



Use Case Brief:

Artificial Intelligence in Health, A Focus on Africa.



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Information Technology Law*

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AI has been used in medicine since the 1970s, with the first utilisation and treatment.

Introduction

Over the years health care in Africa has made significant progress in terms of disease detection, management and containment as well as overall service, however the landscape remains fraught with various challenges ranging from limited access to medical facilities and healthcare professionals to the burden of infectious diseases, inadequate infrastructure, and constrained resources.¹ Technology has been noted to play a significant role in addressing these challenges, and emerging digital technologies such as artificial intelligence (AI) promise to strategically enhance healthcare systems while addressing some of the core challenges. AI systems ingest large amounts of data, analyse it for patterns, and use them to predict the future. AI in healthcare will strengthen health systems and delivery across Africa, including point-of-care, diagnosis, and advancing research based on real-time data.² AI has been used in medicine since the 1970s, with the first utilisation and treatment. AI was utilised in medical experts' systems based on Bayesian statistics and decision theory, and treatments for glaucoma and infectious diseases were successfully diagnosed and recommended. This scaled up in the 1990s to bioinformatics and research, scaling up AI in medicine. Research notes that AI implementations in healthcare can help save \$150 billion in costs by 2026.³

The complexity and rise of data in healthcare mean that artificial intelligence (AI) will increasingly be applied within the field. Payers, care providers, and life sciences companies already employ several types of AI. Although there are many instances in which AI can perform healthcare tasks as well or better than humans, implementation factors will prevent large-scale automation of healthcare professional jobs for a considerable period.⁴ Ethical issues in the application of AI to healthcare arise. This is further discussed in consideration of the challenges and benefits of AI in healthcare, its implications for human rights, and policy considerations.

Purpose of the Use Case

This use case brief aims to outline the benefits, opportunities, risks, and challenges of leveraging AI in healthcare in the African context and, in so doing, introduce elements that must be considered with adoption and implementation by focusing on policy implications, responsible AI, and human rights

¹Oleribe OO, Momoh J, Uzochukwu BS, Mbofana F, Adebisi A, Barbera T, Williams R, Taylor-Robinson SD. 'Identifying Key Challenges Facing Healthcare Systems In Africa And Potential Solutions.' *Int J Gen Med*. 2019 Nov 6;12:395-403. doi: 10.2147/IJGM.S223882. PMID: 31819592; PMCID: PMC6844097. <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6844097/>>

²Harnessing AI to Transform HealthCare In Africa. (Science for Africa Foundation, February 2023) <<https://scienceforafrica.foundation/media-center/harnessing-artificial-intelligence-transform-health-africa#:~:text=AI%20systems%20ingest%20large%20amounts,on%20real%20time%20data%2C%20etc.>>

³Ayomide Owoyemi, Joshua Owoyemi, Adenekan Osiyemi, Andy Boyd, 'Artificial Intelligence for Healthcare in Africa.' (*Front. Digit. Health*, 07 July 2020 Sec. Health Informatics Volume 2 - 2020 | <<https://doi.org/10.3389/fdgth.2020.00006>>

⁴Thomas Davenport, Ravi Kalakota, 'The Potential for Artificial Intelligence in Healthcare.' (*Future Healthc J*. 2019 Jun;6(2) <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/>>

implications. The consideration of use is given to both public and private health care capabilities in leveraging AI, although notably the private sector health care leads in leveraging AI. It will canvass critical areas where AI can profoundly impact, highlighting ongoing initiatives and utilisations in the African continent and the extent of use and potential impact. It will also give practical examples from African countries on how AI has been and is being utilized. Ultimately, this use case brief is intended to create a functional template and instruction guide for policymakers, industry players, practitioners, developers, and investors on considerations for effectively harnessing AI in the health sector specific to the African context.

Impact of AI Utilization on Health.

The application of AI in health, commonly referred to as Medical AI (MAI), notes more meaningful application in developed nations in comparison to what is seen in the continent, although this use case brief notes utilisations in various countries it is not comparable.⁵ For example, AI in the healthcare market was estimated to be valued at US\$ 0.70 billion in 2021 and expected to exhibit an annual growth rate (CAGR) of 43.9% over the forecast period (2021-2030) in comparison to Africa, where the estimated value was US\$664.20m in 2022.⁶

The benefits of utilising AI cannot be understated and have been noted with the promise to address the most pressing challenges facing the healthcare system in Africa, some of the difficulties being the shortage of healthcare workers, limited access to healthcare, and the high prevalence of infectious diseases.⁷ Positive impacts of AI that are identified to solve challenges include improving access to health care through AI-driven telemedicine, enabling consultations and diagnosis regardless of distance, early disease detection through leveraging AI-powered diagnostics tools leading to better treatment outcomes, data management through analysing and managing large volumes of data for better decision making, disease tracking and adequate and equitable allocation of resources and disease surveillance through outbreak prediction through leveraging machine learning. Some identified solutions are discussed below with practical examples of countries where AI is already being leveraged in the health care system.

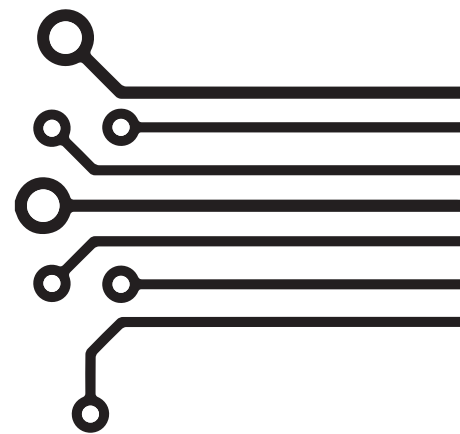
The impact of AI, particularly in health, is twofold. In considering the positive impact of leveraging AI technologies, the challenges arising and negative consequences must be discussed to give a more nuanced picture, identify risks that need to be avoided, and identify mitigating measures. Research notes that, if implemented correctly, AI could improve outcomes by 40 per cent and reduce treatment costs by 50 per cent.⁸ However, do these benefits outweigh the negative implications? Leveraging AI in health care raises concerns regarding data collection, algorithmic development, ethical concerns, social concerns, and

⁵Owoyemi A, Owoyemi J, Osiyemi A, Boyd A. Artificial Intelligence for Healthcare in Africa. *Front Digit Health*. 2020 Jul 7;2:6. doi: 10.3389/fdgth.2020.00006. PMID: 34713019; PMCID: PMC8521850.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8521850/#B13>

⁶Africa Artificial Intelligence (AI) in Healthcare Market Analysis (Insights) <https://www.insights10.com/report/africa-artificial-intelligence-ai-in-healthcare-market-analysis/>

⁷Owoyemi A, Owoyemi J, Osiyemi A, Boyd A. Artificial Intelligence for Healthcare in Africa. *Front Digit Health*. 2020 Jul 7;2:6. doi: 10.3389/fdgth.2020.00006. PMID: 34713019; PMCID: PMC8521850.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8521850/#B13>

⁸AI for Health Care: Concepts and Applications (Harvard School of Public Health) <https://www.hsph.harvard.edu/ecpe/programs/ai-for-health-care-concepts-and-applications/>



clinical implementation concerns.⁹

Data is a critical component in the development and functioning of AI systems. Significant advances in leveraging AI have occurred in sectors where easy access to large data sets is made possible.¹⁰ Information accessibility is the first key concern when it comes to healthcare. Patient records are considered confidential, governed not only by age-old practice but by practitioner standards set within the healthcare sector and further acknowledged in data protection laws as sensitive personal data. Reluctance to share data coupled with regulatory framework makes it difficult to apply AI where the information required is not accessible.¹¹ Additionally, AI-based technologies raise concerns regarding data privacy and security. The nature of health data leaves it easily susceptible to various risks and vulnerabilities, such as data breaches.¹²

AI has the potential to improve or exacerbate existing health inequalities. Unequal access to health services in Africa is often characterized by access to health care in terms of quality of public healthcare service provision, income group, rural/urban location, and gender as social stratifies result in lower health outcomes for disadvantaged groups.¹³ Access to AI technologies or services that leverage AI technologies is also guided by income group, rural-urban location, and gender, informed by the key drivers of the digital divide. These inequalities may present in leveraging AI in healthcare in terms of access and results that may be generated due to existing data patterns and data sets. As a result, it is essential that while focusing on the benefits of leveraging AI on the continent, existing inequalities must be addressed to mitigate discriminatory practices and bias.

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AI Utilizations and Application.

AI continues to gain traction in adoption and use, and its utilization is seen as a futuristic promise. Mapping research conducted by the Center for Intellectual Property and Information Technology (CIPIT) notes that AI in healthcare accounts for 12.5% of AI utilisation in the continent.¹⁴ AI is mainly utilized in healthcare in diagnosis and early detection, telemedicine, remote consultations, predictive analysis and disease detection, drug discovery, and treatment personalization.

AI in Diagnosis and Early Detection

One of the foremost challenges healthcare faces in Africa is the timely and

⁹Khan B, Fatima H, Qureshi A, Kumar S, Hanan A, Hussain J, Abdullah S. *Drawbacks of Artificial Intelligence and Their Potential Solutions in the Healthcare Sector*. Biomed Mater Devices. 2023 Feb 8;1-8. doi: 10.1007/s44174-023-00063-2. <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9908503/#:~:text=servers%20%5B12%5D,-AI%2Dbased%20systems%20raise%20concerns%20regarding%20data%20security%20and%20privacy,records%20is%20crucial%20%5B13%5D>>.

¹⁰Davenport T, Kalakota R. *The Potential for Artificial Intelligence in Healthcare*. Future Healthc J. 2019 Jun;6(2):94-98. doi: 10.7861/futurehosp.6-2-94. PMID: 31363513; PMCID: PMC6616181. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/>

¹¹ibid

¹²ibid

¹³Mutangura G, *Health Inequalities in Selected African Countries: Review of Evidence and Policy Implications*. African Economic Conference 2007: Opportunities and Challenges of Development for Africa in the Global Arena (2007, Nov. 15-17 : Addis Ababa, Ethiopia). Addis Ababa :. © UN. ECA <https://repository.uneca.org/handle/10855/15543>

¹⁴How is AI being Utilized in Africa (CIPIT) <https://app.powerbi.com/view?r=eyJrIjojY-je5NTQyMzQrNTFiZS00ZTdjLTkwMmMtZWZkOGU3Njk1ZjM2IiwidCI6IjdhNTNiM-jZlTl1YTUuNGNiYS05NGM4LTM4ZWFiMjY3MzVjYSJ9&pageName=ReportSection>

accurate diagnosis of diseases. AI-powered diagnostic tools, driven by machine learning algorithms, can significantly enhance this aspect of healthcare.¹⁵ Through the analysis of medical images, such as X-rays and CT scans, AI can assist in the early detection of conditions like tuberculosis, cancer, and pneumonia. Furthermore, AI can aid in interpreting electrocardiograms (ECGs), reducing the burden on overworked healthcare providers and enabling more efficient triage in resource-constrained environments. This is seen with the development of the Radiology Support System for Tuberculosis, which employs AI to analyse chest X-rays for signs of tuberculosis.¹⁶ This innovation has expedited the diagnosis of tuberculosis, a critical concern in many African nations.

Telemedicine and Remote Consultations

Access to healthcare facilities remains a significant challenge in Africa, particularly in rural and underserved areas. AI-driven telemedicine platforms offer a lifeline by bridging the gap between patients and healthcare professionals. These platforms leverage AI, machine learning, and data analytics into telehealth platforms, empowering health providers with data-driven insights, predictive capabilities, and personalised treatment options.¹⁷ AI enhances telemedicine by streamlining various healthcare processes; the COVID-19 pandemic highlighted the need for AI in telemedicine, characterised by the influx of AI-driven telemedicine platforms that enable patients to receive medical services from the comfort of their homes. AI-assisted telemedicine also aided in breaking down language barriers, especially for those in rural areas, through AI language translation services, which facilitated effective communication between the healthcare professionals and the patient.¹⁸

Predictive Analytics for Disease Outbreaks

Infectious diseases pose a persistent threat to public health in Africa and present challenges to other sectors, potentially reversing gains in human development. AI can play a pivotal role in predicting and managing disease outbreaks, and AI-based model systems can be leveraged to improve pattern recognition of disease spread in populations and predictions of epidemics in different geographical locations. These predictions can quickly inform targeted interventions and resource allocation.

Drug Discovery

The lack of advanced technologies has limited the drug development processes, making it a time-consuming and expensive endeavour that can be solved by

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¹⁵Ayomide Owoyemi, Joshua Owoyemi, Adenekan Osiyemi, Andy Boyd, 'Artificial Intelligence for Healthcare in Africa.' Front. Digit. Health, 07 July 2020 Sec. Health Informatics Volume 2 - 2020 | <<https://doi.org/10.3389/fgth.2020.00006>>

¹⁶Qin ZZ, Ahmed S, Sarker MS, Paul K, Adel ASS, Naheyant T, Barrett R, Banu S, Creswell J. Tuberculosis Detection from Chest X-rays for Triage in a High Tuberculosis-Burden Setting: An evaluation of Five Artificial Intelligence Algorithms. Lancet Digit Health. 2021 Sep;3(9):e543-e554. doi: 10.1016/S2589-7500(21)00116-3. PMID: 34446265. <https://pubmed.ncbi.nlm.nih.gov/34446265/>

¹⁷Shamshulaphin Ansari, *The Revolution of AI in Telemedicine: Enhancing Healthcare through Technology*. (LinkedIn, August 7, 2023) <https://www.linkedin.com/pulse/revolution-ai-telemedicine-enhancing-healthcare-through-ansari/>

¹⁸ibid

leveraging AI¹⁹ However, it is essential to note that technology is not a cure-all nor an incentive to jump hurdles in drug discovery. Researchers note that ‘laboratory cell and tissue experiments and human testing, the most time-consuming and expensive parts of the drug development process, cannot be eliminated.’²⁰ AI-driven drug discovery accelerates the development of new medications and tailors treatment plans to individual patients. The stages in which AI can be used for drug discovery include drug design, polypharmacology, chemical synthesis, drug repurposing, and drug screening.²¹

As mentioned above, AI is already being utilised in various ways on the continent in certain circumstances through the abovementioned ways. AI utilization in healthcare in the continent has been noted in the areas noted below; the examples provided are not exhaustive. However, they are a practical representation of AI us. ²²



- **South Africa:** In 2021, the Philips Foundation implemented AI software developed by Delft Imaging, successfully deploying the software in 11 South African hospitals to help triage and monitor COVID-19 patients via X-ray imaging. Delft Imaging’s AI-based CAD4COVID software complements existing COVID-19 diagnostic technologies. It uses chest estimates of the severity and progression of COVID-19 disease based on routinely available chest X-rays. The technology is based on the same technical core as Delft Imaging’s CAD4TB tuberculosis (TB) detection software, which has contributed to screening six million people for TB worldwide.²³ Computerized Aid To Treat (CATT) was also used by nurses in South Africa for drug prescriptions based on a cost-and-effectiveness algorithm. AI is also being leveraged on a more administrative angle in “applying a multinomial logistic classifier-based method to individual resource scheduling, particularly in predicting the duration health employees may stay within public service.”²⁴

- **Tanzania and Zambia:** Delft Institute’s CAD4TB software is also being used in Tanzania and Zambia to assess the utilization of the computer-aided analysis of pulmonary tuberculosis from the chest radiographs.²⁵

- **Zambia:** Researchers conducted a study using AI to diagnose diabetic retinopathy, which showed significantly more promising results than human assessments. It showed clinically acceptable performance in detecting referable diabetic retinopathy.²⁶

¹⁹Paul D, Sanap G, Shenoy S, Kalyane D, Kalia K, Tekade RK. *Artificial intelligence in drug discovery and development*. Drug Discov Today. 2021 Jan;26(1):80-93. doi: 10.1016/j.drudis.2020.10.010. Epub 2020 Oct 21. PMID: 33099022; PMCID: PMC7577280. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7577280/>

²⁰ibid

²¹ibid

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²³Philips Foundation deploys AI Software in South Africa to Detect and Monitor COVID-19 using Chest X-rays. <https://www.philips-foundation.com/a-w/articles/CAD-4COVID.html>

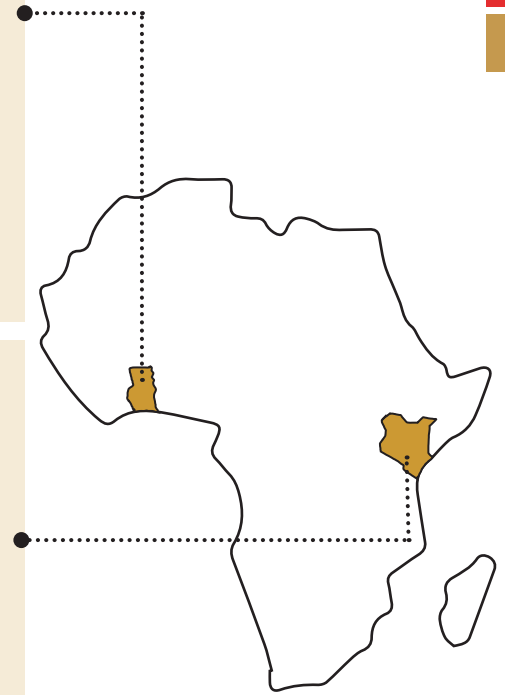
²⁴ Dr. Shadrack Opon, ‘Unlocking the Potential Of Artificial Intelligence For Healthcare In Africa.’ (Africa Health Business) <https://www.ahb.co.ke/unlocking-the-potential-of-artificial-intelligence-for-healthcare-in-africa/>

²⁵ibid

²⁶Owoyemi A, Owoyemi J, Osiyemi A, Boyd A. Artificial Intelligence for Healthcare in Africa. *Front Digit Health*. 2020 Jul 7;2:6. doi: 10.3389/fdgh.2020.00006. PMID: 34713019; PMCID: PMC8521850.

- **Ghana:** MinoHealth AI Labs in Ghana leverages AI for automated diagnostics, forecasts, and prognostics. “MinoHealth has developed AI systems for conditions including breast cancer, pneumonia, fibrosis, hernia, oedema, cardiomegaly, emphysema, effusion, and pneumothorax. The AI system takes a medical image as input and determines if the chosen condition is present or not (diagnostics), if it is developed (forecasts), and its progression (Prognostics). MinoHealth further leverages AI solutions with a specific focus on AI for radiology, AI for infectious diseases, and AI for biomedical treatment.²⁷

- **Kenya:** Ilara Health, launched in 2019, provides AI and tech-powered diagnostic equipment to medical facilities at a fraction of the standard cost. Tests done using their devices are completed in the doctor’s office, and results are available in less than 10 minutes. Their software links diagnostic devices with an electronic medical record (EMR) system that records all patient data. It also sends patients customised health tips and reminders based on their condition. is also offering accurate and affordable diagnostics to people in rural areas via small, AI-powered diagnostic devices incorporated through a proprietary technology policy and correspondingly distributed openly to primary care doctors.²⁸ Applications like Antara Health leverage AI in patient-centred healthcare by adding AI-assisted health navigation to make the complex parts of healthcare easy for patients and providers using AI-assisted health technology to make healthcare simple for patients and providers.²⁹



Policy Implications

Globally, the AI policy landscape is evolving to fill the gap in AI regulation; this is seen from the introduction of the EU AI Act, the US AI Act, and the development of ethical frameworks governing AI from international organisations such as the OECD and UNESCO. Africa is making strides in consideration of AI regulatory practices, which have been noted through the development of national AI strategies. Mauritius and Egypt so far have the most comprehensive national AI strategies.³⁰

More holistically, the WHO and the International Telecommunication Union (ITU) established a Focus Group on AI for Health, which then created sub-working groups, one of which included the Working Group on Regulatory Considerations on AI for Health. Guided by a multi-stakeholder approach, the World Health Organization on 19 October 2023 published Regulatory Considerations for AI in Health aimed at all relevant stakeholders, including the medical devices ecosystems, developers exploring and developing AI systems, regulators who might

²⁷MinoHealth AI Labs, <https://www.minohealth.ai/>

²⁸ILARA Health Using AI for Affordable Diagnostics. (Villgro Africa) <https://villgroafrica.org/ilara-health-using-ai-for-affordable-diagnostics/>

²⁹Antara Health <https://www.antarahealth.com/>

³⁰Sunny IBeneme, Joseph Okeibunor, Derick Muneene, ‘Data Revolution, Health Status Transformation and the Role of Artificial Intelligence for Health and Pandemic Preparedness in the African context.’ *BMC Proc* 15 (Suppl 15), 22 (2021). <https://doi.org/10.1186/s12919-021-00228-1>

be in the process of identifying approaches to manage and facilitate AI systems, manufacturers who design and develop AI-embedded medical devices, health practitioners who deploy and use such medical devices and AI systems, and others working in these areas.³¹ These regulatory considerations were developed to facilitate safe and appropriate use of AI technologies for the development of AI systems in health care.³²

The Regulatory considerations include,

- *Documentation and Transparency*: this refers to the intentional documentation of information for medical and development purposes. These references use information for selecting datasets, reference standards, parameter metrics, deviation from original plans, and updates during development. The report recommends that such documentation should be done in a manner that allows for tracing of the development process adopting a risk-based approach for the level of document and record keeping that has been utilized for the development and utilization of the AI system.³³
- *Risk Management of AI systems development lifecycle approach*: Adopting a product lifecycle approach throughout the phases in the lifecycle of an AI system, from pre-market development management, post-market surveillance and change management. A risk-based approach is also suggested in consideration of risks associated with the use of AI systems such as cybersecurity attacks and algorithmic bias.
- *Intended use and analytical, clinical validation* refers to details of the training dataset composition underpinning an AI system. This ties together with the documentation process, where the details may include information such as size, setting and population, input and output data, and demographic composition. This information should be documented with transparency in mind and made available to the users.
- *Data quality*: Developers should consider whether available data are of sufficient quality to support the development of the AI system to achieve the intended purpose. Furthermore, developers should consider deploying rigorous pre-release evaluations for AI systems to ensure that they will not amplify any of the issues discussed in Section 5.4 of this document, such as biases and errors. Careful design or prompt troubleshooting can help identify data quality issues early and prevent or mitigate possible harm. Stakeholders should also consider mitigating data quality issues and the associated risks that arise in healthcare data and continue to work to create data ecosystems to facilitate the sharing of good-quality data sources.

³¹Regulatory Considerations on Artificial Intelligence for Health (WHO, 2023)<https://iris.who.int/handle/10665/373421>

³²ibid

³³ibid

- *Privacy and Data Protection:* Privacy and data protection should be considered during the design and deployment of AI systems. Early in the development process, developers should consider gaining a good understanding of applicable data protection regulations and privacy laws and should ensure that the development process meets or exceeds such legal requirements. It is also important to consider implementing a compliance programme that addresses risks. It ensures that the privacy and cybersecurity practices consider potential harm and the enforcement environment.
- *Engagement and Collaboration:* During the development of the AI innovation and deployment roadmap, it is essential to develop accessible and informative platforms that facilitate regulatory considerations on artificial intelligence for health engagement and collaboration among key stakeholders, where applicable and appropriate. It is fundamental to consider streamlining the oversight process for AI regulation through such engagement and partnership to accelerate practice-changing AI advances.

Regulation of health-related has developed over time, since the 1960s with advances often following revelations of weaknesses in the regulatory process.³⁴ This is still the case, considering how fast technology is constantly evolving and the various ways it can be leveraged to improve healthcare. An established regulatory mechanism for AI in the continent has yet to exist. This is the same case when it comes to sectoral AI regulation. More specific to health and the application of AI, particularly as it relates to medical devices, analysis of statutes governing medical devices in the selected African countries shows that no single legislation explicitly mentions AI or algorithms within the definition of a medical device. Furthermore, when compared to the definition of AI provided by the OECD, the definition of software included in current medical device regulations does not specifically and adequately address novel features of AI software.³⁵

Assessing maturity of AI in health in Africa is guided by the existence of a regulatory framework, the absence of which may in certain circumstances impede the uptake of AI in the healthcare sector.³⁶ Notably, Although there are no laws specific to the regulation of AI in health, the healthcare sector is not underregulated; this is seen through the enforcement of national health statutes, digital health policy documents, professional codes of conduct, and healthcare standards and guidelines across different African countries.

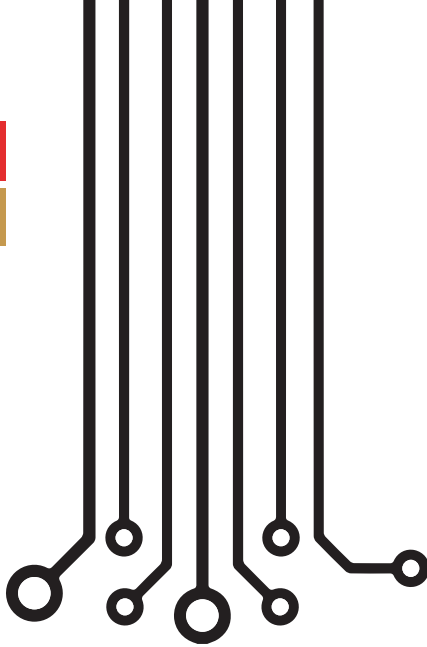
The African Union, through the African Medical Devices Forum³⁷, has the

³⁴Martin McKee, Olivier J. Wouters, 'The Challenges of Regulating Artificial Intelligence in Healthcare.'<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10125205/pdf/ijhpm-12-7261.pdf>

³⁵Beverley Alice Townsend, Irvine Sihlahla, Meshandren Naidoo, Shiniel Naidoo, Dusty-LeeDonnelly, and Donrich Willem Thaldar, 'Mapping the Regulatory Landscape of AI in Healthcare in Africa.'<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10484713/pdf/fphar-14-1214422.pdf>

³⁶ibid

³⁷The forum is hosted jointly by the Secretariats of the African Union Development Agency - NEPAD (AUDA-NEPAD) and the World Health Organisation (WHO). The forum was founded in 2012 with the purpose of steering harmonization of the regulation of medical devices in Africa based on the WHO global model for Medical Devices Regulatory Framework Model. This aims to enable access to medical devices and diagnostics of assured quality, safety and performance across Africa.



Human rights play a vital role in balancing the risks and benefits of leveraging technologies generally, especially when involved in health.

opportunity to provide regulatory guidance on leveraging AI in health, particularly for clinical healthcare and research.³⁸ Advances towards foundational policies regionally are underway with the development of the policy and implementation plan on health data sharing by the Intergovernmental Authority on Development (IGAD) in 2021.³⁹ which will significantly contribute to AI development in Africa; noting that sharing health data is one of the key challenges towards leveraging AI in the continent. Given the unique challenges an African AI ecosystem is still developing, especially in terms of its regulatory landscape, specific to AI in health, the following policy implications must be considered in the development of regulatory and governance structures,

- **Regulatory Frameworks:** one of the gaps in the African AI ecosystem is regulation. There is a need to establish clear and comprehensive regulatory frameworks for AI in healthcare at the regional and state levels. This will entail defining the scope of AI utilisation, data privacy, security concerns, and ethical considerations. Part of establishing regulatory frameworks is ensuring that regulatory bodies also exist that would work closely with healthcare providers and developers to create practical guidelines to ensure safety and efficiency in leveraging AI in health.
- **Data Governance:** Data is the bedrock of efficient and effective AI. AI in healthcare relies on not just access to data but quality data. Data protection laws are already being established in various African countries, with approximately 35 countries having enacted data protection laws, additionally, the Malabo Convention sets a regional framework for data governance. There is also a need to establish data collection standards for AI in health care, considering already existing standards and practices in the health sector.
- **Training and Education:** Capacity development and skills development are necessary to equip healthcare professionals with the required skill set to work with AI technologies. With the development of national AI strategies, investing in education and training programs training physicians, nurses, and technicians to interpret AI-generated insights to make informed decisions.
- **Digital Divide:** There already exists a digital divide with existing technologies. Leveraging AI, particularly in health, has the risk of exacerbating already existing healthcare inequalities brought about by technology. The affordability and accessibility of AI-based healthcare solutions need to be guided by policy. Connectivity and infrastructure must also be improved to facilitate access to remote and underserved areas ensuring the benefits of AI are spread equitably across the continent by guaranteeing access to health facilities have access to reliable internet and power sources. Does not exacerbate healthcare inequalities.
- **Stakeholder engagement:** Robust policy development requires

³⁸Beverley Alice Townsend, Irvine Sihlahla, Meshandren Naidoo, Shiniel Naidoo, Dusty-LeeDonnelly, and Donrich Willem Thaldar, 'Mapping the Regulatory Landscape of AI in Healthcare in Africa.' <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10484713/pdf/fphar-14-1214422.pdf>

³⁹ibid

collaboration and partnership with all relevant stakeholders. Promoting stakeholder engagements between government, private sector, academia, healthcare professionals, developers, and international organizations will help better leverage resources and expertise in addressing policy issues that cut across all stakeholders in regulating AI in healthcare.

- **Ethical Considerations:** Beyond already established ethical standards and guidelines in the healthcare sector, there needs to be clear guidelines for the ethical use of AI in healthcare. Issues of bias, fairness, transparency, and accountability must be addressed in successfully leveraging AI while ensuring AI-related technologies do not exacerbate existing healthcare inequalities. Develop clear guidelines for the ethical use of AI in healthcare, including bias, fairness, transparency, and accountability. Policymakers should ensure that AI technologies do not exacerbate existing healthcare disparities.

Human Rights Implications

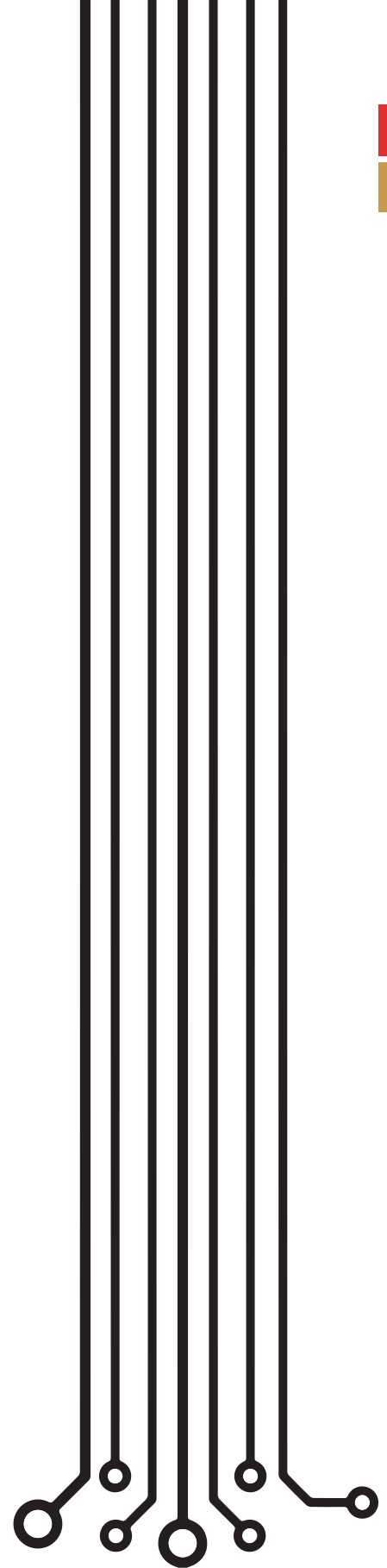
AI-based technologies have the potential of either alleviating or exacerbating existing human rights impacts in the healthcare sector.⁴⁰ Human rights play a vital role in balancing the risks and benefits of leveraging technologies generally, especially when involved in health. Human rights are enshrined in the Universal Declaration of Human Rights, the International Convention on Civil and Political Rights, and the International Convention on Social and Cultural Rights. The core values and principles of universality, interdependence, indivisibility, and non-discrimination enshrined in the instruments equally apply to leveraging technologies, particularly in the design and implementation processes of AI.⁴¹

Regionally, the African Charter on Human and Peoples Rights guarantees certain human rights and fundamental freedoms; in contextualising this to leveraging AI, several human rights obligations apply in leveraging AI in health in the continent and provides a foundational framework in canvassing human rights implications specific to the continent. The Key human rights considerations under the charter include:

- **Right to Health:** the right to health outlines four key elements: accessibility, availability, accessibility, and quality. Enshrined under Article 16, The African Charter recognises the right to enjoy the best attainable state of physical and mental health. When implementing AI in healthcare, it is crucial to ensure that AI technologies improve healthcare access, quality, and affordability for all c, especially those in underserved and remote areas.
- **Privacy Rights:** derived from a reading of Article 6, which provides for the right to liberty and security and further supplemented by the African Union Convention on Cyber Security and Personal Data Protection, the right to privacy and security of one personhood extends to the digital

⁴⁰AI and Human Rights in Healthcare (BSR, October 2023) <https://www.bsr.org/reports/BSR-AI-Human-Rights-Healthcare.pdf>

⁴¹JeongHyun Lee, Attlee Gamundani, Serge Stinckwich, 'Towards a Human Rights-Based Approach to Artificial Intelligence.' (UNU Macau, March 2021) <https://unu.edu/macau/blog-post/towards-human-rights-based-approach-artificial-intelligence>



spaces and in the use of different technologies such as AI. AI systems leveraged for healthcare often involve the collection and analysis of sensitive health data that are susceptible to harm, such as cyber-attacks, identity theft, and fraud, which would affect the security and autonomy of an individual. An exercise of this right in leveraging AI for health requires the implementation of general data protection laws and sector-specific data protection laws that outline technical and organizational measures that safeguard patients' medical records, ensuring the data is utilized only for the intended purpose and with informed consent.

- **Non-Discrimination:** Articles 2 and 3 guarantee the enjoyment of rights and freedoms without discrimination based on race, equality, and protection before the law. Discrimination on any grounds, including health-related, is equally applicable in this instance. Leveraging AI technologies in health may present risks to discriminatory practices depending on the data that informs algorithms in use. Biased human decisions and inequalities reflected through gender, race, and social status may be replicated in data,⁴² magnifying the already existing health inequalities.
- **Freedom of Thought and Expression:** Article 9 provides for the right of every individual to receive information and to express and disseminate the information within the confines of the law. Informed consent establishes the extent to which individuals can give information/ data, particularly health data, when receiving health care services that may involve using AI. The right to obtain information informs the right to be notified of the technology being leveraged to make informed decisions. AI technologies may influence healthcare decisions and recommendations. This further informs the right to express one's thoughts and concerns about AI-generated diagnoses and treatments. This ensures healthcare remains a collaborative process between patients and healthcare professionals.
- **Access to Information:** Article 9 also speaks to information on benefits, limitations, and potential risks related to AI in healthcare, which must be accessible and understandable to all, ensuring transparency and informed consent in decision-making processes.
- **Right to Life:** Article 4 recognises the right to life as every person is entitled to the respect of life and integrity and cannot be arbitrarily deprived of this right. This speaks to the right to bodily autonomy and integrity, informing the human right that everyone should enjoy making self-determined decisions over their own body.⁴³ While AI can enhance healthcare outcomes, the ethical and safe implementation of AI technologies is vital to avoid unintended harm and violations of this right.

⁴²Eke, D.O., Chintu, S.S., Wakunuma, K. (2023). Towards Shaping the Future of Responsible AI in Africa. In: Eke, D.O., Wakunuma, K., Akintoye, S. (eds) Responsible AI in Africa. Social and Cultural Studies of Robots and AI. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-08215-3_8

⁴³Bodily Autonomy and Integrity (HIV/AIDS Language Compendium) <https://hivlanguagecompendium.org/bodily-autonomy-and-integrity.html>

Responsible AI Implications

Responsible AI refers to creating ethical and accountable AI.⁴⁴ Transparency, fairness, security, and inclusivity are the core elements of responsible AI. Interpretation and operationalisation may vary depending on the sector applying responsible AI frameworks.⁴⁵ Responsible AI in health presupposes the design and implementation of ethical transparent and accountable AI solutions aimed at maintaining trust and minimizing privacy risks. Responsible AI places the patients/ users at the centre and aligns with stakeholder expectations as well as applicable regulations and laws.⁴⁶ From an African perspective, responsible AI goes beyond compliance with laws, including human rights provisions; it also envisions developing AI compliant with socially, culturally sensitive, acceptable, and ethically responsible AI.⁴⁷

General observations note that research on the use of AI in health care primarily focuses on the technological perspective and exploration of the economic value of AI applications with a notable lack of studies and practices, mechanisms and infrastructure, and ecosystem for sustaining and supporting responsible AI, particularly from a social responsibility perspective.⁴⁸ This is especially true for the African continent, where the focus is more on innovation than considerations for infrastructural development and regulatory processes that would support the implementation of AI in health. Although the national AI strategies developed in the continent by Egypt, Mauritius, and Rwanda speak to leveraging AI in health, consideration is given more to the economic impact as opposed to the social and cultural implications of leveraging AI, which would require considerations of responsible AI and arising ethical considerations.

Responsible AI principles can be inferred from existing human rights provisions and data protection laws as the core principles of fairness, accountability, inclusivity, and security overlap. However, applied to the health sector, due to the nature of data utilized and the weight of decisions relating to health that inform the quality of life, the weight of application and implementation may vary and must be considered in line with the technical elements of leveraging AI in health. Social and cultural elements also factor into establishing responsible AI from an African perspective.

Notably the World Health Organization (WHO) published guidance on large multi-modal Models (LMM) primarily focusing on ethics and governance of AI for health. In the guidance WHO communicates its consensus ethical principles for use of AI for health, the ethical principles include, the protection of autonomy, promotion of human well-being human safety and public interests, ensuring transparency, explainability and intelligibility, fostering responsibility and

Transparency,
fairness, security,
and inclusivity are
the core elements
of responsible AI.

⁴⁴What Exactly is Responsible AI in Principle and Practice.' (Brookings, May 2021)<https://www.brookings.edu/events/what-is-responsible-ai/>

⁴⁵ibid

⁴⁶Sivarajah U, Wang Y, Olya H, Mathew S. Responsible Artificial Intelligence (AI) for Digital Health and Medical Analytics. *Inf Syst Front.* 2023 Jun 5:1-6. doi: 10.1007/s10796-023-10412-7. Epub ahead of print. PMID: 37361886; PMCID: PMC10240104.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10240104/#:~:text=It%20aims%20to%20design%20and,as%20applicable%20regulations%20and%20laws.>

⁴⁷Eke, D.O., Chintu, S.S., Wakunuma, K. (2023). Towards Shaping the Future of Responsible AI in Africa. In: Eke, D.O., Wakunuma, K., Akintoye, S. (eds) *Responsible AI in Africa. Social and Cultural Studies of Robots and AI.* Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-08215-3_8https://link.springer.com/chapter/10.1007/978-3-031-08215-3_8#citeas

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The recommendations proposed speak to implementation mechanisms that key stakeholders must consider in successfully leveraging AI in health in Africa.

accountability, ensuring inclusiveness and equality and promotion of AI that is responsive and sustainable.⁴⁹

Implementation Recommendations

The recommendations proposed speak to implementation mechanisms that key stakeholders must consider in successfully leveraging AI in health in Africa. The recommendations do not cover a comprehensive overview of implementation mechanisms but provide key pointers on the impact of leveraging AI in health in Africa, human rights implications, and considerations for responsible AI given Africa's unique positioning in the adoption of AI in order to harness the benefits of AI while considering the challenges in adoption and implementation.

For Developers

- **Understand Local Healthcare Challenges:** Developers should have a deep understanding of the specific healthcare challenges in Africa, including access to healthcare, infrastructure limitations, and disease prevalence. Tailor AI solutions to address these challenges.
- **Prioritize Data Privacy and Security:** Implement strong data privacy and security measures to protect patient information. Ensure compliance with data protection regulations and build systems with encryption and access controls. **Data Ownership and Consent:** Clarify data ownership and ensure patients have control over their health data. Obtain informed consent for data usage and provide clear information to patients about how AI is used in their healthcare.
- **Mitigate Bias:** The African AI ecosystem has unique elements characterised by different cultural and social practices. Developers must pay close attention to bias in AI algorithms and data, particularly gender and ethnic bias. Mitigating this calls for regular audits, particularly of healthcare applications.
- **Transparency:** Developers need to ensure transparency is at the center of the development process. This will enable healthcare providers and patients to understand how AI algorithms work quickly and the data used to make recommendations.
- **Accountability:** Clear lines of accountability for AI systems in use must be established. Developers should be accountable for the performance and ethical use of their technologies. This can be implemented by developing design mechanisms for oversight and auditing.
- **Adherence to Ethical Guidelines:** The health sector is governed by its own set of health guidelines that extend to healthcare practitioners when dealing with patients regardless of the medium. The UNESCO guidelines of Ethical AI serve as one of the core guidelines applicable to developers alongside the OECD principles and other developed sectoral guidelines varying from jurisdiction to jurisdiction. Developers should adhere to ethical guidelines for AI in healthcare, addressing issues such

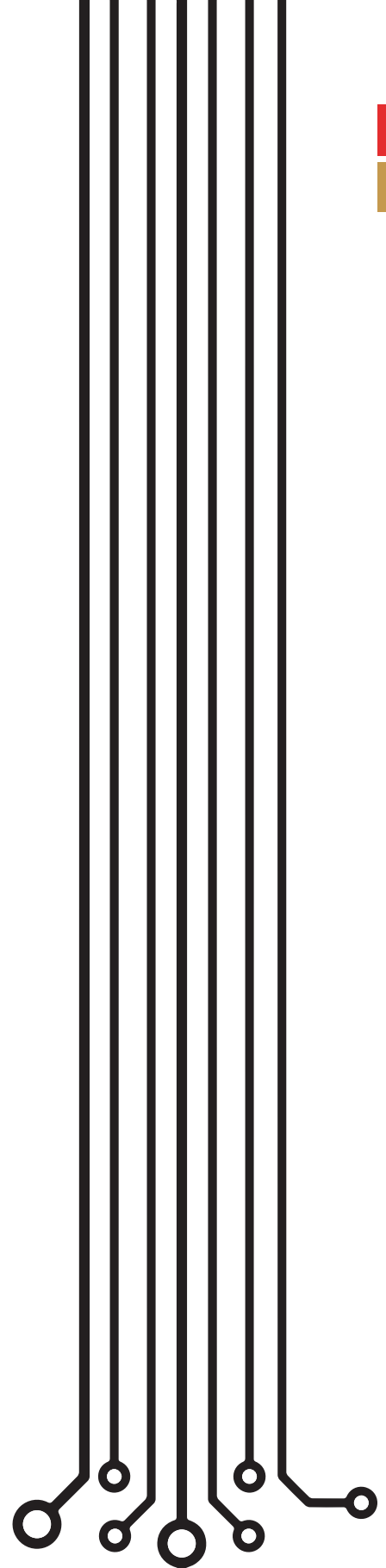
⁴⁹Ethics and Governance of Artificial Intelligence for Health Guidance on Large Multi-Modal Models (World Health Organization, 2024) <https://iris.who.int/bitstream/handle/10665/375579/9789240084759-eng.pdf?sequence=1>

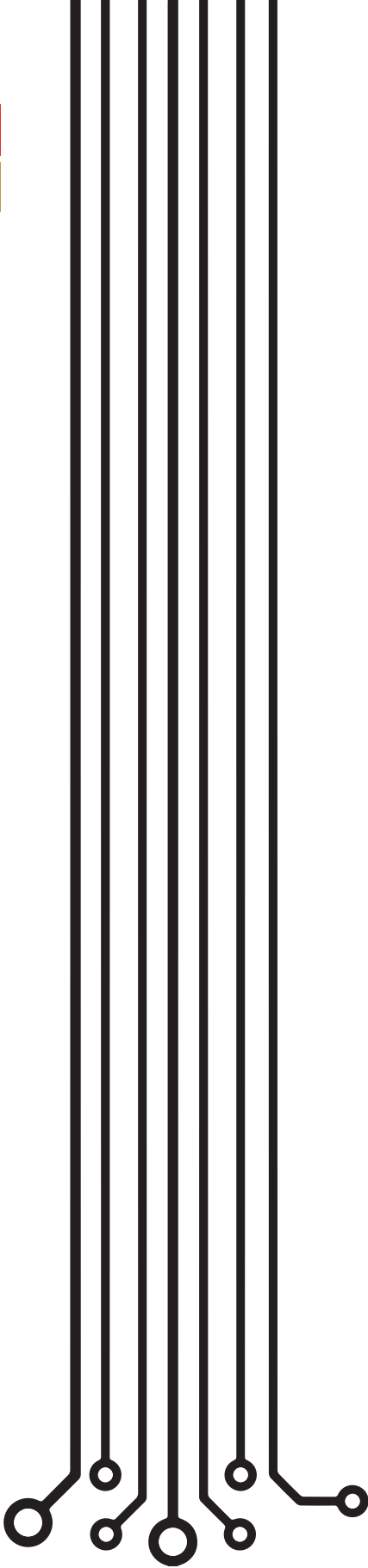
as fairness, transparency, accountability, and privacy.

- **Safety and Reliability:** Developers should prioritize the safety and reliability of AI systems. The implications for AI in health are likely to have adverse effects on end users, especially when such systems are not safe or reliable. Developers should implement testing and validation processes to minimize the risk of errors before deployment and incorrect diagnosis or treatment recommendations.
- **Local Innovation:** Encourage local innovation and research in AI for health. Developers should consider the unique healthcare challenges and cultural contexts of Africa, which may differ significantly from other regions.

Government

- **Develop Comprehensive AI Policies and Regulations and Ethical Frameworks:** Governments, guided by regional and international understanding and harmony, need to create and implement robust policies, regulations, and guidelines that govern AI in health care. These should be aligned with international human rights standards, emphasizing transparency, fairness, accountability, and data privacy. This aligns with the ethical guidelines for the development and deployment of AI.
- **Data Protection and Privacy Laws:** Data protection laws apply to health data. African governments that have yet to develop data protection and privacy laws need to enforce such laws alongside subsidiary legislation and guidelines, such as data governance frameworks specific to the application of data protection and privacy laws in healthcare, to mitigate the risks of leveraging AI technologies.
- **Access and Equity:** Regionally, governments should invest in and prioritize healthcare access and equity in AI initiatives. This can be achieved through developing and executing strategies that ensure that AI technologies bridge healthcare disparities and benefit all segments of the population, especially underserved communities.
- **Investment in research and innovation:** Governments complemented by the private sector are the most prominent investors in deploying technologies such as AI, particularly where such technologies are leveraged to improve public services. As such, governments should invest in training and capacity-building programs for healthcare professionals to work effectively with AI systems, promote AI literacy among healthcare staff to ensure responsible AI integration and provide funding and support for local research and innovation in AI for healthcare.
- **Community Engagement:** Encourage public participation and input in AI healthcare initiatives by engaging with local communities and patients to understand their needs, concerns, and preferences regarding AI in healthcare.





Healthcare Professionals

- **Public Awareness:** Healthcare professionals using AI are responsible for conducting public awareness campaigns to educate citizens about the benefits and risks of AI in healthcare. Transparency and information sharing build public trust and informed decision-making.
- **Education and Training:** Healthcare professionals may not necessarily be aware of the intricacies of AI technologies in health beyond functionality. Through continued education and training in AI technologies beyond the functional aspects, healthcare professionals must be well informed of the capabilities, limitations, and ethical considerations of AI in healthcare.
- **Patient-Centered Care:** The central focus of leveraging AI technologies in healthcare is to improve healthcare not just administratively but ultimately for better patient care. Healthcare professionals should continuously prioritize patient-centred care and ensure they are informed and comfortable using AI technologies. This is especially true for communities in rural areas.
- **Ethical Considerations:** Healthcare practitioners have established ethical guidelines, making it easier to adopt ethical considerations when leveraging AI. Be aware of moral considerations in AI. Advocate for the responsible use of AI in healthcare, including fairness, transparency, and data privacy issues.
- **Data Privacy and Security:** Healthcare professionals need to be familiar with data privacy and security practices in their respective regions, especially as they apply to sensitive health data. Confidentiality is the cornerstone of healthcare practice in ensuring the protection of patient information. This practice ought to extend equally to how data privacy and security apply, especially in leveraging AI technologies.
- **Collaboration:** Healthcare professionals best understand the needs of the healthcare sector and can quickly point out patterns not only with respect to treatments but also patient care across different demographics. Collaboration with AI developers, data scientists, and policymakers to ensure that AI technologies are designed to complement healthcare workflows, improve patient outcomes, and address and mitigate any healthcare inequalities.
- **Feedback Mechanisms:** Healthcare professionals intentionally leveraging AI technologies are responsible for the AI technologies they decide to use. As such, they may also be held accountable for arising risks and/or harms. As such, there needs to be a functional mechanism for patients to provide feedback or raise concerns about the use of AI in their healthcare.

Conclusion

As AI evolves, so will the varied ways of utilization; the health sector will also note changes in the evolving use of AI. The futuristic promise of AI in health presents varied benefits and challenges for the African continent. Considerations presented above in viewing AI in health from a utilization perspective and harmonizing the same with impact and ethical considerations deriving from human rights and ethical approaches of responsible AI will be beneficial where implemented. The successful implementation will rely on regional cooperation and a collective understanding of the impact of AI on health, both positive and negative.

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