

ARTIFICIAL INTELLIGENCE (AI) AND AFRICAN HEALTH: ENHANCING HEALTHCARE DELIVERY THROUGH TECHNOLOGY

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Abstract

This paper explored the role of Artificial Intelligence in enhancing healthcare in Africa. It critically analyzed how AI contributes to improving healthcare delivery through technological advancements. AI has emerged as a transformative force across the health sectors in Africa, presenting significant opportunities for growth. In sub-Saharan Africa, the application of AI in healthcare, particularly in resource-constrained settings, holds great potential for transforming and enhancing services. The article offers valuable insights into the integration of AI within the African health sector, addressing policy frameworks, challenges, and future prospects. It begins with an overview of AI and emphasizes the groundbreaking effects of AI technologies in tackling healthcare challenges faced by various African nations. The benefits of AI in advancing healthcare delivery in Africa are also highlighted. The study concludes that without the necessary infrastructure for secure data collection, along with data privacy, education, and sound governance, the dream of leveraging artificial intelligence to advance healthcare in Africa may remain unfulfilled.

Keywords: Artificial Intelligence, Healthcare Delivery, Technology, Machine Learning

Introduction

Artificial Intelligence (AI) in healthcare encompasses the use of machine learning algorithms and cognitive technology within medical settings, representing the convergence of human and machine learning (Otaigbe, 2022). The use of AI in medicine dates back to the 1970s, with the development of medical expert systems that use Bayesian statistics and decision theory to diagnose and recommend treatments for conditions like glaucoma and infectious diseases (Owoyemi, Owoyemi, Osiyemi & Boyd, 2020). As AI gains traction in various industries, including healthcare, it holds the potential to revolutionize patient care. Employing computer technology to simulate intelligent behaviour akin to human critical thinking, AI in healthcare is primarily utilized for diagnosing, prognosis and treating diseases (Amisha, Malik, Pathania & Rathaur, 2019).

The integration of AI in healthcare significantly aids medical practitioners in various

aspects of patient care, extending to administrative procedures. As of 2020, the adoption of AI in the USA and Canada has resulted in a 25% reduction in healthcare expenses in the former and a 12% decrease in the latter (Kondo, Diwani, Nyamawe and Mjahidi, 2023). The potential of AI to revolutionize healthcare in Africa is substantial, particularly in automating medical procedures and enabling health professionals to achieve more with limited resources. The AI's application extends to the evaluation of vast healthcare data, as demonstrated by a logistic regression-based prediction model automating early diagnoses of cardiac diseases with promising results. (Davenport & Kalakota, 2019). Furthermore, AI technology has the potential to enhance patient care, leading to more precise diagnoses, including in surgical procedures. Noteworthy initiatives in Nigeria, such as the startup, utilize advanced technologies such as machine learning to improve the diagnosis of birth asphyxia in low-resource settings. (Kondo, Diwani, Nyamawe and Mjahidi, 2023). In Zambia, AI is employed for diagnosing diabetic retinopathy, the results obtained are significant and promising when compared to human assessment. (Bellemo, Lim, Rim, Tan and Cheung et al., 2019)

(AI) is transforming healthcare systems globally, and Africa is beginning to harness its potential to address long-standing healthcare challenges. By integrating AI technologies into the healthcare system, African healthcare systems can overcome barriers such as limited access to medical services, shortages of healthcare professionals, and inadequate infrastructure. AI-driven solutions offer opportunities for early disease detection, personalized treatments, efficient data management, and improved health outcomes across the continent.

Artificial Intelligence (AI) and associated technologies hold great promise to rapidly improve healthcare delivery in under resourced environments. Africa stands to greatly accelerate and improve its health standards with the application of AI. The advent of mobile technology, Electronic Medical Record Systems (EMRs) and cloud computing have laid a pathway for delivery of advanced artificial intelligence technologies that have the potential of closing the gap in healthcare outcomes between Africa and the rest of the world (Amisha, Malik, Pathania and Rathaur, 2019).

Overview of AI in Healthcare

Artificial Intelligence (AI) is a system that can precisely understand external data, assimilate knowledge from the data and employ the acquired learnings to achieve goals and tasks through adaptation. The AI comes in different forms and one way to categorize it is by considering its level of cognitive capability. The three main types of AI classification include weak or limited artificial intelligence, often referred to as "functional" AI, which is engineered to efficiently execute specific tasks without the capability to reason generically or learn from novel situations (Morgenstern, Rosella, Daley, Goel, Schünemann and Piggott, 2021). This type of AI is tailored to solving particular problems and lacks the adaptability to generalize its behavior across various

contexts. It finds application in systems requiring repetitive tasks, such as filtering email spam, deriving generalizations from vast datasets, offering recommendations on streaming platforms and making decisions in e-commerce settings. A great example is Alexa, Amazon's AI-powered voice assistant, which is considered an instance of weak AI. Although, it exhibits apparent intelligence and responsiveness, its capabilities are limited to specific tasks like managing smart home devices, responding to voice commands, playing music, offering weather updates and setting reminders. However, Alexa is confined to a predetermined set of functions and cannot adapt to novel or unfamiliar situations, setting it apart from more advanced forms of AI (Şerban, and Todericiu, 2020).

1. Early Disease Detection and Diagnosis

AI tools enable faster and more accurate disease detection through advanced imaging and predictive analytics. Machine learning algorithms can analyze medical images for early signs of diseases like cancer, tuberculosis, and malaria, improving diagnostic accuracy and reducing diagnostic delays (Esteva *et al.*, 2017). For example, AI-powered mobile applications are used in rural Africa to detect malaria parasites through smartphone microscopes, providing quicker diagnoses in remote areas (Yang *et al.*, 2021).

2. Personalized Healthcare and Treatment

AI facilitates personalized healthcare by analyzing patient data to create customized treatment plans. In Africa, AI can help tailor treatments for infectious diseases such as HIV/AIDS and malaria, considering genetic, environmental, and social factors that influence treatment outcomes (Topol, 2019). This approach enhances patient care, especially where one-size-fits-all treatments are less effective.

3. Remote Healthcare Access and Telemedicine

Telemedicine powered by AI expands healthcare access in remote regions where healthcare facilities are scarce. AI-driven chatbots and virtual health assistants provide medical advice and triage services, reducing the need for in-person consultations (WHO, 2021). In countries like Kenya and Nigeria, AI platforms offer virtual consultations and medication reminders, improving patient adherence and reducing healthcare disparities (Ouma & Dimoka, 2020).

4. Efficient Health Data Management

AI improves data collection, analysis, and management in African healthcare systems. Predictive analytics helps health authorities track disease outbreaks and allocate resources efficiently (Obuobi *et al.*, 2022). AI tools streamline patient record management and facilitate large-scale health data analysis, enabling evidence-based policymaking.

5. Addressing Healthcare Workforce Shortages

AI technologies can help mitigate the shortage of healthcare professionals in Africa by automating routine tasks, assisting in clinical decision-making, and supporting training programs. AI-based diagnostic tools allow non-specialist healthcare workers to provide high-quality care, especially in rural areas (Adesina *et al.*, 2020).

Challenges and Considerations

Artificial intelligence (AI) has substantial potential to revolutionize healthcare systems worldwide, including those in Africa. By enhancing diagnostic precision and simplifying administrative workflows, AI can improve the quality, accessibility, and efficiency of healthcare services. Nevertheless, incorporating AI into African health systems comes with various challenges and considerations, such as infrastructure deficiencies, limited human resources, and ethical as well as socio-cultural issues.

A key challenge is the insufficient infrastructure. Essential components like reliable electricity, internet access, and modern computing systems are necessary for effective AI implementation, yet many healthcare facilities in Africa are hampered by basic infrastructure shortcomings (Ekong *et al.*, 2021). This technological gap inhibits the scalability and sustainability of AI solutions, particularly in rural and underserved areas. Additionally, the high costs associated with deploying AI tools create significant obstacles. Many African nations operate under tight healthcare budgets, and prioritizing investments in advanced technology may be challenging when immediate needs like essential medicines and workforce training take precedence (Oke & Fernandes, 2020). The lack of skilled professionals is another significant challenge. Effective AI adoption requires trained individuals such as data scientists, health informaticians, and clinicians adept in digital technologies. However, Africa experiences a persistent shortage of healthcare workers, with even fewer skilled in AI and machine learning (Olayemi *et al.*, 2023). Without robust capacity-building initiatives, the disparity between technological advancements and practical implementation is likely to persist.

Data quality and accessibility also raise considerable issues. AI systems require extensive datasets for training and validation, yet health data in many African countries is often incomplete, fragmented, or inadequately digitized (Asan *et al.*, 2021). There is also a lack of standardized data governance policies to ensure that collected data is accurate, ethically sourced, and securely managed. Concerns around privacy, consent, and data ownership are further complicated by weak regulatory frameworks and enforcement.

Ethical and cultural factors are also critical. AI applications must be developed and implemented in ways that are culturally sensitive to prevent reinforcing existing biases or disparities. For example, algorithms derived from Western populations may not

accurately reflect the disease profiles or genetics of African communities, which can lead to misdiagnoses or exclusion from effective treatments (Floridi *et al.*, 2018). Additionally, there is rising concern that using foreign-developed AI solutions without local modifications could foster technological dependency and stifle local innovation.

Building trust in AI systems is another hurdle to widespread adoption. Patients and healthcare providers may have doubts about AI-generated recommendations, especially in contexts where the technology is not well understood or where existing health systems already suffer from trust issues. Consequently, fostering community engagement and transparency is vital for building public confidence and ensuring that AI supports rather than replaces human judgment (George *et al.*, 2021).

In summary, while AI holds significant promise for enhancing healthcare in Africa, its implementation should be approached with caution and a contextual understanding. Stakeholders, including policymakers, healthcare providers, and technology developers, need to work together to tackle infrastructure challenges, invest in skill development, create robust data governance frameworks, and ensure ethical and culturally suitable integrations. With the right investments and collaborations, AI could emerge as a transformative instrument for advancing health equity across the continent.

Significance of AI Integration into Africa HealthCare System

Transformative power of AI in diagnostics and disease prediction: Introducing artificial intelligence in the African health sector portrays a major and important development, particularly in the aspect of diagnostics and disease prediction. This development is enhanced by an excellent understanding of machine learning algorithms and sophisticated AI models, that propel the best prospects for combating the complex issues of healthcare that are disturbing several continents. In sub-Saharan Africa, where specialized healthcare resources are often hard to find and access, AI is a perfect solution for enhancing diagnostics. Because of its ability to process vast datasets, including medical structures and patient records, it optimally enhances the accuracy and efficacy of the detection of disease. This is particularly necessary in regions where early detection can be very crucial for successful treatment outcomes. The adaptive nature of AI is advantageous for curbing the variations and unique disease patterns prevalent in several African regions. Diseases often manifest differently across continents and AI's capacity for progressive learning ensures that diagnostic abilities evolve, maintaining pace with the developing nature of diseases.

Applications of AI in Africa healthcare

Maternal, newborn and child health

Smartphone based anthropometry technology which allows frontline health workers to screen for low-birth-weight babies. In 2016, Niramai Health Analytics (Bangalore), developed a non-invasive, low-cost solution to screen early breast cancer based on mapping body heat embedded with AI technique. 'Niramai' is an acronym for Non-

Invasive Risk Assessment with Machine-learning and Artificial Intelligence. It can detect tumours five years earlier than mammography or clinical exams based on 'Thermalytix' technology. Janitri Innovations focusing on pregnancy healthcare with different innovations like Daksh a paperless labour monitoring system. Keyar a non-invasive cardiotocography CTG device that can monitor the heart rate of a baby in the mother's womb and track uterine contractions of pregnant women. This device is portable, non-invasive, and easy to use in rural remote areas. The performance of the device when tested against the gold standard CTG machine was equivalent to the gold standard (Rinkoo AV, Panjiyar AK, Songara D, *et al*, 2019). Predictive AI has shown that for predicting suicide attempts, AI triumphs over human beings. Taking family history using chat bots will be great boon in African setting because patients usually travel from far off places to cities or town's only to sit and answer questions. This can be a great time saver. Family history is extremely important in genetics. In Africa voice bots may overcome several challenges of literacy which chatbots face. Challenge in chatbot development is how to translate most of it in regional languages that is comprehensible by a lay person; also, they have limitation in areas with limited literacy.

AI in Screening

AI has been found to be as effective and, in some cases, more effective particularly in diagnostics areas like radiology and pathology (Mahajan A, Vaidya T, Gupta A, *et al*. Mahajan A, Vaidya T, Gupta A, *et al*, 2019). Artificial intelligence in healthcare in developing nations: The beginning of a transformative journey (Mahajan, Vaidya, Gupta, *et al*, 2019). CARING (Centre for Advanced Research in Imaging, Neuroscience and Genomics) applied AI to imaging as well as the integrative research in the field of neuroscience and genomics and they have taken forward cutting edge scientific and clinical research but also focused on producing relevant products in collaboration with others. AI-based Radiomics project by NITI Aayog in collaboration with Tata Memorial Centre Imaging Biobank (Machine learning and Artificial Intelligence Database and Tumor Radiomics Atlas Project for Cancer unit) is currently underway. There are several other interesting innovations happening with NITI AAYOG. Currently it has been used in medical diagnosis, in psychiatry and for treatment of certain medical ailments. Diabetic retinopathy: Remidio Fundus on Phone: - portable affordable retinal camera. This AI innovation shifts DR screening to primary care centres (Rajalakshmi R, Subashini R, Anjana RM, *et al.*, 2018).

Medios AI automated screening of referable DR on the Remidio FOP works offline, and is deployed on camera smartphone. It works with non-mydratic image and output and provides referral for ophthalmologist and visualization of the detected lesions. There are AI innovations for Histopathological image analysis as well as TB screening using X-rays. Wadhwani Institute for AI is also doing tremendous work in this areas as official AI partner for India central tuberculosis division technologies (Kadam, 2019). Medical Devices Based on IOT/IOMT are uploading and analysing data in real time; used for quarantined self to telemonitoring/teleICU consultation to AI predication from sepsis.

There are AI enabled devices like wheelchairs- sensor for automatic parking of wheelchairs, thermometer, weighing scale, ECG. Founded in 2018, Kolkata based medtech startup is building affordable non-invasive AI based solutions for early diagnosis of chronic diseases. This device aims to make the adoption of preventive healthcare approach more feeling accessible for Africans by providing easy affordable diagnostic solutions. The startup first product AJO which stands for anemia jaundice and oxygen saturation is a non-invasive IOT enable device that test for anaemia liver and lung related medical problems without any blood work and for less than Rs 1. The user-friendly device does not require medical knowledge or expertise to operate once the test is completed the result can be transferred by email or text message in less than 1.5 seconds. The device cleared clinical trials at NRS Medical College Kolkata with high accuracy. Osteoporosis Prediction Models for Patients' Risk Assessment

Osteoporosis Prediction Models for Patients' Risk Assessment

The aim of this invention ~Osteoporosis is to design the predictive model for early and accurate detection of osteoporosis. In most of the situations patient's age, weight, and gender are taken as the clinical features. It assesses the risk of patient having developed osteoporosis by classifying the patient into at risk or not at-risk category. AI in treatment interventions Kochi based startup founded in March 2017 BAGMO (blood bag monitoring) device addresses lack of blood availability in rural India. It has developed a blood bag monitoring device bag more which monitors temperature of blood bank blood bags during transportation and storage. It improves logistics and communication issues (Douglas *et al*, 2015). Prantaeis is Bhubaneswar based biotech startup born out of experience of the founder suffering from a pregnancy disorder called pre-eclampsia; this startup develops devices and diagnostic solutions mainly for pregnancy related health care. So far 4 products are there this includes EyeRa for early detection of preeclampsia; ProFoIU to monitor kidney health Salubrious, which provide solution for hidden hunger and Embargo which can detect antibiotics in food products (Hlatky, Mark, *et al*. 2015). Waferchips Techno solutions developed in Kollam Kerala is a wearable electrocardiography ECG device called 'Biocalculus' to transfers data to an Android application via Bluetooth if a smartphone is not available. It will store the data up to a month of recording. The device uses AI to generate a clinically actionable report for further diagnosis and treatment Douglas, Pamela, *et al*. (2016).

AI in rehabilitation

One of the areas where AI is helping is in the area of rehabilitation. There are several AI based products which are coming out which help in mobility. They include rehabilitative prosthetics, exoskeleton, augmentations, Brain Computer Interface (BCI) EMG based interface to take inputs from thoughts. AI in times of COVID AI played an important role in times of COVID. Various AI applications have been tested for (I) Early detection and diagnosis of the infection; (II) Monitoring treatment; (III) Contact tracing; (IV) Futuristic projections of cases and mortality; (V) Development of drugs and vaccines; (VI) Reducing workload of healthcare workers; (VII) Prevention of

disease.

Detection of diabetic retinopathy in retinal fundus images

Many diseases of the eye can be diagnosed through non-invasive imaging of the retina through the pupil. Early screening for diabetic retinopathy is important as early treatment can prevent vision loss and blindness in the rapidly growing population of patients with diabetes. Such screening also provides the opportunity to identify other eye diseases, as well as providing indicators of cardiovascular disease. The increasing need for such screening, and the demands for expert analysis that it creates, motivates the goal of low cost, quantitative retinal image analysis. Routine imaging for screening uses the specially designed optics of a 'fundus camera,' with several images taken at different orientations and can be accomplished with (mydriatic) or without (non-mydriatic) dilation of the pupil. Assessment of the image requires skilled readers, and may be performed by remote specialists. With the advent of digital photography, digital recording of retinal images can be carried out routinely through Picture Archiving and Communication Systems (PACS).

Challenges to be addressed to Improve the use of AI in healthcare delivery in Africa

The challenges and barriers to the implementation of AI in healthcare in Africa have been emphasized before now in a previous sub-theme but for clarity sake as the paper comes to an end, it is still necessary that it is reemphasized and must be understood to facilitate the scaling up of use of AI in healthcare Africa (Verma, Rao, Eluri, *et al*, 2020). They include:

Lack of trained personnel and expertise for AI Replacement of human: This is another huge worry which affects the support for the adoption of AI in healthcare (Kalyanakrishnan, Panicker, Natarajan, *et al*. (2018). The lack of AI trained professionals can also be a key barrier to using AI in healthcare.

Awareness of AI and quicker deployment of AI innovations: There is a lack of awareness about potential and benefits of AI use in healthcare delivery at level of multiple stakeholders. Neither healthcare owners, healthcare professionals nor patients have much idea about it in India. There is still a lack of understanding of AI and its benefits, among medical professionals particularly among those in leadership positions and the general population (Bali, 2020).

Information asymmetry among the stakeholders is another huge challenge. Negative media in India of the impact AI will have on jobs has resulted in an increased struggle for start-ups to acquire funding (Bali, 2020).

Ethical issues of AI in healthcare delivery: Inequality concerns in the adoption of AI in healthcare in India include the under-representation of minority groups in the data

used to develop algorithms and solutions; the prominence of males in the software industry, resulting in a male bias in technologies; and greater benefits to higher income populations with access to technologies (Bali, 2020). Data integrity is another burning issue that requires. Datasets based on large and diverse population would be required to offset bias. This could have disastrous effect on increasing the divide in society. AI design is prone to being a reflection of all the bias that exists in society if care is not taken. Algorithms can generate data that may be based on race, gender, age, and religion, resulting in discrimination and unfair results which might be better for some demographics in India than others.

Legal liability and attribution of negligence: Liability for AI is also a key issue that needs to be resolved as, currently, liability falls solely on the doctor, rather than the technology. Explain ability, when making its decisions, is very important.

Cybersecurity: Cyberattacks on all types of organizations globally are on the rise, rendering private digitized data vulnerable to being hacked and accessed by other parties (Silva, Bruno, *et al*, 2015). In 2016, the laboratory database hacking, resulted in the leaking of over 35,000 patient records from across India. This is despite a prior hack; the laboratory had not taken action to secure the data. This requires increase higher standards in data privacy and data security. There are concerns in India about multinationals accessing to local data, without local benefits. Issues of confidentiality and cybersecurity also need to be addressed, in order to prevent the compromise of sensitive health information.

High initial cost in AI ventures: The infrastructure required for AI to grow remains inadequate. Smaller organizations in the health sector also struggle, in particular, with limited resources and insufficient data backup systems. Start-ups in the medical field also face issues in accessing data from outside of India. Data protection laws, in the EU for example, do not allow for interoperability.

Lack of infrastructure While the Indian government has increased spending in the healthcare industry, the amount of public funding it invests in healthcare is small compared to other emerging economies. Government investment specifically in health-related AI in India is limited (Paul, Hickok, Sinha, *et al*, 2018). The infrastructure necessary for AI to take off in India remains neglected by policy makers. This includes availability of internet and electricity. Hospitals that do not have their own IT infrastructure can produce difficulties for managers using IT technologies.

Challenges to data availability in healthcare for use by AI in healthcare There are several problems facing India the large number of unstructured data sets and problems with interoperability. Concerns about the absence of open sets of medical data; inadequate analytics solutions capable of working with big data; and concerns that algorithms may generate data that reflect cultural biases. Lack of access to open data

sets is a particular challenge for start-ups (Paul, Hickok, Sinha, et al. (2018). For example, gathering and uploading all the data from intensive care unit monitors, deciphering significant medical patterns and triggering a medical action (Esteva, Kuprel, Novoa, Swetter, Blau, & Thrun, 2017).

Data pooling and data collection Access to data is essential for AI implementation. India has extensive amounts of health data available. India lacks, however, a structured regime in terms of sharing health related data. A key obstacle to the adoption and implementation of AI in healthcare in India is the absence of robust open sets of medical data. Accessing healthcare datasets can be difficult, legally and due to other reasons. This is a particular challenge for start-ups, in particular, as larger actors often already have access to such data (Paul, Hickok, Sinha, *et al*, 2018). Start-ups thus often rely instead on publicly available datasets from the US, Europe, and elsewhere. This undermines the effectiveness of using AI in healthcare as it does not cater to the Indian demographic. Reliance on open data from other contexts results in algorithms that reflect the bias of such data and development of solutions trained to a specific demographic. It would be necessary to adjust for these biases in the application of AI tools and to retrain solutions on Indian data, particularly when it involves drug discovery and genomics. While there are some scattered examples of open-source data in the Indian context, such as the state of Tamil Nadu and the National Cancer Registry, they are insufficient. There is in India a lack of necessary historical health data due to a plethora of reasons. Health records are often hand-written in local languages, which may make it more challenging to digitize.

Data protection and privacy Information privacy concerns are identified as a tremendous obstacle to big data adoption in healthcare in Africa. There are concerns in India that international companies in the past have drawn on intangible knowledge from the healthcare sector in India in order to develop a hospital information system using the resources of Indian hospitals. However, these same hospitals were later not able to access these products they helped to develop, having to buy licenses for the next versions of the same or similar products. Consent for collection is a key data challenge (Paul, Hickok, Sinha, *et al*, 2018). Technical deployment seemed to precede policy development, adequate privacy legislation, and ethics constraints (Verma, Rao, Eluri, *et al*, 2020). The Aadhaar Act [2016] and other existing regulations fail to provide robust consent provisions and address privacy issues in regards to the collection of biometrics.

Conclusion

AI has the potential to revolutionize healthcare delivery in Africa by enhancing diagnostic accuracy, improving access to care, personalizing treatments, and strengthening healthcare systems. Strategic investments, policy support, and capacity development are essential to harness AI's full potential for improving health outcomes across the continent.

The integration of AI in the sub-Saharan African health sector holds promise, varying across countries due to infrastructure and policy variations. The AI's transformative impacts in diagnostics, treatment and healthcare operations address challenges like limited resources and accessibility. Examples include mobile based diagnostics, malaria prediction and precision medicine. However, barriers such as infrastructure challenges, data privacy concerns and healthcare workforce training gaps hinder the progress. The healthcare sector's challenges, including malaria prevalence, are linked to AI's potential benefits in diagnostics. Addressing these gaps is crucial for ensuring ethical deployment and consumption, marking a paradigm shift in healthcare delivery. Healthcare in sub-Saharan Africa holds potential future improvement through technology adoption, community health initiatives and increased access to medical services. Challenges like infrastructure limitations and healthcare inequality need addressing for sustainable progress. Finally, the government and all stakeholders are urged to convene to facilitate the necessary focus on AI and digital health in the advancement of the healthcare sector in sub-Saharan Africa.

When it comes to deployment of new technologies, Africa may oftentimes be perceived as lagging behind the rest of the world. However, because of the nature of artificial intelligence systems used in healthcare, they are uniquely suited for the challenge of delivering healthcare to remote and under resourced settings. This has led to the deployment of many programs across Africa in attempt to specifically address these challenges. Nevertheless, even though AI systems may hold great promise for the future of in Africa, the reality of the situation is that only a handful of African nations have embraced and pursued artificial intelligence deployment in healthcare. These countries are notably Kenya, South Africa, Nigeria, Ghana, and Ethiopia. Even in these countries, many healthcare providers are unaware that these systems exist and are currently being used in their respective countries. Without the availability of needed infrastructure for secure data collection with data privacy, education, and good governance, the dream of artificial intelligence leapfrogging healthcare in Africa into the future may not be realized.

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