing pertinent policies and regulations. Strengthening training and capacity-building initiatives at both academic and professional levels is crucial to ensuring a knowledgeable workforce capable of leveraging AI responsibly and effectively. Furthermore, fostering collaboration among interdisciplinary stakeholders, including developers, clinicians, regulators, and patients, is vital to tailoring AI solutions to local contexts.

Ultimately, the integration of AI in healthcare holds the promise of improving health outcomes, reducing disparities, and promoting sustainable development across Sub-Saharan Africa. This report serves as a guide for policymakers, developers, researchers, entrepreneurs, and citizens, offering insights and recommendations to advance the responsible adoption of AI in healthcare. By working together, stakeholders can unlock AI's full potential to create a healthier, more equitable future for all.

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Annex

10. Annex: AI Initiatives in Health Listed by Country

Country	Domain	Initiative	Organisation Type
Botswana	Telemedicine and remote patient monitoring	Health-E-Net	Company
Cameroon	Drug discovery	UeCB	Academia
	Telemedicine and remote patient monitoring	Waspito	Company
		Mboacare	Company
		e-same	Company
Ethiopia	Sexual, maternal and child health	Sexually transmitted disease monitoring and assistance tool design in Ethiopian higher education institute	Academia
Ghana	Diagnostics	mPharma	Company
	Medical imaging	Foundation Model for Radiology	Company
		Building a Bioimaging Network in West Africa	Academia
	Sexual, maternal and child health	Utilising AI to Promote Sexual and Reproductive Health Outcomes for Adolescents with Disabilities in Ghana	Academia
	Telemedicine and remote patient monitoring	AI-Powered Decision Support for Antibiotic Prescribing in Ghana	Company
Kenya	Diagnostics	Vectorgram Health	Company
	Medical imaging	Rology Connect	Company

Country	Domain	Initiative	Organisation Type
		Neural Labs Africa	Company
		Strengthening MRI Education & Research in African Countries	Academia
	Healthcare operations and management	Afya Rekod	Company
		Helium Health	Company
	Pathology	The Pathology Network	Company
	Sexual, maternal and child health	BESHTE: A Chatbot to enhance HIV testing, status awareness, and status disclosure among adolescent boys and girls and young men and women in Kenya	Academia
		Sophie Bot	CSO
	Telemedicine and remote patient monitoring	Large Language Models (LLMs) Targeting Non-Communicable Disease Risk Factors Among Kenyan Youth	Company
		mDaktari Health Access Initiative	Company
		Advancing Healthcare Communications: Penda Health's Adoption of ChatGPT4 for Patient Interactions	Company
		VIDA PLUS: The Most Accessible Official Public Health Data Insights	Company
		BESHTE	Academia
		mDaktari	Company
Malawi	Real data-driven surveillance	An Intelligent Disease Surveillance Data Feedback System	Academia

Country	Domain	Initiative	Organisation Type
Namibia	Sexual, maternal and child health	Machine Learning for identifying teenage patients at risk of gestational hypertension	Company
Nigeria	Healthcare operations and management	LifeBank	Company
		A Large Language Model (LLM) Tool to Support Frontline Health Workers in Low-Resource Settings	Company
	Medical imaging	CAMERA	Academia
	Real data-driven surveillance	E-Health Africa's	Company
	Sexual, maternal and child health	mDoc Healthcare	Company
		Integration of a Large Language Model (LLM) for Women Centered Care	Company
	Telemedicine and remote patient monitoring	Lafiya Telehealth	Company
Rwanda	Diagnostics	Babyl Rwanda	Company
	Healthcare operations and management	Zipline	Company
Senegal	Medical imaging	African BioImaging Consortium	Academia
	Real data-driven surveillance	AI Applications in Infectious Diseases in Africa	Academia
South Africa	Healthcare operations and management	Vula Mobile	Academia
		Aviro Health	Company
		BroadReach Healthcare's Vantage AI	Company
	Medical imaging	Democratizing Imaging for Infectious	Academia

Country	Domain	Initiative	Organisation Type
		Disease Research in Africa	
	Predictive/Analytics	Palindrome Data	Company
	Telemedicine and remote patient monitoring	"Your Choice": Using AI to Reduce Stigma and Improve Precision in HIV Risk Assessments	Company
		Ask-AVA: Developing an Automated Verified Analyst for Public Health	Company
		Leveraging AI for Improved Public Health: An Optimized Evidence Horizon Scanning Approach	CSO
		RecoMed	Company
Tanzania	Sexual, maternal and child health	Artificial Intelligence for screening of TB among people living with HIV	Academia
	Diagnostics	Saratani AI	Company
	Telemedicine and remote patient monitoring	AI in Community Radios: Enhancing Health Communication and Malaria Control in Tanzania	Company
		Improving the Use of Integrated Management of Childhood Illness Protocols in Tanzania	CSO
Uganda	Healthcare operations and management	ClinicMaster	Company
	Real data-driven surveillance	AI for Health Equity: Transforming Pandemic Preparedness in Uganda (HEAL)	Academia
		Using Artificial Intelligence to Predict Disease Emergence in Uganda	Company
	Sexual, maternal and	Prediction of miscarriages among	Academia

Country	Domain	Initiative	Organisation Type
	child health	women seeking antenatal care in Uganda: A machine learning approach	
		Leveraging Artificial Intelligence Techniques To Inform Choice Of Modern Contraceptives Among Adolescent Girls And Young Women.	Academia
		Wekebere	Company
		Using Machine Learning and Artificial Intelligence (AI) modeling to identify high-risk sub-population eligible for PrEP and willing to pay for the services.	Company
	Telemedicine and remote patient monitoring	Baobab Circle	Company

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