GOVERNANCE OF ARTIFICIAL INTELLIGENCE FOR GLOBAL HEALTH IN AFRICA

A Review of Policy and Regulatory Frameworks

SCIENCE FOR AFRICA FOUNDATION

Project led by Dr Uzma Alam, Programme Lead of the Science Policy Engagement with Africa's Research (SPEAR) programme.

Malawi recognises the immense potential of AI systems to accelerate progress across all the SDGs. This potential will not be realised automatically. We will govern AI in the public interest and ensure that the application of AI fosters diverse cultures and languages and supports locally generated data for the benefit of countries and communities' development. This includes equitable partnerships; therefore, the Ministry of Education convening in collaboration with the SFA Foundation was a pivotal moment in brainstorming the pathway for AI governance in Malawi.

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EXECUTIVE SUMMARY

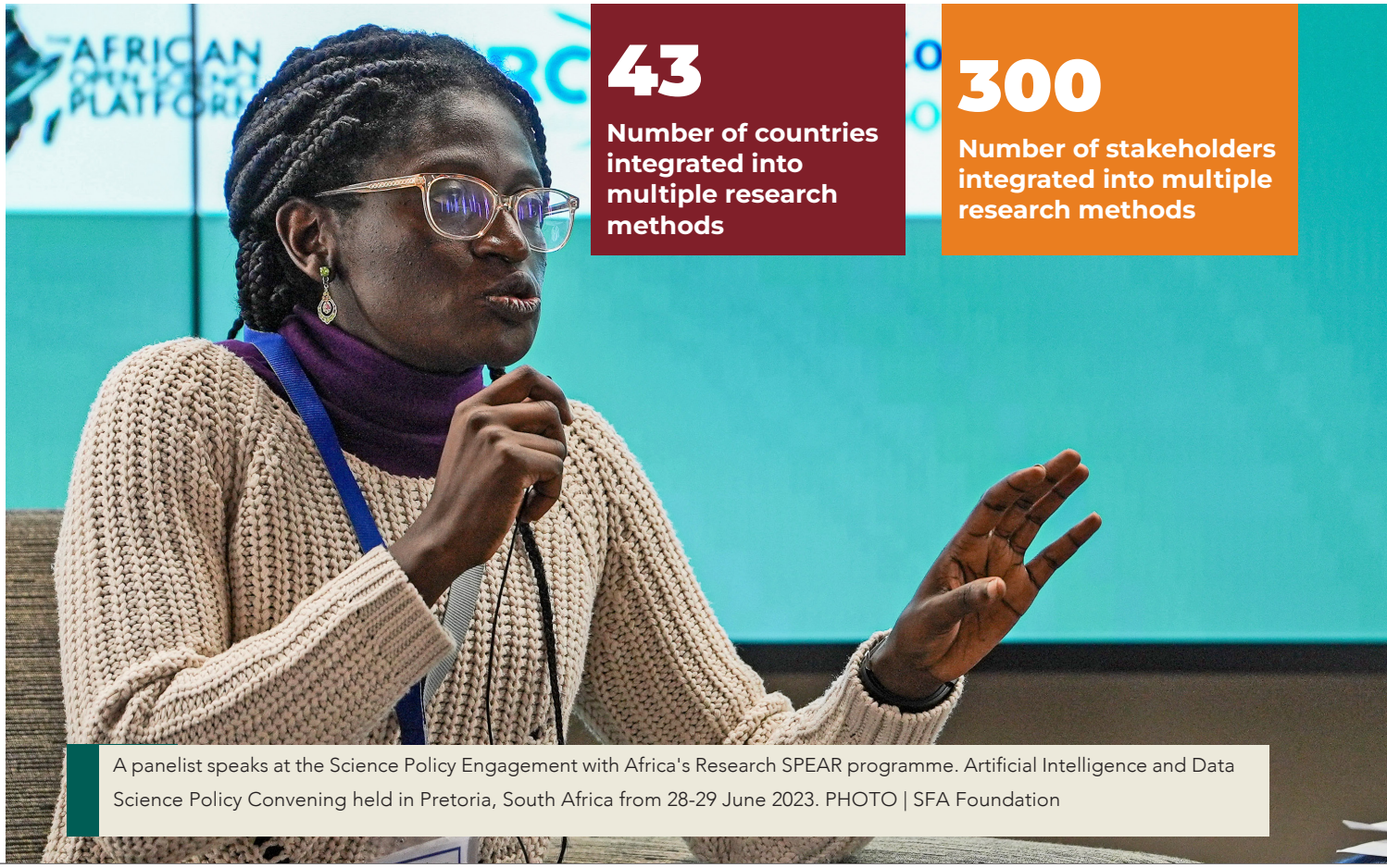
The role and impacts of AI and data science in global health have far-reaching policy, research, economic, and political implications, driven by rapid advancements that transform individuals, industries, economies, and society at large. These technologies are particularly impactful in sectors such as agriculture, health, manufacturing, and finance. In global health, they revolutionize medical service delivery, the production of new medical devices and pharmaceuticals, and health research, especially in fields like genomics, pandemics, and clinical trials.

This report, prepared by the Science for Africa Foundation (SFA Foundation), provides a comprehensive review of the governance of AI and data science for global health in Africa. It is based on a multifaceted methodology that includes academic and grey literature reviews, online surveys, six regional convenings, stakeholder interviews, bibliometric and policy analysis, and a bilingual survey. The integration of multiple research methods and extensive stakeholder engagement across 43 countries and involving over 300 stakeholders ensures a richer and more nuanced perspective compared to studies relying on a single methodology. Additionally, compared to other reports that primarily focus on technological and ethical considerations without delving deeply into regional specifics or stakeholder engagement, the SFA Foundation's report offers a granular, Africa-specific analysis backed by empirical data and stakeholder insights.

The findings emphasise the importance of local context, addressing urban-rural divides, gender considerations, and indigenous knowledge systems, ensuring that the recommendations are both globally relevant and practically applicable within African contexts. The focus on gender and equity in AI policy frameworks, is an aspect often underrepresented in other reports, yet critical if AI governance is going to contributes to inclusive and equitable development.

Policy recommendations include the need for adaptive regulations and the strategic use of existing frameworks, such as the AU's Digital Transformation Strategy, to create a robust AI governance structure tailored to African global health needs. While underscoring the importance of capacity building and trust, providing practical recommendations for innovative funding and institutional support to strengthen AI governance. Furthermore, policy recommendations emphasise science diplomacy and the necessity of African representation in international forums to ensure that global AI policies are inclusive and reflective of African priorities.

In summary this report contains rich empirical information on the status of AI policy and regulations for responsible and ethical AI for health and includes discussion of the challenges and opportunities for African countries developing effective governance regimes for the adoption of AI for global health in Africa. While the combination of desk review, policy analysis, bibliometric studies, and stakeholder perspectives provides a more integrated and actionable framework for AI health governance in Africa, making the report a valuable resource for policymakers, researchers, and stakeholders navigating the complexities of AI governance in the African context.



A panelist speaks at the Science Policy Engagement with Africa's Research SPEAR programme. Artificial Intelligence and Data Science Policy Convening held in Pretoria, South Africa from 28-29 June 2023. PHOTO | SFA Foundation

INTRODUCTION

Few new technologies have attracted so much political and public interest as Artificial Intelligence (AI). There is an intense public debate and academic discourse on potential socio-economic, health, security, and environmental impacts of AI. They are stimulated by the revolutionary and disruptive nature of AI in most sectors, including healthcare, health research and global health. There is a growing issue of policy and political attention at the national, regional, and international levels on how to govern AI and related scientific advances and technologies including data science, the Internet of Things (IoT), cloud computing, robotics, and drones.

At international and regional levels, organisations such as the United Nations (UN) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the European Union (EU), the World Health Organization (WHO) and the African Union (AU) are exploring ways of establishing mechanisms and tools for governing AI and data science. Some of the international and regional frameworks already adopted include the UN Secretary General Special Advisory Panel on AI, and soft policy frameworks adopted by UNESCO and WHO countries, consisting mainly of recommendations and guidelines on AI. The EU has established a legally binding regulatory framework for AI.

An increasing number of national governments in both developed and developing countries are instituting policy and regulatory measures to govern the development and application of AI in various sectors such as finance, agriculture, transportation and health. These international and national efforts are informed, to a large measure, by the recognition that like other new technologies, AI and data science can be negatively disruptive, causing or exacerbating social, economic and environmental challenges. To maximise benefits and reduce risks, data science must be governed through a variety of approaches, including policy and legislation.

In this report, global health refers to collaborative and transnational research, practice and action to promote health for all. The field seeks to ensure that all peoples have a healthy life, irrespective of where they live: global health seeks to promote and achieve equality in health around the world. This report focuses on how the development and application of AI can spur equality in health in Africa through its application in (and for) genomics, clinical trials, pandemic preparedness and prevention, discovery and development of diagnostics, vaccines and therapeutics, and other areas of research and innovation. It identifies critical gaps in policy and regulatory frameworks for AI and makes recommendations on building capacity for effective governance of these technologies for global health in Africa, while protecting the privacy and other rights of all people.

This report is based on a literature review, an online survey, regional and national convenings, and key informant interviews. It also draws on commissioned and bibliometric analysis of gender impacts of AI. The literature review (of both academic and grey/non-academic reports) identifies key principles and policy issues for effective governance of AI. A succinct conceptualisation of governance of AI is developed drawing on a rich and growing corpus of multi-disciplinary scholarship. The survey questionnaire was based on the literature review and was designed and administered to gather empirical information on trends in and challenges of AI and data science governance in Africa.

Three hundred plus respondents participated in the survey between May and October 2023. Additional empirical information on the status of and barriers to effective governance of AI for global health in Africa was gathered through interviews of key stakeholder groups including the AU, international funders, researchers and practitioners. Workshops or convenings were held in five regions of the continent (Southern, Eastern, Central, Western and Northern Africa) to learn the views of various stakeholders on how best to strengthen policy and regulatory frameworks for ensuring responsible AI for global health in Africa. The convenings also assessed national and regional capacities for effective governance of AI in public health, health genomics, pandemic preparedness, pharmaceutical manufacturing and clinical trials.

Regional AI policy awareness (YES)

1 The first section of this report is an overview of key concepts, a description of the framework used to discuss what constitutes effective governance of AI in global health, and some of the key principles that should be institutionalised to guide responsible and ethical development and application of AI in health. This is based on the belief that entrenching principles of trust, transparency, public participation and accountability in policy and regulatory frameworks is the hallmark of effective governance.

2 Section 2 is a short review of global trends in health AI. It focuses on trends in the development and application of AI and data science in public health systems and health research and innovation. Key characteristics of AI in global health are discussed, and emerging policy and regulatory frameworks for ethical and responsible AI are briefly analysed.

3 Section 3 maps Africa's evolving AI and data science landscape with emphasis on AI- related policy and regulatory frameworks as well as institutional arrangements that are being established at national, regional and continental levels. This is followed by an overview of various programmatic initiatives and institutional actors in AI research and innovation.

4 Section 4 presents the survey data, synthesis of key interviews and regional convenings, as well as overall findings of the study, focusing on governance gaps and challenges in each of the regions.

5 Section 5 makes recommendations on building Africa's capacities for effective governance of AI, with recommendations for actions to strengthen AI and data science governance on the continent.

BACKGROUND

Framing global health in the African context

The concept of global health is in wide usage and subject to misuse. It is often confused with public health, a related concept. There is a vast and rich body of literature with varying perspectives of what constitutes global health. As Holst (2020) notes: "Despite the importance it has acquired over the last two decades, the complex collective term "Global Health" still lacks a uniform use today."[1] For purposes of this report, 'global health' is defined as a transnational equitable provision and/or insurance of health for all people in the world. (A comprehensive discussion of global health, which is beyond the scope of this report, is provided by Bozorgmehr (2010)[2], Garay, Harris and Walch (2013)[3] and Holst (2020, op. cit.).) This definition emphasises the cross-border interconnectedness of the health challenges and priorities across countries, and the globalisation of health research and innovation. Global health focuses on social (e.g., gender), economic (pro-poor) and political determinants of health and wellbeing. From a technical standpoint, it is about research and innovation that reduce health inequalities within and among countries. From policy and political perspectives, global health is a universal public good to which all peoples are entitled—i.e., health as a fundamental human right. Many countries around the world include 'health rights' provisions in their constitutions. For example, the constitutions of most African countries, including Kenya, Namibia and South Africa, contain explicit provisions that create health rights. Section 43(1)(a) of the Constitution of Kenya (2010) treats health as an economic and social right. It states that every person has the right "to the highest attainable standard of health, which includes the right to health care services, including reproductive health care."[4] Section 27(a) of South Africa's Constitution (1996) grants every citizen the right to "have access health care services, including reproductive health care", and obliges the state to enact laws and institute policies and programmes that ensure that this right is realised.[5] Entrenching health as a human right in constitutions forms the basis for national policies and laws that address social inequalities, including those that may be associated with the development and deployment of AI and other new technologies.

Global health considerations are increasingly finding space on agendas of international politics, policy and law. Stoeva (2016)[6] and Davies, et al (2014)[7], among others, show how health has become an important concern in international politics and foreign policy. International foreign affairs and politics influence health in many complex ways, and global health security is a matter of politics and diplomacy. Ongoing negotiations on the global treaty on pandemic preparedness, the adoption of the Framework Convention on Tobacco Control, and the decision of the United Nations General Assembly to hold a high-level meeting on non-communicable diseases in 2011, as well as the integration of health issues in trade and environmental treaties such as those of the World Trade Organisation (WTO) and the Paris Agreement on Climate Change, are clear manifestations of growing health diplomacy and politics. The COVID19 pandemic and epidemics such as HIV/AIDS and Ebola have brought into sharp focus the political and foreign policy dimensions of health.

The international politics and foreign policy discourse on health pertain directly to access to, the potential risks and benefits of, and the governance of new technologies such as AI. For example, issues of technology transfer and access

1 Holst, J., (2020), Global Health – emergence, hegemonic trendata science and biomedical reductionism. *Globalization and Health* (2020) 16:42 https://doi.org/10.1186/s12992-020-00573-4
2 Bozorgmehr K. Rethinking the 'global' in global health: a dialectic approach. *Globalization Health*. 2010; 6:19
3 Garay J, Harris L, Walch J. Global health: evolution of the definition, use and misuse of the term. Face à face. 2013;12. http://faceaface.revues.org/745.
4 Republic of Kenya (2010), *The Constitution of the Republic of Kenya, 2010*. Government of Kenya Printers, Nairobi.
5 Republic of South Africa (1996), *The Constitution of the Republic of South Africa*, 1996.
6 Stoeva, P (2016), International Relations and the Global Politics of Health: A State of the Art? Global Health Governance. *Journal for the New Health Security Paradigm*, 10 (3). pp. 97-109.
7 Davies, S., Elbe, S., Howell, A., and McInnes, C. (2014), Global Health in International Relations: Editors' Introduction, *Review of International Studies* (2014), 40, 825–834 6 2014 British International Studies Association doi:10.1017/S0260210514000308

to essential health products have acquired more currency in international trade and politics over the past two decades, particularly within the WTO. There is corresponding debate within the UN on how to ensure that benefits of health AI are shared fairly and equitably across the world so that developing countries are not left out of the AI revolution – noting that these very countries are also sources of much of the data on which AI depends, including health data from clinical trials. These concerns are likely to dominate international treaty negotiations on AI, and research and innovation issues in general, over the coming years.

Africa participates in global health policy and political discourse through several continental policy frameworks and political declarations that have been adopted over the past four decades or so. The 2008 Bamako Call to Action on Research for Health[8], and the 2004 Algiers Declaration of the Ministerial Conference on Research for Health in the African Region, the AU Pharmaceutical Manufacturing Plan[9] and the AU Health Research and Innovation Strategy for Africa (HRISA)[10] are policy frameworks that steer research and innovation (R&I) for global health in Africa.

In the Bamako Call to Action on Research for Health, African governments recognise that "research and innovation have been and will be increasingly essential to find solutions to health problems, address predictable and unpredictable threats to human security, alleviate poverty, and accelerate development."[11] The document commits governments to "give priority to the development of policies for research and innovation for health, especially related to primary health care, in order to secure ownership and control of their research for health agendas" ... and to "promote and share the discovery and development of, and access to, products and technologies addressing neglected and emerging diseases which disproportionately affect low- and middle-income countries."[12]

The Algiers Declaration recognises the "need for adequate and incentive investments in research and development to produce new and effective medicines, diagnostic tools, vector control tools and vaccines..."[13] It calls for an allocation of "at least 2% of national health expenditure and at least 5% of external aid for health projects and programmes to research and research capacity building and [to] invest more in research aimed at improving health systems.... [and] to continue to promote innovative research in basic sciences and its transformation into new tools such as medicines, vaccines and diagnostics tools."[14]

The Pharmaceutical Manufacturing Plan for Africa (PMPA)[15], adopted in 2006, is based on the premises that: (a) local production of pharmaceuticals will save foreign exchange, (b) local production will reduce health inequities and inequalities, create jobs or employment in Africa, thus alleviating poverty and promoting social development, (c) local manufacturing will facilitate transfer of new technologies to Africa, and (d) local production will stimulate exports from Africa and improve access to and self-sufficiency for drugs. African governments committed to the principles of the Trade and Related Aspects of Intellectual Property Rights (TRIPS) and DOHA Declaration on TRIPS and Public Health to produce generic medicines locally on the continent. However, they also recognise that their countries must create or strengthen their scientific and technological capabilities because the production of drugs (whether under patent or generic) is "capital, technology and knowledge intensive...The continent will have to invest in the production of different skilled scientists."[16]

The Health Research and Innovation Strategy for Africa (HRISA) seeks to facilitate the implementation of the PMPA and related continental as well as global policy frameworks. Its goal is "to promote and increase health research and innovation for improved health and well-being of Africa's Peoples."[17] Its principles specifically articulate global health considerations such as, "health is a human right that must be accessible to all"; "equity is important in accessing health services and addressing the determinants of health"; "respect for cultural diversity and gender equality is important to overcome access barriers to health"; and "diseases and disasters go beyond borders, cross border cooperation in disaster management and disease control is required."[18]

The HRISA makes recommendations for promoting health innovation by:

1. Developing and promoting sustained financing mechanisms for health R&I
2. Supporting the generation and translation of knowledge into products, practices, services and policies to improve health
3. Supporting the development and adoption of emerging and existing technologies to improve health
4. Developing human and institutional capacities for health R&I

8 https://wacihealth.org/wp-content /uploadata science/2018/05/the-bamako-call-to-action-on-research-for-health.pdf
9
10 AUDA-NEPAD (2019), Health Research and Innovation Strategy for Africa 2018-2030. African Union Development Agency-New Partnership for Africa's Development, Midrand, South Africa.
11 https://wacihealth.org/wp-content /uploadata science/2018/05/the-bamako-call-to-action-on-research-for-health.pdf
12 https://wacihealth.org/wp-content /uploadata science/2018/05/the-bamako-call-to-action-on-research-for-health.pdf
13 WHO (2008), 'The Algiers Declaration: Narrowing the knowledge gap to improve Africa's health'. Ministerial Conference on Research for Health in the African Region. World Health Organization Regional Office for Africa.
14 WHO (2008), op. cit.
15 AU (2006), Pharmaceutical Manufacturing Plan for Africa. African Union Addis Ababa.
16 AU (2006), Pharmaceutical Manufacturing Plan for Africa. African Union Addis Ababa.
17 AUDA-NEPAD (2019), op. cit. p. 16.
18 AUDA-NEPAD (2019), op. cit. p. 21.

Artificial Intelligence for Global Health: Overview of emerging issues

Data science involves analysing large amounts of data ('big data') to extract useful knowledge to build predictive models and machines..... AI will likely improve access to healthcare and how patients are treated, but it also optimises the way resources are allocated, thus helping health systems function more effectively and efficiently

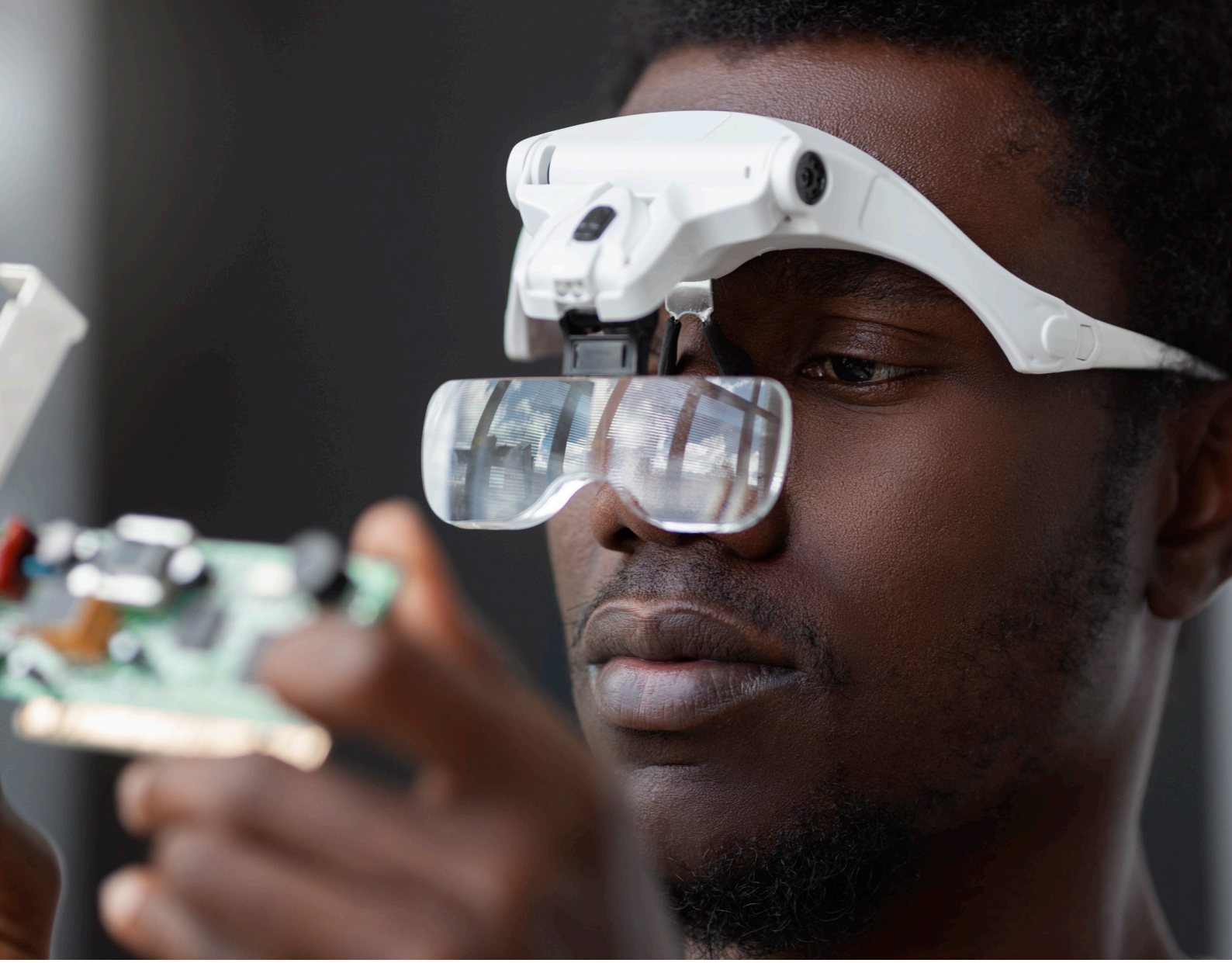
In a recent book, Kissinger, Schmidt and Huttenlocher (2021, p.14) define AI as "machines that can perform tasks that require human-level intelligence."[1] They explain how AI is already irreversibly transforming health through radical innovation:

In early 2020, researchers at the Massachusetts Institute of Technology (MIT) announced the discovery of a novel antibiotic that was able to kill strains of bacteria that had, until then, been resistant to all known antibiotics. Standard research and development efforts for a new drug take years of expensive, painstaking work as researchers begin with thousands of possible molecules and, through trial and error and educated guessing, whittle them down to a handful of viable candidates. Either researchers make educated guesses among thousands of molecules or experts tinker with known molecules, hoping to get lucky by introducing tweaks into an existing drug's molecular structure. MIT did something else: it invited AI to participate in its process. AI "learned" the attributes of molecules predicted to be antibacterial. Curiously, it identified attributes that had not specifically been encoded—indeed, attributes that had eluded human conception or categorisation.[2]

UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (UNESCO COMEST, 2019) characterises AI as "machines capable of imitating certain functionalities of human intelligence, including such features as perception, learning, reasoning, problem solving, language interaction, and even producing creative work."[3] It considers AI to be a cognitive technology that has substantial societal and cultural implications for and in many spheres of human life including health and wellbeing.

Data and its production and use are the main drivers of AI. Data science involves analysing large amounts of data ('big data') to extract useful knowledge to build predictive models and machines. According to Brodie (2019), data science "is a body of principles and techniques for applying analytic methods to data at scale, including volume, velocity, value, veracity and variety (the 5Vs of Big Data), to accelerate the investigation of phenomena represented by the data, by acquiring data, preparing and integrating it, possibly integrated with existing data, to discover

1 Kissinger, H., Schmidt, E., and Huttenlocher, D., (2021), *The Age of AI*. John Murray Publishers, UK.
2 Kissinger, H., Schmidt, E., and Huttenlocher, D., (2021), op. cit. p. 9.
3 UNESCO (2019), Preliminary Study on the Ethics of Artificial Intelligence. UNESCO COMEST, Paris.



correlations in the data, with measures of likelihood and within error bounds. Results are interpreted with respect to some predefined (theoretical, deductive, top-down) or emergent (fact-based, inductive, bottom-up) specification of the properties of the phenomena being investigated."[4] Data science is driving major (and sometimes radical) technological developments in AI.

AI is a pervasive, disruptive technology in that its applications and impacts are cross-sectoral. It is being developed and deployed in numerous sectors and spheres, including health, finance, sports, conservation, manufacturing, space, automotive, education and the arts. Related to its pervasiveness is the increasing convergence and inter-dependence among AI and related technologies such as Cloud Computing, Internet of Things, gene editing, and behavioural sciences. AI can be a convergence of digital (computing and data analytics), biological and industrial technological applications. Successful entry into the AI 'revolution' is dependent on prior accumulated capabilities for a wide range of other technologies and scientific fields. For example, a country with weak or limited capabilities for digitalisation of its health records or with no prior bioinformatics activities may have challenges developing and using AI in/for disease diagnostics and surveillance.

AI will transform healthcare and health systems around the world in unprecedented ways. According to a recent report for the European Union (EU) Parliament, (EPRS, 2022, p.1), "AI will likely improve access to healthcare and how patients are treated, but it also optimises the way resources are allocated, thus helping health systems function more effectively and efficiently."[5] Already, healthcare providers are using AI (with big data analytics) to plan and deliver health services. Human-centred healthcare intelligent systems are being developed and deployed in hospitals and clinics to enhance efficiency and effectiveness in attending to patients in more humane ways. Furthermore, AI and data science can be deployed in health systems to remotely monitor patients' performance and provide point-of-care services.

Another important potential of AI relates to its application in

4 Brodie, M., (2019), What is Data Science? https://www.researchgate.net/publication/333752364
5 European Parliamentary Research Service (2022), Artificial intelligence in healthcare: Applications, risks, and ethical and societal impacts. EU Parliament, Brussels.

health research, particularly in genomics, clinical trials and clinical diagnostics. Dias and Torkamani (2019)[6] provide a rich account on how AI and data science are transforming clinical genomics. They give examples of how deep learning is being used to process large and complex genomic datasets, helping to improve clinical diagnostics and create the potential of developing personalized medicine. The EU (EPRS, 2022) also provides various examples of the potential of AI in clinical trials, including using it to select study participants.

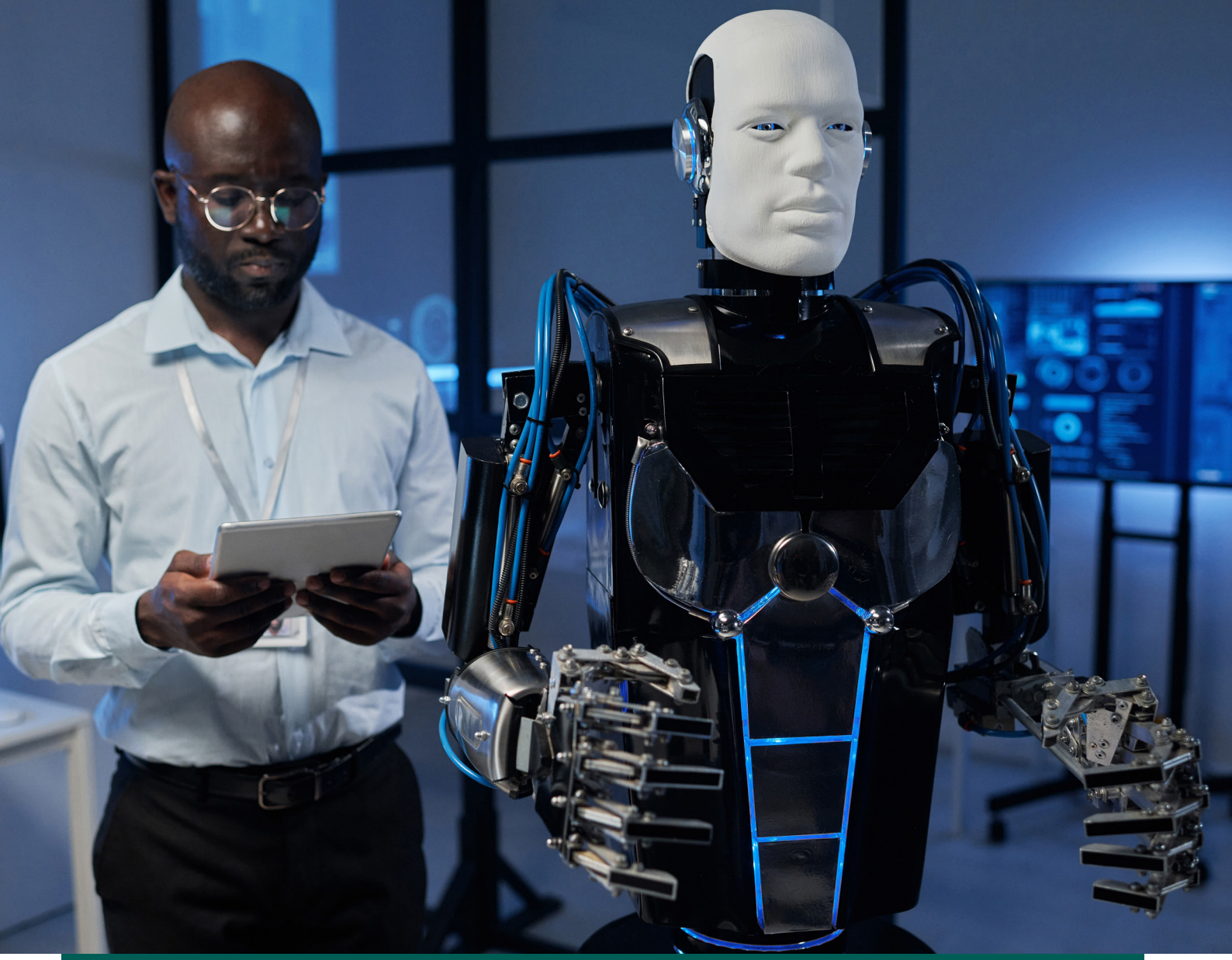
According to UNESCO COMEST, "Within the life sciences and medicine in particular, the development of AI technologies has significantly transformed the health care and bioethics landscape over the years. They can bring positive effects, like more precision in robotic surgery, and better care for autistic children, but at the same time, they raise ethical concerns, such as the cost they bring to LMIC within the context of scarcity of resources in the health care system and the transparency they should bring to respect the autonomy of patients."[7]

Effective governance of AI has also found its way into the UN human rights discourse and agenda. Human rights issues have been on the agenda of WHO and health issues in the work of the United Nations Commission for Human Rights. AI seems to heighten the urgency for a more coherent UN approach to health as a human right. As stated earlier, the right to health as a fundamental part of our human rights is embodied in UN treaties. The 1946 Constitution of the WHO states that "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition."

AI and related scientific and technological advances will pose challenges to how the 'right to health' or 'health as a fundamental right' is applied in health systems and development practice. The development and deployment of AI for health raises complex social, ethical and legal issues that require public attention. Regulatory frameworks for AI must be agile and flexible to accommodate its rapid development. Bioethics associated with the development and deployment of AI in health requires careful consideration, given the growing sophistication of the technology and its pervasive nature. Without effective governance of AI, socio-economic inequalities and human rights abuses in global health will be heightened or exacerbated. This is particularly so in African countries with weak health systems and nascent governance regimes, including regulatory capabilities. In addition, the development and training of AI methods in predominantly non-African populations may drive innovation that is not responsive to African needs. Effective governance can mitigate the impact of this bias.

While AI promises to revolutionise health research and innovation, enlarging prospects for attaining Sustainable Development Goal 3 (health and wellbeing—global health), governance issues must be addressed to manage potential risks, ensuring the protection of health rights and enlarging social inclusion in health. Like all technologies, AI can pose risks to individuals and populations, particularly vulnerable ones in poorly resourced countries. Legal, social and ethical implications of AI must be adequately addressed through policy and regulatory frameworks at all levels of governance. For these reasons, international and regional organisations as well as nations have instituted various policy and regulatory frameworks to govern AI and various aspects of data science.

6 Dias, R., Torkamani, A. Artificial intelligence in clinical and genomic diagnostics. *Genome Med* **11**, 70 (2019). https://doi.org/10.1186/s13073-019-0689-8
7 UNESCO (2019) Preliminary Study on the Ethics of Artificial Intelligence. SHS/COMEST/EXTWG-ETHICS-AI/2019/1 Paris, 26 February 2019



Overview of emerging AI governance frameworks

There are several premises to effective governance of AI in the context of policy and regulation. The 'governance of technology' has gained currency in the lexicon of academics and policymakers in the science and technology policy communities. It applies to technology assessment (TA), technology fore sighting (TF) and technology policy (TP) to address potential social, economic and environmental consequences of innovation.

Mugabe and Musanago (2023)[1] discuss the use of TA as a toolbox for 'governance of technology', which they define as norms, rules, organisations and practices that a community or a government adopts and uses to regulate the safe development, handling and use of a new technology. This definition is similar to the United Nations Convention on Biological Diversity (Article 19) that addresses governance of modern biotechnology.

This report adopts the language of governance of AI for global health to refer to policies, regulations, laws and institutions (or agencies) that governments at national, regional and continental as well as international levels adopt to ensure responsible (and ethical) development, diffusion and deployment of AI to secure human health in socially inclusive, risk free and equitable ways. The goal is understood to apply AI to achieving global health, including promotion of health as a fundamental human right, and considering gender (special conditions of women and girls) and persons with different abilities.

Governance of AI for global health involves decision-making using instruments and institutions to ensure equitable, ethical, safe and legally authorised development, adoption and deployment of the technology (AI) to improve human health. Governance institutions and instruments help to unlock social, economic and technical barriers to equitable distribution of the health benefits of AI and data science within and across countries.

Multiple international frameworks (policy and regulatory) have been instituted to govern responsible AI and data science. Most are not restricted to health or global health. The dominant international AI governance frameworks are the 2021 'UNESCO Recommendation on Ethics of AI', 2021 'UNESCO Recommendation on Open Science', the 2022 'OECD Recommendation on Artificial Intelligence' [OECD/LEGAL/0449]), the 2013 OECD Privacy Guidelines, 2016 OECD 'Recommendation on Health Data Governance,' WHO 'Global Strategy on Digital Health 2020-2025', the 'European Union (EU) Artificial Intelligence Act', the UN Roadmap to Digital

1 Mugabe, J. and Musango, J., (2023), Technology Assessment in Africa in Arim, G. Handbook of Technology Assessment.

Cooperation, and the WHO's 2021 'Ethics and Governance of Artificial Intelligence for Health: WHO Guidelines'. With the notable exception of the EU AI Act, these frameworks are not legally binding. And of course, the EU AI Act does not carry authority in the governance of AI and data science in African and other non-European states.

This report uses the 2021 Ethics and Governance of Artificial Intelligence for Health: WHO Guidelines, the UNESCO Recommendations on Ethics of AI and the UNESCO Recommendation on Open Science, and the OECD Recommendation on Health Data Governance to identify principles and policy actions and instruments applicable to assessing the strengths and weaknesses (gap analysis) of AI and data science policy and regulatory frameworks in African nations.

Because African countries are members of UNESCO, they are required to consider UNESCO's recommendations on ethics of AI and Open Science (which covers data science). We also consider the OECD AI governance framework because South Africa has observer status in the OECD and collaborates with OECD in policy development for data science of research and innovation and is perhaps Africa's leader in health AI and data science, with strong scientific and technological capabilities for genomics, clinical trials, pharmaceutical production and development of diagnostic tools.

Another international framework of relevance to this report is the 2021 OECD Good Practice Principles for Data Ethics in the Public Sector calling for governments "to take action to address issues and concerns associated with data corruption; biases affecting the generation of data or its extraction (e.g. selection of data sources); and the quality of data inputs used to train Artificial Intelligence (AI) models. Other hazards include data misuse and abuse by individuals and organisations and the delivery of negative outcomes through data use, including in the context of AI systems."[2]

The applicability of the various available standards vary, depending on social, economic and political conditions. However, ethics, social inclusion, technical feasibility, legal and sustainability factors are the core principles of national policy and regulatory frameworks for AI and data science globally (see Table X).

A synthesis of AI and data science governance principles and policy benchmarks (or standards) is in Table 1 below.

2 OECD (2021), Good Practice Principles for Data Ethics in the Public Sector, p. 3. Organisation for Economic Cooperation and Development, Paris.

Governance Framework	Key Principles	Policy actions/instruments
WHO Guidelines on Ethics and Governance of AI	• Protection of human autonomy (humans in control of health-care systems and medical decisions) • Promotion human well-being and safety and the public interest • Ensuring inclusiveness and equity • Ensuring transparency	• Protection of privacy and confidentiality. • Legal requirements for informed consent for data protection. • Establish legally binding and voluntary regulations for safety and accuracy. • Establish national standard data science and programmes that ensure that AI for health is designed and deployed to encourage equitable use and access, irrespective of age, sex, gender, income, race, ethnicity, sexual orientation, ability or other characteristics protected under human rights codes. • Legislation requiring AI developers and users to publish and make public all information on applications before development and deployment.
UNESCO Recommendation on Ethics of AI	• Ensuring trustworthiness and integrity of the life cycle of AI systems • Promoting or ensuring fairness and non-discrimination • Make sure that there is proportionality and no harm • Protecting the right to privacy, and ensuring data protection • Ensuring transparency & explainability	• Develop and implement frameworks for ethical impact assessment. • Develop and implement data policy. • Entrench gender considerations into all AI and data science policy frameworks and instructions. • Integrate environmental sustainability considerations in AI and data science policy frameworks. • Improve access to information on AI and enhance communication.
UNESCO Recommendation on Open Science	• Ensuring equity and fairness • Promoting collective benefit • Promoting diversity and inclusiveness • Responsibility, respect and accountability	• Developing an enabling policy environment for open science. • Promoting a common understanding of open science, associated benefits and challenges, as well as diverse paths to open science. • Investing in open science infrastructures and services Investing in open science infrastructures and services. • Investing in human resources, training, education, digital literacy and capacity building for open science. • Fostering a culture of open science and aligning incentives for open science.
OECD Recommendation on Artificial Intelligence [OECD/LEGAL/0449])	• Promotion of inclusive growth, sustainable development and well-being • Ensuring human-centred values and fairness • Ensuring transparency and explainability; and • Ensuring robustness, security and safety; and accountability	• Invest in AI research and development. • Foster a digital ecosystem for AI. • Shape an enabling policy environment for AI. • Build human capacity and prepare society for transformation. • Promote international co-operation for trustworthy AI.
2016 OECD Recommendation on Health Data Governance		• Establishment of appropriate training and skills development in privacy and security measures for those processing personal health data. • Require organisations processing personal health data to demonstrate that they meet national expectations for health data governance.

Table 1: Key principles and policy benchmarks in international AI and data science governance: Source: Various

Typology of actors in AI and data science for global health

In applying the core principles of AI governance, different stakeholders have incentives and obligations to steer the practical expression or force of policy. This section considers key actors and their respective responsibilities and/or obligations.

AI and data science stakeholders include universities, private companies (firms), industry (business), associations, banks, governments (executive branches of nation states e.g. cabinets, regulators, standards bodies and ministries), legislatures, courts (judiciary), civil society organisations, hospitals (public and private), regional and international organisations (including funding agencies) and professional organisations. Of course, individuals as consumers or users of AI are also key actors. All these organisations, groups and individuals have various interests in AI and data science applications and their benefits and costs.

Each of them advocates for frameworks in their interest, consistent with their values, norms and priorities. According to Chinen (2023), "these actors, informed by inner logic, advocate a variety of tools along a range of soft and hard norms and laws to govern artificial intelligence: general principles, statement of ethics, private ordering through contract, national strategies, and formal regulations, laws, and treaties. These stakeholders are in a dynamic relationship, 'co-producing and co-enforcing norms of governance,' so that the various forms of regulation are no longer exogenous to a system but emerge from the participants themselves. These interactions reshape an already-existing, normative landscape at the international level, a landscape in which AI stakeholders act and that those stakeholders are trying to change."[1]

Because AI and data science are pervasive and converging with other technologies, their governance must consider various actors who interact with data science in different ways and through various organisational channels or mechanisms. Organisations such as UNESCO, WHO and OECD provide international platforms for designing and adopting common norms and rules of governance. At the regional and/or continental levels, the EU, AU and regional economic communities (RECs e.g., SADC, ECOWAS and EAC) are forums for inclusive and participatory decision-making. On the national level, some countries (e.g., Mauritius in Africa) have established specialised AI councils; others assign responsibilities for health AI and data science governance to ministries of health or ICT. Table 2 below provides an overview of responsibilities or roles of different groups of actors in AI governance.

1 Chinen, M., (2023), AI actors and the landata sciencecape of AI regulation, p. 34 in *The International Governance of Artificial Intelligence*. EE ElgarOnline https://doi.org/10.4337/9781800379220.00008

Group/category of actor	Overall responsibilities
Private companies	Developers and users of AI and data science.
Universities	R&D on and for AI and data science, including policy and law research on various aspects of AI and data science; training or capacity building in developing and applying AI and data science; deployers of AI and data science in health sciences research and training, etc
Public research institutes	Developers and users of AI and data science; support to government in ethical and technical impact assessments
Government	Develops and implements policy and oversees enforcement of regulatory frameworks. Governments may also use AI to design, monitor and evaluate policy. In these ways, AI itself is a tool for policy development.
Legislature	Pass legislation and determine budgets for AI and data science (public development and use) as well as resource for regulatory oversight.
Judiciary	Adjudicates legal disputes and may influence AI jurisprudence.
Civil society	Oversight/watchdog role for ethical AI and data science.
Industry associations	Mobilises industry (private sector) for engagement with state actors on AI and data science policy and regulations; and some fund private sector AI and data science development.
Think tanks	Research to generate evidence for policy and regulatory frameworks.
Funding agencies	Funding AI and data science R&D in public and private sectors; some funding governments and legislatures to develop governance frameworks; and funding research in think tanks.
Intergovernmental bodies	Setting international standards and guidelines for ethical AI and responsible use of data science.

Table 2: Actors and responsibilities in AI and data science for global health governance

Attending the last round table in Abuja was an enlightening experience, highly topical, addressing current and relevant issues in the integration of AI into healthcare. One of the highlights was the ambitious yet promising roadmap presented by the Federal Ministry of Health (FMoH). It outlines a clear vision for the future, emphasizing the pivotal role of AI in transforming the healthcare sector.

A major takeaway from the conference was the critical importance of data-driven decision-making and the necessity for constant monitoring and evaluation. This approach ensures that healthcare policies and interventions are effective and continuously improved based on empirical evidence.

However, the discussions also highlighted a significant need for capacity development. There is a pressing need for knowledge transfer and collaboration with countries that have advanced and sophisticated IT systems and services. Strengthening IT infrastructure and expertise throughout Nigeria's healthcare ecosystem is crucial to fully leverage the benefits of AI.

We need a sustained commitment to developing the necessary capacity and infrastructure.

Lami Shata-George, Technical Advisor, PVAC, Presidential Initiative for Unlocking the Healthcare Value Chain

GOVERNANCE OF ARTIFICIAL INTELLIGENCE IN AFRICA

Overview of trends and drivers of health AI in Africa

There is scant information (and correspondingly little data) on AI developments and applications in Africa, particularly as it applies to genomics, clinical trials, pandemic and epidemic preparedness, diagnostic tools, pharmaceutical production, and related areas of global health. A literature review reveals a relatively long history of AI applications in African health systems.[1] In the 1980s there were efforts to deploy AI-related tools to improve interactions between patients and health workers in the Nairobi and Aga Khan private hospitals.

In Egypt in 1986, the USA supported university-hospital programmes to use machine learning tools to improve the detection of common and potentially blinding eye disorders. AI algorithms called Computerised Aid to Treat (CATT) were used in South Africa by nurses for drug prescriptions in the late 1980s and early 1990s. These were early pilots and test cases.

There are several ongoing private sector-led initiatives in AI that could be leveraged to address global health challenges in Africa. These are mainly focused on the establishment of AI infrastructure that is the most necessary for Africa to harness technological opportunities and build capabilities across economic sectors.

Microsoft and Google have opened AI and data science research hubs in African countries including in Ghana, Kenya, Nigeria and South Africa. Incentives, including good regulatory frameworks, can steer these companies to enter health AI and data science domains such as AI genomics. One such initiative is the use of chatbots for sexual and reproductive health monitoring in Kenya.

Surveys conducted by UNESCO, the International Development Research Centre (IDRC), the African Development Bank (AfDB), and study reviews (e.g., Eke, et al 2023)[2] also reveal that most recent health AI developments and applications in Africa are in the private sector, mainly small companies, with a focus on services (vs products), and most of these are in healthcare. The box below provides a description of some initiatives on AI for health in Africa (Owoyemi, et al 2020).

1 Owoyemi A, Owoyemi J, Osiyemi A and Boyd, A., (2020) Artificial Intelligence for Healthcare in Africa. *Front. Digit. Health* 2:6. doi:10.3389/fdgth.2020.00006
2 Eke, O. D., Wakunuma, K., and Akintoye, S., editors (2023), *Responsible AI in Africa: Challenges and Opportunities*. Palgrave Macmillan.

> *"A partnership comprising researchers and a social enterprise has been developing an AI planning application for optimising the scheduling of community health workers (CHWs) in communities in Africa (11). In Nigeria, Ubenwa is a start-up that is using signal processing and machine learning to improve the diagnosis of birth asphyxia in low-resource settings (12). Bellemo et al. (13) conducted a study in using AI to diagnose diabetic retinopathy in Zambia which showed significant and promising results when compared with human assessments. It showed clinically acceptable performance in detecting referable diabetic retinopathy (13). The Delft Institute's CAD4TB software has been employed in pilot studies examining the use of a computer-aided diagnosis of pulmonary tuberculosis from chest radiographs in Tanzania and Zambia. The results are exciting as the performance of CAD4TB compared well with that of human experts (14, 15). Pharmaceutical industries have also benefited from the use of AI in Nigeria. A group of five high school girls developed an app based on MIT open-source software to identify fake drugs in Nigeria. Their stellar idea received recognition in 2018 upon winning a Silicon Valley contest. Earlier in 2019, Adebayo Alonge, a Nigerian trained pharmacist won the grand prize of Hello Tomorrow Global Challenge 2019 for his AI-hyperspectral platform for authenticating drugs."*
>
> **Source: Owoyemi et al (2020)**

0.3%

There is still relatively little health R&D in AI in Africa, with only an estimated 0.3% of global AI articles generated in Sub-Saharan Africa

A regional research and innovation initiative dedicated to promoting responsible AI for sexual, reproductive and maternal health for women and girls in Africa is the IDRC-funded 'Artificial Intelligence for Global Health (AI4GH)' Hub at Makerere University.[1]

The three-year Hub for Artificial Intelligence in Maternal, Sexual and Reproductive Health (HASH) project[2] focuses on research in maternal health, sexually transmitted infections, adolescent sexual reproductive health and HIV.

The few other AI and data science R&D initiatives in Africa are largely funded by external donors. Public universities with dedicated programmes for health AI and data science exist in South Africa, Kenya, Ghana, Nigeria, Tunisia, Algeria, Uganda, Egypt and Mauritius. But generally, there is still relatively little health R&D in AI in Africa, with only an estimated 0.3% of global AI articles generated in Africa

1 https://idrc-crdi.ca/en/project/innovation-hub-artificial-intelligence-sexual-reproductive-and-maternal-health-africa
2 https://hash.theacademy.co.ug/

Country	Institution (Organisation)	Overview of Health AI
Benin	Optimisation of machine learning techniques for agricultural yield prediction	This study aims to determine from pattern mining algorithms associated with pre-generated weather characteristics using maize yield data cultivated in real environments.
Botswana	Ensemble Constitutional Neural Network for Multi-class, Multi-label Retinal disease detection	Using deep learning method science to provide automated detection models that could match and/or surpass human level detection accuracies for retinal diseases.
Ghana	MinoHealth AI Labs is a Ghanaian initiative working on artificial intelligence solutions for healthcare across Africa — for radiology, infectious diseases, and biomedical research.	They use Artificial Intelligence (AI) for automated diagnostics, forecasts and prognostics. Main areas of focus are on Radiology, infectious diseases and biomedical health research.
Kenya	Speech Improvement Framework using Long Short-Term Memory Neural Network and Dynamic Time Warping to improve Kenyatta National Hospital health record data science Retrieval	This study will develop a framework based on long short-term memory neural network and dynamic time warping algorithm which will be tested and validated using data obtained from health record data science.
Rwanda	Secure and Efficient Anonymous Certificate-less encryption for Key Distribution Scheme for Smart Grid	Using certificate-less signcryption for key distribution scheme to prevent hacking of client's data while in Transit to service provider.
Rwanda	Prediction model and decision support system for Chronic Obstructive Pulmonary Disease (CORD) patients based on wearable pulse oximeter	This study aims to provide a cloud computing hybrid AI and data sciences applications to facilitate physicians to make decision on processed patients' cases more intelligently.
Senegal	Internet of Things (IoT) security for e-health in developing countries	This research aims to develop and optimise security mechanisms to ensure the privacy and confidentiality of sensitive health data transmitted and stored within IoT devices and systems.
South Africa	Centre for Artificial Intelligence Research (CAIR) a network of five universities (University of Pretoria, University of Cape Town, Stellenbosch University, North-West University and University of KwaZulu-Natal) and the Council for Scientific and Industrial Research (CSIR).	Multi-disciplinary teams working on ethics of AI health, use of AI in pandemic preparedness, and application of AI in genomics.
Tanzania	The Hybrid Approach in Verbal Autopsy Cause of Death Determination	Using AI to predict and explain the causes of deaths within rural communities where people mostly die at home. The solution is being deployed by the Government of Tanzania.
Zambia	A framework for an early warning system for the management of the spread of Locust invasion based on Artificial Intelligence Technologies	It is an AI-based early warning system for locust invasion in Africa. This initiative uses IoT, Geospatial, cloud computing and machine learning technologies to detect African Migratory Locust (AML) invasion.
Zambia	Automatic generation of biomedical image captions (Biomedical images captioning)	This study generates captions for biomedical images that were generated automatically. It aims at assisting doctors diagnose pathologies relating to the lungs, brain and bones.
Africa – Successes in Rwanda and Kenya	FAIR Forward – Artificial Intelligence for All by GIZ African countries involved. Ghana, Rwanda, Kenya, South Africa, and Uganda	This initiative aims to close the gap created by the scarcity of suitable African data from African nations has so far been a scarce resource and reduce social inequality by providing fair and open access to language data. The project has already seen some initial successes in Rwanda. Millions of people there will soon be able to use a chatbot to receive coronavirus advice in their local language.
Africa	Grand Challenges and Bill and Mellinda Gates Foundation	The use of Large Language Models (ChatGPT-4, or other credible sources with equivalent capability) to build an evidence base across the Bill & Melinda Gates Foundation Divisions of Global Health, Gender Equality, Global Growth and Opportunity (including Global Education), and Global Development contexts in LMICs.[2] (Link)
Africa	The African Health Initiative (AHI) is a special initiative launched in 2007 by the Doris Duke Foundation	Provide funding for strengthening health systems (link).

Table 3: Illustrative examples of AI Research (R&D) in Africa

There are an increasing number of start-ups (companies) in health AI (applications of different AI products in healthcare) in Africa. Some of the start-ups are spinoffs from the research community or are supported by international funders such as the International Development Research Centre (IDRC) to promote public-private partnerships.

Table 4 Examples of start-ups in health AI in Africa

Country	Start up	Overview
Kenya	The Pathology Network	The Pathology Network (TPN) is a Kenya-based, Africa-focused health-technology company operating in the referred laboratory testing space leveraging on AI to ensure every African has access to diagnostic tests. We are transforming healthcare provision in Africa by enhancing the lab diagnostic capacity of hospitals – connecting them to a local and global network of pathologists. As a digital intermediary, we connect patients and their doctors to the complex world of pathology and laboratory medicine while also moderating interactions to ensure consistent quality of lab results and diagnostic services.
Kenya	Damu Sasa	Damu Sasa is a startup that facilitates timely access of safe blood products to needy patients. While the need for blood is universal, access for all who need it is not. Damu Sasa uses digital technology and AI to help resolve this health challenge through our cloud-based vein-to-vein (end-to-end) blood services information management platform. The platform provides information that allows stakeholders, especially frontline healthcare workers (FLHWs), to effectively collaborate to save patients' lives. This allows in real-time blood products sourcing, blood donor relationship management, blood product screening, inventory management, transfusion management, hemovigilance reporting, and e-learning.
Kenya	Swift Lab	Swift Lab, aim to advance the use of AI-driven drone technology in Africa and make a positive impact in multiple industries. They believe that the future of innovation lies in the convergence of AI, drones, and data analysis, and we strive to be at the forefront of this transformation.
Kenya	Jacaranda Health	Google, in Kenya, is working with Jacaranda Health. The collaboration aims to help improve ultrasound AI technology, with a focus on using handheld ultrasound devices that don't need to be attached to larger machines. This, according to Google, can help people who aren't trained to operate traditional ultrasound machines to acquire and interpret ultrasound images and triage high-risk patients, simply by sweeping the handheld probe across the mother's belly.
Uganda	Photo - Kabada	Photo-Kabada is a hybrid remotely monitored phototherapy machine that can monitor and treat multiple babies with Jaundice simultaneously.
Zambia	Dawa Health	A digital health platform that monitors and guides mothers through their pregnancy using AI to collect information from the expectant mothers and measure relevant vital signs. This platform enables women to get 24/7 digital support where patients have access to a chatbot on WhatsApp. They also have a mobile app that enables the mother to register her last menstrual period date, which we then use to provide tailored maternal health support based on the gestational age.

Governance of AI policy and regulatory frameworks

20+

Number of African countries that have embedded the need to develop and apply AI in their development plans and long-term vision statements. 22 countries report having legal frameworks for personal data protection.

46

Ranking of Sub-Saharan African countries at the bottom globally in terms of readiness to engage with and govern AI in all sectors.

There is a growing body of literature (including survey reports) on trends in data science and AI governance in Africa. For example, Eke, et al (editors, 2023)[1], Nayebare (2019)[2], UNESCO (2021)[3], Owoyemi et al (2020)[4] and Gaffley et al (2022)[5] provide good overviews of the status of and issues in AI and data science governance in Africa. These cover various aspects of capacity needs for data science and current efforts to design and implement policy and regulatory frameworks for health AI and highlight the formulation of AI policies and strategies in several African countries. According to UNESCO (2021), over 20 African countries have embedded the need to develop and apply AI in their development plans and long-term vision statements. Twenty-two countries report having legal frameworks for personal data protection, though they do not necessarily cover health AI.[6]

The 2022 Government AI Readiness Index does not focus on health but provides a good assessment of the preparedness of nations to govern AI and data science. It ranks 46 African countries at the bottom globally in terms of readiness to engage with and govern AI in all sectors. Mauritius ranks the highest among African countries at 57th globally because it has a national AI strategy. South Africa is the second-highest ranked among African nations, for its good AI and data science infrastructure.

AI policy and regulatory measures tend to be embedded in frameworks for science, technology and innovation (STI), health research and innovation and information and communication technologies (ICT). In 2022, UNESCO released results of a survey of the priorities for AI in African countries: most identified capacity-building for AI policy, legislation and strategy development. Table 5 is a list of national priorities for AI capacity building in Africa.

1 Eke, O. D., Wakunuma, K., and Akintoye, S., editors (2023), *Responsible AI in Africa: Challenges and Opportunities*. Palgrave Macmillan.
2 Nayebare, M., (2019), Artificial Intelligence Policies in Africa Over the Next Five Years. *Futures*, XRDATA SCIENCE · WINTER 2019 · VOL.26 · NO.2
3 UNESCO (2021), Artificial Intelligence Needata science Assessment Survey in Africa. United Nations Educational, Scientific & Cultural Organisation, Paris.
4 Owoyemi, A., et al (2020), Artificial Intelligence for Healthcare in Africa. *Frontiers in Digital Health*, OPINION published 7 July 2020.
5 Gaffley M, Adams R & Shyllon O "Artificial Intelligence. African Insight. A Research Summary of the Ethical and Human Rights Implications of AI in Africa" (2022) HSRC & Meta AI and Ethics Human Rights Research Project for Africa – Synthesis Report.
6 The countries with data protection laws include Kenya, South Africa, Mauritius, Egypt.....

Table 5: National priorities for capacity-building in AI

Country Name	Strategies	Policies	Legislation	Ethical Guidelines	Centres of excellence on AI, start-up and incubation centres
Benin			Available		
Cabo Verde					Available
Cameroon	Available	Available	Available		
Congo	Available	Available	Available	Available	
Côte d'Ivoire					Available
Egypt	Available	Available	Available		Available
Equatorial Guinea		Available	Available		Available
Eswatini	Available	Available			Available
Gambia	Available				Available
Ghana	Available	Available			Available
Madagascar	Available				Available
Rwanda		Available			Available
Sao Tome and Principe	Available	Available		Available	
Senegal	Available	Available			Available
Sierra Leone	Available	Available			Available
Uganda	Available	Available			
Zambia	Available	Available			
Zimbabwe	Available	Available	Available	Available	Available

The assessment shows that health/global health does not feature in the AI priorities of several African countries, as shown in Table 6.

Country	Other priority areas for the use of AI
Botswana	» AI in mining to reduce costs » Use in tourism for immersive experiences
Cabo Verde	» Energy and water monitoring » Agriculture data processing
Congo	» Employment creation » Establishment of centers of excellence specialised in AI application and training
Guinea	» Communication and information » Using AI to increase government efficiency and transparency, AI for SDGs
Egypt	» Education
Madagascar	» Health
Malawi	» ICT programme in community area in Malawi
Senegal	» Telemedicine
Somalia	» National security, risk and disaster management

Table 6: National AI priorities of selected countries based on UNESCO Survey. Source: UNESCO 2022

AI Governance in Southern Africa

The regional convening for Southern Africa was held in Pretoria in June 2023. A review of proceedings shows that there is an increasing number and variety of initiatives to promote responsible AI for global health. Most health AI initiatives are not documented or analysed, so the report relies heavily on the survey, interviews and proceedings of the convening to identify country and regional efforts to build effective governance mechanisms for responsible AI for global health. At least 45% of survey participants for this report (n=310) were from the Southern Africa region.

Most participants in both the survey and convening were from research and policy-making organisations. Below is a summary of the status of national and regional AI governance in Southern African, based on this regional convening:

1 Most countries in Southern African do not have dedicated AI for health policy but do have policy frameworks that can be applied to governance of AI for health, or aspects of it. These include institutionalised policies and/or regulations for data protection, biosafety, health risk assessment and management, and technical standards which contain applicable provisions to address some of the ethical considerations of health AI.

2 Many research institutions, including universities and science councils, have established institutional ethical applications and control protocols as well as intellectual property guidelines which contains principles (such as patient data privacy, confidentiality, consent, etc) for good governance of AI.

3 There is increasing R&D on AI for healthcare such as on disease surveillance, pandemic preparedness (South Africa) and aging population health issues (Mauritius). Most of health AI R&D is concentrated in South Africa and Mauritius, with universities in South Africa forging the largest and most productive network of research excellence in AI.

4 There is an emerging and growing ecosystem of start-ups in AI health in the region, with most of them focusing on the AI of related technologies, such as robots in pharmacies, drones for delivery of healthcare services, and data science in clinical trials.

5 Policy literacy (awareness of existing policy and regulatory frameworks) is generally low. More than 53% of survey participants from the region were unaware of their own national policies, laws and/or regulations covering AI.

6 Most participants identified the following barriers to good governance of AI and data science for health: (a) limited public awareness of AI and data science and their applications as well as implications for health; (b) absence of platforms for public awareness-raising and dialogue on AI and data science; (c) limited awareness of international and regional as well as national frameworks for responsible AI and data science.

7 Most countries in the region have explicit and/or implicit policy frameworks, particularly laws and regulations, for personal data protection, and related ones for regulating access to genetic information. However, there is inconsistent enforcement of the laws and/or regulations.

8 There is a growing presence of international actors, particularly foreign private companies and funders, in AI and data science. Some funders (e.g., IDRC and GIZ) are supporting R&D for responsible AI for health in the region.

9 No country in the region has a dedicated policy and regulatory framework for AI in health. However, in most countries, institutions (particularly universities) involved in health genomics, clinical trials and other health R&D areas where AI is applicable, tend to deploy their institutional ethics policies and procedures.

10 There was consensus that the general public and most policymakers are not engaged in discourse on AI because there is relatively low awareness and/or knowledge of the technology. Regional forums such as the UNESCO-supported Southern Africa Ethics of AI Platform and intra-national networks are needed to stimulate public awareness.

11 Building capacities of policymakers and civil society is one of the priorities for enhancing the region's engagement in effective governance of AI. International partners and national governments must support training and awareness-raising workshops and courses on AI socio-economic, political and related sustainability issues. Such workshops and courses can apply tools such as technology assessment (TA) and technology foresighting (TF) to build public and policy consensus on specific interventions for governing AI in the health sector.

12 While there is recognition of the need to ensure that governance of AI is based on international principles such as the UNESCO Recommendation on Ethics of AI, more attention should be given to developing national frameworks that protect the rights of traditional communities, women and people with disabilities. AI design must take into account traditional and community health systems and be sensitive to the reproductive rights of women.

AI Governance in Southern Africa

Because most countries in Southern Africa do not have dedicated national policy for health AI and existing policy and regulatory frameworks are inadequate to effectively govern AI for public health, governments must step up to the task. The development and use of AI should not be left entirely to corporate or private sector.

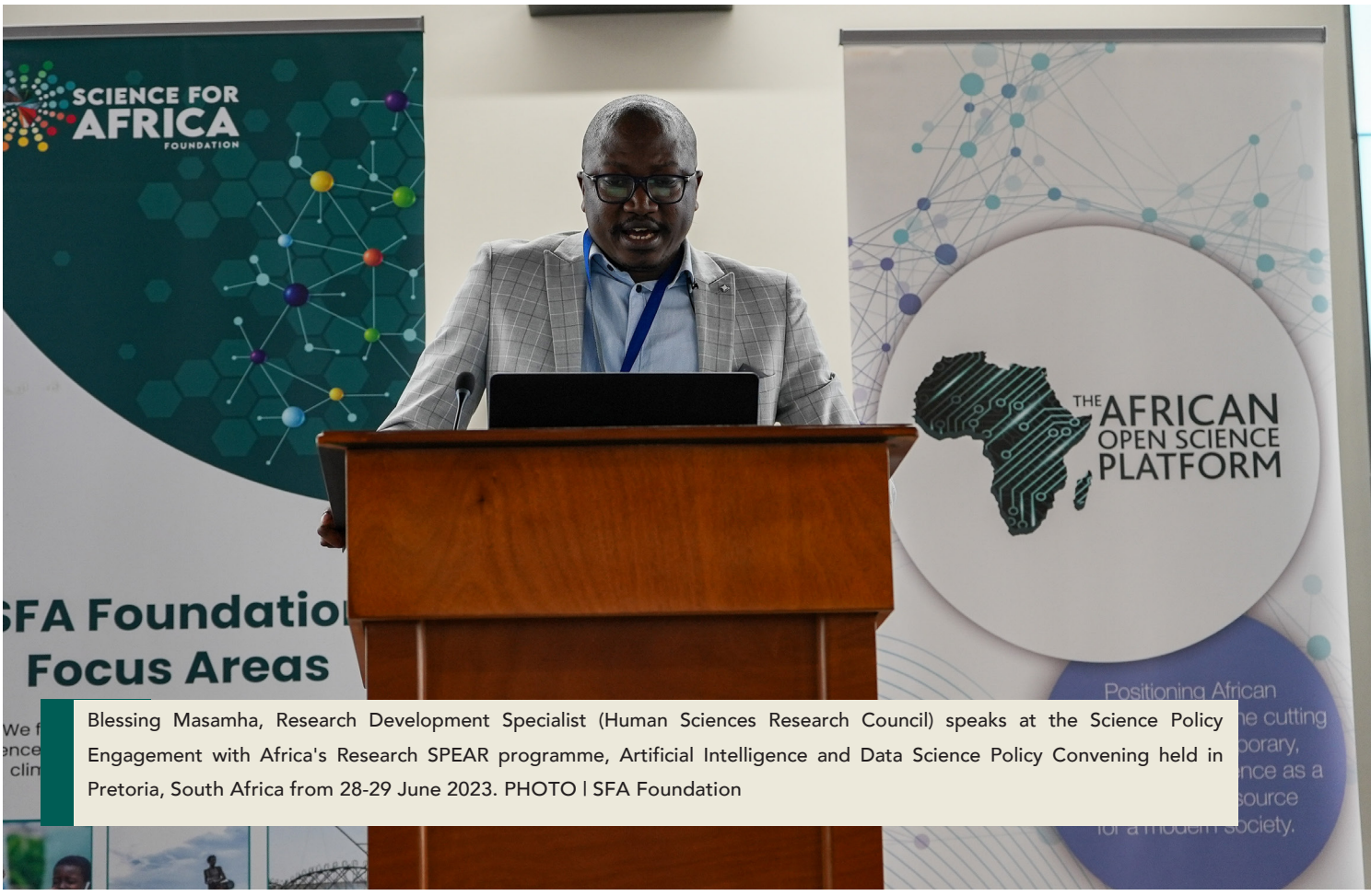
A recent study (UNESCO, 2022)[1] indicates that in the region, AI use is proliferating by privately owned companies, offering significant opportunity for socio-economic development. Findings also demonstrate that the majority of AI use cases are not operating within a framework that helps AI project holders understand and analyse the potential ethical implications of their products and projects.

South Africa's 2019 White Paper on Science, Technology and Innovation[2] has policy provisions for regulating AI and data science as well as promoting open science, including broad provisions on responsible research and innovation (RRI, paragraph 2.2.9).

The Government of South Africa commits to expanding existing national initiatives on AI (e.g., the Centre for AI Research) and to building skills and strengthening the regulatory framework. The country has established a national centre of excellence in AI, the Centre for Artificial Intelligence Research (CAIR), a distributed research network across eight universities funded primarily by the Department of Science and Innovation (DSI). It is coordinated by the Council for Scientific and Industrial Research (CSIR), which "conducts foundational, directed and applied research into various aspects of AI through its nine established research groups: Adaptive and Cognitive Systems, AI and Cybersecurity, AI for Development, Applications of Machine Learning, Computational Logic, Ethics of AI, Foundations of Machine Learning, Knowledge Representation and Reasoning, and Probabilistic Modelling."[3] Despite these efforts, South Africa has not developed a dedicated national AI policy and/or regulatory framework.

Mauritius is the first and perhaps only country in Southern Africa with a dedicated national AI strategy. The Government of Mauritius set the policy foundations for building a national AI ecosystem in its 2018/2019 budget, creating and funding the Mauritius Artificial Intelligence Council (MAIC) to develop a national AI strategy and oversee its implementation. The MAIC is comprised of representatives from public institutions

1 UNESCO (2022), *Landata sciencecape Study of AI Policies and use in Southern Africa*. United Nations Educational, Scientific and Cultural Organisation, Regional Office for Southern Africa, Harare, Zimbabwe.
2 Republic of South Africa (2019), *White Paper on Science, Technology and Innovation: Science, technology and innovation enabling inclusive and sustainable South African development in a changing world*. Department of Science, Technology, Pretoria.
3 https://cair.org.za/about



Blessing Masamha, Research Development Specialist (Human Sciences Research Council) speaks at the Science Policy Engagement with Africa's Research SPEAR programme, Artificial Intelligence and Data Science Policy Convening held in Pretoria, South Africa from 28-29 June 2023. PHOTO | SFA Foundation

8

Number of years a company set up on or after 1 July 2017 and involved in innovation-driven activities for intellectual property assets which are developed in Mauritius can benefit from an exemption of income tax... [for] innovation-driven activities. The Government also allows double deduction of qualifying expenditure incurred for R&D purposes

(including researchers), private sector and international experts. It developed the country's national AI strategy, adopted in November 2018.

One of its core priority areas is health (paragraph 9), with emphasis on e-health, use of genomics to address various diseases and challenges of the aging population, development of personalised medicine, development of treatments for cancers (such as skin cancer), cosmetic and reconstructive surgery, and other outcomes with the potential to harness AI applications. The strategy outlines specific fiscal and legal incentives for private sector investment in AI R&D and their application.

It states for example that, "a company set up on or after 1 July 2017 and involved in innovation-driven activities for intellectual property assets which are developed in Mauritius can benefit from an exemption of 8 income years...[for] innovation-driven activities. The Government also allows double deduction of qualifying expenditure incurred for R&D purposes."[4]

The Mauritius strategy also provides legal incentives in the form of intellectual property protection by strengthening the enforcement of intellectual property protection and establishing the Intellectual Property Promotion Scheme (IPPS) "to encourage individuals, enterprises, industry and R&D institutions to take advantage of the mechanisms for protecting innovation." Potential for applications to AI are self-evident. The IPPS is coordinated by the Mauritius Research Council (MRC) and the Industrial Property Office (IPO).

The Mauritian AI Strategy *does not contain explicit principles and policy actions on ethical dimensions of AI*. It recognises that country policy and regulatory frameworks are weak or inadequate to address ethical dimensions of AI and data science and espouses the principles of transparency and accountability in the development and implementation of AI and data science. It states that, "accountability will be a key element to discuss for when things go wrong. The question of liability in artificial intelligence is very complex compared to most other environments. Given the multiple participants involved in any artificial intelligence value chain, an efficient way of solving the liability problem will be for the various market players to define the parameters of their

4 Republic of Mauritius (2018), *Mauritius Artificial Intelligence Strategy*.

own liabilities" (para 31), and in paragraph 32, "the AI ecosystem should be ethical, and therefore, a permanent committee on ethics should be set up to maintain the dialogue and formulate proposals to maintain a healthy relationship between AI and humans."

Botswana's SmartBot Strategy contains general policy provisions on the promotion of AI and data science in the economy and makes passing reference to health and regulatory governance of 4IR technologies in general. It identifies the need for an explicit national AI policy and regulatory framework to implement UNESCO Recommendation on Ethics of AI and UNESCO Recommendation on Open Science. The 2020-2030 National Science, Technology and Innovation Policy of Namibia and its National Action Plan (2023 draft) outlines specific priorities for AI and data science, including to address global health challenges such as epidemics and pandemics, and to promote social inclusion (particularly gender equality) in the development and application of AI.

Seychelles' 2016-2025 National Science, Technology and Innovation Policy and Strategy adopted in 2017 also refers to AI and data science and identifies health as a priority sector for R&D investment.[5] Section 4.4 identifies data science, in particular Decision Analytic Models (DAMS), as key to strengthening the country's health system and improving the provision of healthcare. It does not have explicit provisions for regulating the development and use of AI and data science in and/or for healthcare. However, it does provide for the establishment of "the People STI Group" to promote the regulation of technologies, in particular to preclude a "digital divide."

The implicit policy frameworks (particularly for STI and ICT) such as those of Seychelles and South Africa do not adequately govern the development and deployment of AI and data science. Most of them do not address ethical and social inclusion considerations and tend to be 'technology promoting' more than 'technology governing'. They were developed prior to the establishment of current international principles and guidelines for AI and data science, and thus tend not to contain and/or articulate key principles of transparency, accountability, inclusiveness and clarity that are in UNESCO, WHO and OECD frameworks for AI and data science. In addition, most STI and ICT policy frameworks make reference to health as a priority sector but to do focus on issues of equity and equality (including the distribution of benefits of AI and data science).

5 Republic of Seychelles (2017), *Seychelles' National Science, Technology and Innovation Policy and Strategy 2016-2025*. National Institute for Science, Technology and Innovation (NISTI).

Establishing a strategic framework incorporating AI within our National Science, Technology and Innovation policy is essential for fostering a culture of innovation and creativity. The Malawi Space Agency is ready to leverage this framework to push the boundaries of what is possible in exploring the opportunities for utilising space technology to facilitate enhanced socio-economic development for Malawi.

Thandikile Chisala Mbvundula,Chair, Malawi Space Agency Taskforce

Vice President, African Space Council

Breakout discussions at the Science Policy Engagement with Africa's Research SPEAR programme, Artificial Intelligence and Data Science Policy Convening held in Pretoria, South Africa from 28-29 June 2023. PHOTO | SFA Foundation

Governance of AI in Eastern and Central Africa

The regional convening for Eastern and Central africa was held virtually. Like in Southern Africa, AI applications in healthcare and health systems are emerging rapidly from the private sector in Eastern and Central Africa. Rwanda is the only country in the region that has adopted a national AI policy framework, in 2023: the National Artificial Intelligence Policy for the Republic of Rwanda[1] seeks to enable the country to "harness the benefits of AI and mitigate its risks.

Building on the mission of the Vision 2050, Smart Rwanda Master Plan and other key national plans and policies, it equips Rwanda to harness AI for sustainable and inclusive growth. By mobilising local, regional, and international stakeholders, it positions Rwanda to become a leading African Innovation Hub and Africa's Centre of Excellence in Artificial Intelligence" (Republic of Rwanda 2023, ibid., p.1).

Health is one of the key sectors for investment in AI R&D. The policy does not have specific provisions for global health but articulates principles of transparency and accountability, social inclusion and technical feasibility for responsible AI. Suggested interventions include building national, institutional and human capabilities for responsible AI through training and education, emphasising the importance of adherence to 'Rwanda's Guidelines on the Ethical Development and Implementation of Artificial Intelligence' and strengthening capacity for ethical AI.

The policy establishes a Responsible AI Office (RAI Office) within the Ministry of Information and Communication Technology and Innovation (MINICT) by "coordinating stakeholders across institutions and championing the responsible development and deployment of AI across the Rwandan public and private sectors. Beyond domestic engagement, … it can actively participate in global AI governance and policy fora such as the OECD AI Policy Observatory, ITU, UNESCO, and Global Partnership on AI (GPAI)."

As in Southern Africa, most countries in the region have regulatory frameworks for data protection that cover the use of data science in health. For example, Kenya's Data Protection Act of 2019 covers health data, defined as, "data related to the state of physical or mental health of the data subject and includes records regarding the past, present or future state of the health, data collected in the course of registration for, or provision of health services, or data which associates the data subject to the provision of specific health services."[2] The Act requires data processors to be transparent and fair in handling personal data. It can be applied to the acquisition and use of personal health data in clinical trials and other health R&D activities to ensure that they are done ethically and responsibly.

The (virtual) regional convening for eastern and central Africa discussed trends in AI and data science for global health, and challenges of and opportunities for effective governance of the technology. In addition, issues and recommendations were made by survey participants and interviewees. Key issues that emerged from the convening, the survey and interviews are highlighted in the next page.

1 Republic of Rwanda (2023), *The National AI Policy: To leverage AI to power economic growth, improve quality of life and position Rwanda as a global innovator for responsible and inclusive AI*. Ministry of Information and Communications Technology and Innovation, Kigali
2 Republic of Kenya (2019), *The Data Protection Act No. 24 of 2019*.

Governance of AI in Eastern and Central Africa

Key issues that emerged from the convening, the survey and interviews are:

1 There is low public and political awareness of AI and its implications for national security and development. Some countries (e.g., Kenya) reports on AI in the media and a growing community of AI researchers and practitioners is actively engaging in public debate on the technology. But in most countries in the region there is not much reporting on AI and no organised associations or networks on AI for health.

2 International funders, such as IDRC, Sida (Sweden) and GIZ, are supporting research on AI for reproductive health, HIV/AIDS data science and diagnostic kit development in several universities in the region. Some research projects are linked to or focused on stimulating the creation of start-ups for health AI.

3 The Inter-University Council of the East Africa and other academic associations can help to establish a regional, multidisciplinary (or transdisciplinary) network for AI research and innovation, to encourage collaboration among university-based research teams, think tanks, private sector, civil society and international research bodies so that they may conduct evidence-based studies for AI governance, including AI health assessment. Such studies would inform the design and operational aspects of regional AI governance mechanisms.

4 Kenya, Rwanda and Uganda seem to have the highest concentration of actors (both public and private) engaged in AI in general and AI for health. These are mainly university-based research groups and technology vendors; there are some hospital- or clinic-based practitioners involved in telemedicine-like activities.

5 Apart from Rwanda, countries in the region do not have dedicated policy frameworks for AI. However, Kenya, Uganda and Tanzania have regulations for governing the procurement, sharing and use of personal data. In September 2023, Kenya was set to initiate the development of a national AI governance framework, coordinated by the ICT ministry.

6 Most or all countries in the region have ethical standards for data science and use of health technologies. Examples of such health policies and regulations applicable to AI in public health include those for occupational health safety, pharmacy and health professional standards, and laws controlling the approval of medical products and medicines. A compilation and assessment of the regulatory frameworks for health which have implications for AI is needed to ensure that regulators are aware of and can use and coordinate with them.

7 Data science capacity, including computing infrastructure for big data, and human technical skills for data processing, are still in very short supply in the Eastern and Central Africa region. Most institutions, particularly public health research institutes and universities, lack the requisite capacities to generate, safely store and exchange big data. There is need for the region to develop data governance frameworks; the EAC can is positioned to provide the political platform for this.

8 Governance of AI for public health (and global health in general) in the region should be considered within the wider context of strengthening national and regional systems of research and innovation. Countries require modern and effective policy and regulatory frameworks, and national institutions for funding, research and innovation. Institutions such as the SFA Foundation, IDRC and national research granting councils must integrate and prioritise funding of national and regional initiatives to establish effective mechanisms for governance of AI.

9 Related to point 7, effective governance of AI for health requires a systemic whole-of-government approach. It cannot be left to single ministry of ICT or health. Given the transdisciplinary nature of governance of AI for health, inter-ministerial and multistakeholder committees or institutional arrangements must be established by (or within) countries to lead the development and implementation of national policy and regulatory frameworks for AI and related aspects of data science.

10 There is very limited awareness (or knowledge) of existing international policy frameworks such as the WHO guidelines on AI and the UNESCO Recommendation on Ethics of AI. Building awareness of these international frameworks through workshops, popular media and policy briefs will help address this.

11 A regional multi-stakeholder' forum on AI for health should be established by the EAC and other bodies to promote awareness-building and knowledge-sharing, helping to build public (civic) constituencies for governing the development and application of AI for global health, with emphasis on priority diseases and epidemic preparedness (e.g. Ebola).

Most government officials and other key stakeholders such as in the judiciary, legislatures and regulatory agencies have relatively limited knowledge of AI and the related, many complex socio-economic, legal and technical issues associated with its governance, particularly in the health sector.

Capacity building (increasing awareness, policy literacy, information access and sharing and technical skills development) is needed to strengthen national capacities for effective governance of AI for health in the region. Workshops on governance of health AI must be tailored to different stakeholder groups in the region.

Governance of AI for health in North Africa

The regional convening for North Africa was held in Cairo. North Africa (Algeria, Egypt, Libya, Morocco and Tunisia) has a relatively developed infrastructure for AI in general and for AI applications in the health sector. A review of available policy documents suggests that Egypt is unique in its region because of its "National AI Strategy is a key priority for helping Egypt achieve relevant UN Sustainable Development Goals as they pertain to Egypt (in numerical order 4, 5, 8, 9, 10, 11 [inclusive and equitable education, gender equality, inclusive and sustainable growth and decent work opportunities, fostering innovation via inclusive and sustainable infrastructure, reducing inequalities within and between countries, and working toward sustainable and resilient cities and settlements, respectively]", adopted in 2019.

The document spells out the country's plans to pursue the use of AI technologies to transform the national economy, going beyond adopting technology to fundamentally rethinking business models and integrating profound change to reap productivity gains and create new areas of growth.[1] While the document does not explicitly reference SDG3 (health and wellbeing, including global health), healthcare is identified as an area for AI development and application.

Egypt's National AI Strategy contains the same principles as the international frameworks, particularly the UNESCO Recommendation on Ethics of AI. The country aims to "contribute to global efforts and playing an active role in different AI international fora, especially around topics of AI Ethics, future of work, responsible AI and the social and economic impact of AI."[2] The National Council for Artificial Intelligence (NCAI) is mandated to promote responsible AI by "advising the government on the ethical and legal use of AI and data and related ethical, legal, policy, and governance issues."

The NCAI is expected to conduct ethical and technical assessments of AI development and application on a continuous basis, and to develop and institutionalise national guidelines for Responsible and Ethical AI for AI practitioners and companies in Egypt (the "Egyptian Charter for Responsible AI").

Most other countries in the region do not have explicit policy or regulatory frameworks for AI and data science that are directly applicable to global health and/or have provisions that can be interpreted as applicable to global health goals. As in other regions, there is a tendency to integrate AI and data science policy measures in frameworks for STI, ICT and 4IR.

The regional convening, held in Cairo, Egypt (17-18 Sep 2023) organised by the SFA Foundation, revealed increasing foreign investment in and public funding for health-related AI activities in the region, particularly in Egypt and Morocco. National research institutes and public universities are actively engaged in the development and application of AI in human genomics, pharmaceutical/drug development, clinical trials, reproductive health and other aspects of AI for public health.

Some countries in the region attract US and EU as well as Chinese AI private companies in health-related activities. Public funders such as IDRC are also supporting research and innovation on AI for health in North Africa, including IDRC support for an AI innovation network to enhance reproductive and maternal health outcomes in the MENA region. Emphasis is on ensuring safe, ethical and responsible applications of AI.

1 Republic of Egypt (2019), Egypt National Artificial Intelligence Strategy. National Council for Artificial Intelligence (NCAI)
2 Republic of Egypt (2019), op. cit.

A group photo of a section of participants at the Artificial Intelligence and Data Policy Gaps in Global Health, North Africa Dialogue held in Cairo, Egypt from 18-19 September 2023. PHOTO | SFA Foundation

Governance of AI for health in North Africa

Key policy issues and recommendations emerged from the regional convening:

Governance of AI for health is fairly weak in North Africa despite countries of the region having significant scientific and technological capacity for research and innovation. There are ongoing efforts by governments in the region to develop and adopt AI strategies and policies. However, these will remain inadequate if they are not accompanied by legally binding regulatory frameworks that ensure responsible and ethical AI, with transparency, public participation and accountability measures. Building the capacity of institutions, both state and non-state, for effective governance of AI for health must become a priority for the region.

1 All countries in the region have well developed policy and regulatory frameworks for data governance, clinical trials and health research and innovation in general. Most have general AI strategies or are in the processes of finalising such strategies.

2 No country in the region has developed a legally binding framework for ethical, safe and secure AI for health.

3 There is a somewhat weak participation of civil society and NGOs in AI discourse and limited public awareness of the technology and its implications for global health. Most of the countries in the region have no established culture of participatory technology assessment (TA).

4 Egypt, Morocco and Algeria are participating in an UNESCO-supported responsible/ethical AI readiness assessment. This will provide an empirical basis on which to strengthen their AI governance frameworks.

5 There is scant information on the status of or current activities in AI research and innovation for global health, particularly in fields such as health genomics, clinical trials and pharmaceuticals. It is generally reported that universities and research institutes in the region have ongoing programmes in AI.

6 Currently, countries in the region have relatively weak health data security systems. This is particularly problematic in public or government health centres or hospitals where private clinical data is not properly stored and secured, making it easily accessible to third parties. Even with data protection regulatory frameworks, implementation and enforcement are key challenges.

7 Effective governance of AI for health suffers from weak inter-institutional and state agency coordination. This includes coordination among and between legislatures, judiciaries, ministries, research institutes and regulatory bodies for health research and innovation and for AI and data science.

8 There is no formally established platform for countries of the region to engage in information sharing for effective governance of AI for health. Strengthening regional cooperation in AI governance, including research and innovation, will enable countries to learn from each other and harmonise their policies and regulations in areas of mutual interest.

Governance of AI for health in West Africa

The regional convening for West Africa was held in Mali.

Like in other regions of the African continent AI, for health in West Africa is still in its infancy. This includes applications in genomics, clinical trials, drug development and other aspects of global health.

There is some research on AI for health ongoing at public universities in Cameroon, Ghana, Nigeria and Senegal, and a few private companies based in the region have operations focusing on the application of AI-related technologies, such as robotics in pharmacies and healthcare. AI-driven telemedicine is a growing enterprise in the region.

There is little information on the nature and effectiveness of policy and regulations in different countries in the region to govern AI for health. A review of reports and interviews as well as discussions at the SFA Foundation convening for West Africa suggests that Nigeria has the most developed institutional infrastructure and related policy instruments for AI governance in the region.

According to one analyst, "Nigeria's commitment to advancing AI technology is evident through the establishment of institutions like the National Centre for AI and Robotics (NCAIR), the Nigeria Data Protection Regulation (NDPR), and the Cybercrimes (Prohibition and Prevention) Act of 2015. The country's burgeoning AI ecosystem, bolstered by private entities and start-ups, further exemplifies its readiness to embrace AI-driven innovation."[1]

Effoduh (2021) states that, "Nigeria's Data Protection Regulation (NDPR) provides a legal framework for the use and exchange of electronic data. Also, Guidelines for the Management of Personal Data by Public Institutions in Nigeria was also introduced by the National Information Technology Development Agency (NITDA). Whilst these are progressive rules, there is a need for a comprehensive National data legislation and an ombudsman for Nigeria's data governance."[2]

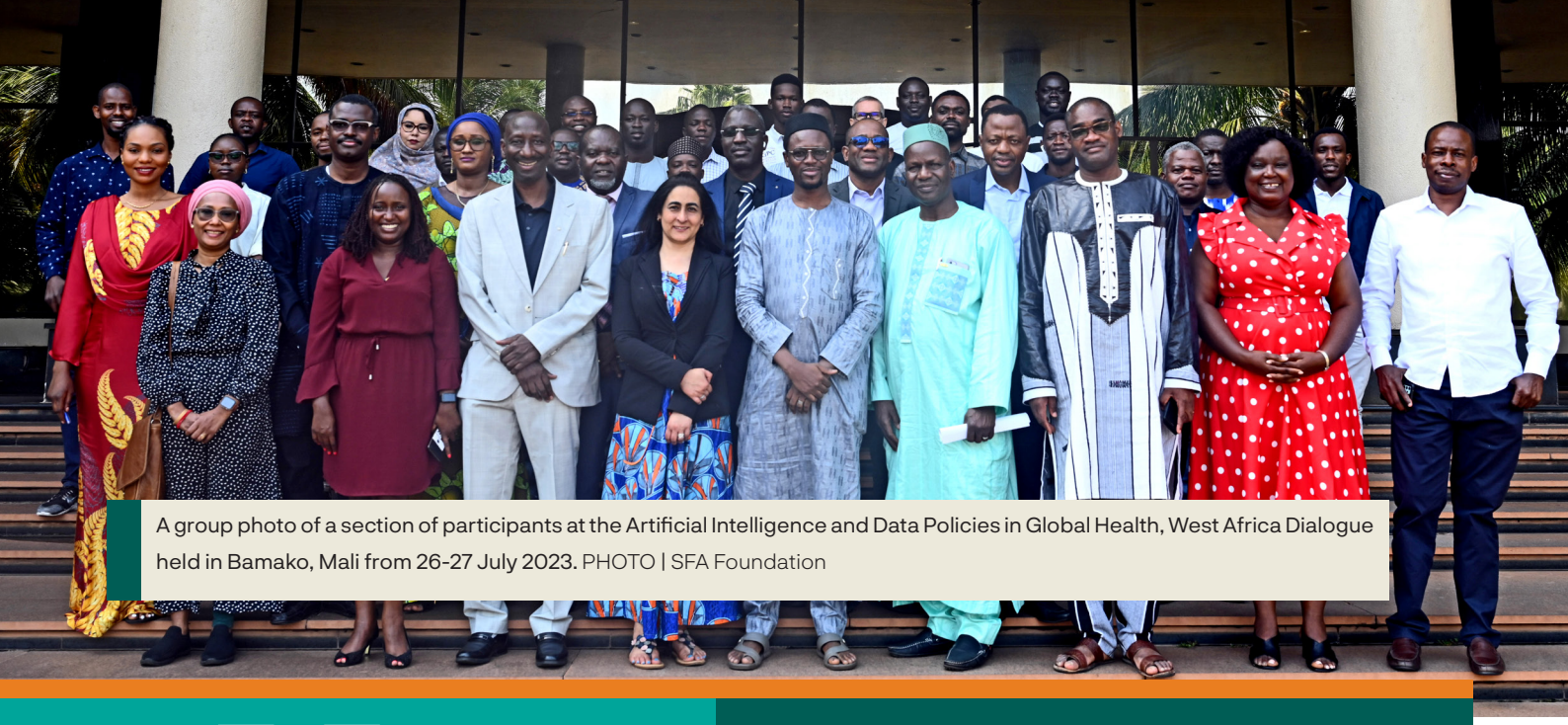
In Ghana, the Ministry of Communications and Digitalisation and the National Data Protection Commission, with technical support from GIZ and Smart Africa, are finalising the 'National Artificial Intelligence Strategy 2023-2033', currently under review by various stakeholders and national consultations which were held between 2021 and 2023.

In mid-2023, Ghana's parliamentarians called on the government to develop legally binding regulations for AI.[3] To date, it is unclear whether the strategy has been adopted by government and if there has been progress on developing a legal framework for AI.

Senegal and Benin are also developing or have developed national AI strategies.[4] According to D4D Hub (2023), Senegal adopted a national AI strategy developed under the Ministry of Communications, Telecommunications and the Digital Economy (MCTEN).[5] The strategy document was, however, not made available for review for this report.

Most AI initiatives in the region are documented in UNESCO (2021, op. cit.,) and other reports. They include the IDRC-funded Interdisciplinary Centre of Excellence in Artificial Intelligence for Development (CITADEL), a collaboration between Burkina Faso Virtual University and Open Burkina.

1 https://www.mondaq.com/nigeria/new-technology/1373830/artificial-intelligence-ai-regulation-in-nigeria-key-considerations-recommendations-legal-framework-and-policy-development-for-artificial-intelligence-ai-in-nigeria#:~:text=Presently%2C%20Nigeria%20lacks%20a%20formalized,driving%20progress%20in%20this%20realm.
2 Effoduh, J., (2021), Towardata science A Rights-Respecting Artificial Intelligence Policy for Nigeria. https://paradigmhq.org/wp-content/uploadata science/2021/11/Towardata science-A-Rights-Respecting-Artificial-Intelligence-Policy-for-Nigeria.pdf
3 https://www.dw.com/en/ghana-debates-regulating-artificial-intelligence/a-66025595
4 https://www.institute.global/insights/tech-and-digitalisation/how-a-pan-african-roadmap-can-unlock-the-potential-of-ai
5 https://d4dhub.eu/news/implementing-the-national-ai-policy-key-lessons-from-rwanda



A group photo of a section of participants at the Artificial Intelligence and Data Policies in Global Health, West Africa Dialogue held in Bamako, Mali from 26-27 July 2023. PHOTO | SFA Foundation

No doubt, Artificial Intelligence has come to stay. Its unique role in healthcare delivery cannot be underestimated and there is a need for all stakeholders in the health industry to embrace it. Participating in this dissemination seminar was quite helpful and informative. Going forward, we are now better informed on what AI holds for holistic and effective healthcare delivery in Nigeria

Clerk, House of Representatives, National Assembly, Abuja, Nigeria.

Represented by Alhaji Aliyu Maccido, Director and Head of Administration in Deputy Speaker's Office

The SFA Foundation convening for the region produced the following key issues and recommendations:

1 Most of the emerging (or in development) national AI strategies are generic in nature and do not address the specifics of developing and applying the technology for health. Countries would be well advised to explore the development of health sector-tailored AI governance frameworks or instruments.

2 There is limited institutional infrastructure for effective AI for health governance in West Africa. While some countries have set up agencies and/or programmes for data protection and health technology assessment, most do not have agencies with capacity to ensure ethical and responsible development and application of AI for health. It is thus recommended that the development of AI strategies should be accompanied by the creation of competent authorities for AI governance.

3 Countries that are formulating AI strategies are treating the technology in a reductionist way, reducing it to ICT and often ignoring its pervasive nature, with applications and impacts across sectors. It is crucial to recognise the breadth and potential penetration of AI and to use a cross-sectoral approach in formulating and implementing policy and regulations for AI. Inter-ministerial and multi-stakeholder mechanisms are best suited for effective governance of AI, particularly for health.

4 As the bibliometric analysis shows and was emphasised in the convening, West Africa's scientific productivity in AI for health is very small (even insignificant). This is due to very limited investment in and weak capacity for research in AI and its applications. Addressing this is crucial to strengthening effective governance of AI for health in the region.

5 Public awareness of AI and its contributions to and impacts on health is low in most countries of the region. There are no organised civil society organisations or independent think tanks that are actively engaged in AI discourse. Because of this, the uptake of public participation, social inclusion, transparency and accountability in AI governance frameworks in the region will be difficult to achieve. Thus, building the participation of non-state actors in AI should be a priority. Such capacity building may include provision of information, public awareness workshops and training in AI governance.

Stakeholders in African AI and data science in Africa: Selected examples and bibliometric analysis

A mapping of actors in African health AI and data science for global health shows that over the past decade or so there has been an increase in the number of private and public organisations and individuals active in these issues. In South Africa, Egypt, Mauritius, Kenya, Nigeria, Uganda and Ghana, there is a growing number of AI-driven health start-ups, particularly in data science for healthcare and telemedicine.

There are also pharmacies in Kenya, South Africa, Namibia, Seychelles, Rwanda and Mauritius that are reported to be deploying AI to deliver services. In addition to start-ups**,** private, nonprofit funders support AI-driven health, predominantly the Bill and Melinda Gates Foundation, IDRC, GIZ and the Swedish International Development Cooperation Agency (Sida). These funds generally support university-based research on AI and data science for global health. UNESCO is supporting countries (particularly in Southern Africa) to build awareness of responsible AI and to help some to develop a governance framework for AI.

Our bibliometric analysis identified a total of 7,268 records (studies relating to the use of AI and data science in global health) with 113 articles included after screening. Results show that in terms of corresponding authors the greatest numbers were from the USA followed by South Africa (Fig 1). Findings also demonstrate that 42% of corresponding authors were from African countries (8/19). This included Ethiopia, Egypt, Ghana, Morrocco, Nigeria, Rwanda and Benin. Ethiopia and the UK had equal number of corresponding authors and are the 4th most joint ranked counties in terms of corresponding authors. Similarly, Ghana, Morrocco, Nigeria and Rwanda are joint 7th ranked and Benin is 8th ranked.

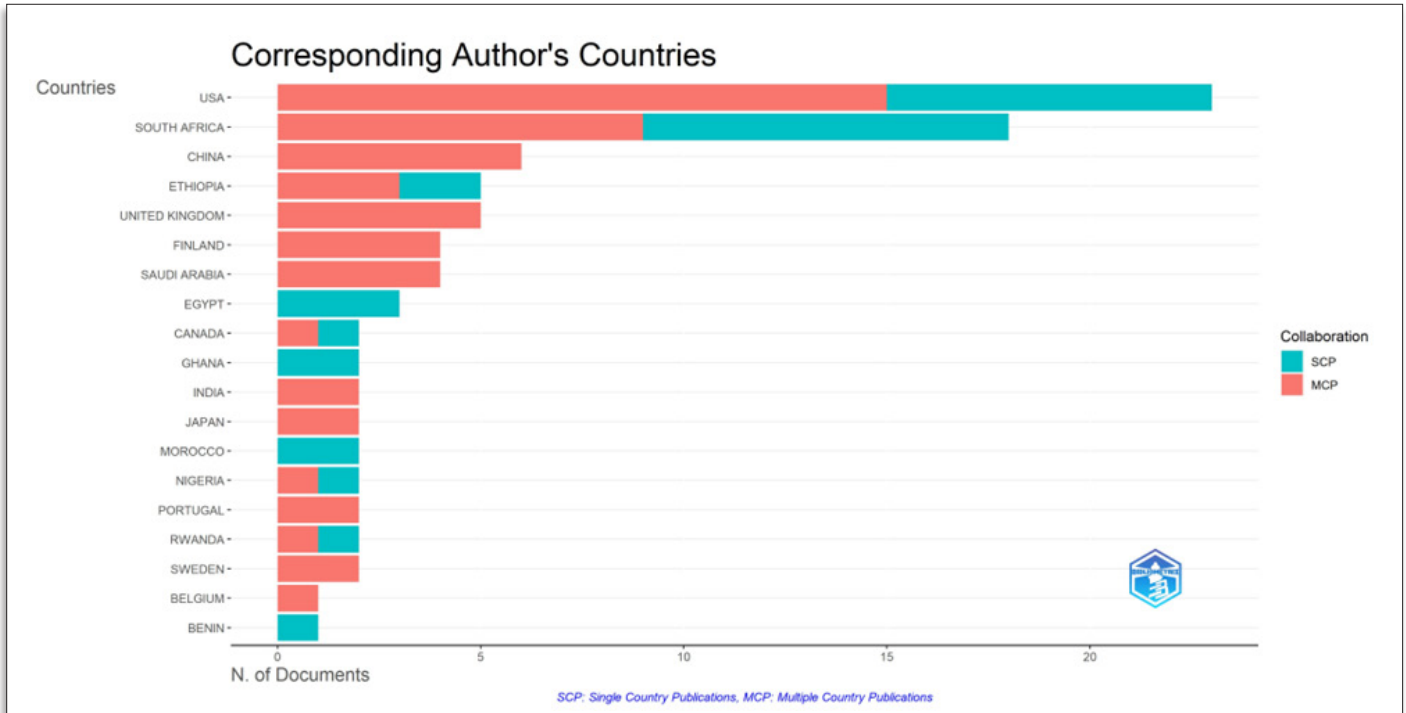


Figure 1: Number of publications on AI in global health by leading countries

> **Publications on AI for health represent authors across multiple countries. This may be suggestive of increasing global collaboration in health-related AI research around the world.**

Increasingly, publications on AI for health represent authors across multiple countries. This may be suggestive of increasing global collaboration in health-related AI research around the world. Among the African countries, South Africa, Ethiopia, Nigeria and Rwanda had multi country authorship. With approximately 50% single country and 50% multi country in South Africa, Nigeria and Rwanda. While Ethiopia had more multi country verses single country corresponding authorship. In contrast publications from Egypt, Ghana, Morrocco, and Benin were single country. However, this is not an Africa specific trend as seen in the figure above. Despite the number of corresponding authors from Africa only three African countries South Africa, Kenya and Egypt (Fig 2) have AI research productions in global health.

Figure 2: Heat map showing the country specific production of AI research outputs in global health across the world.

Thematic map (fig 3) analysis based on the bibliometric findings illustrate that AI research concepts co-occurred with topics around Covid-19, SARS-CoV2, and pandemics. This is a significant finding, as it indicates that AI research is being used to address some of the most pressing health issues of our time.

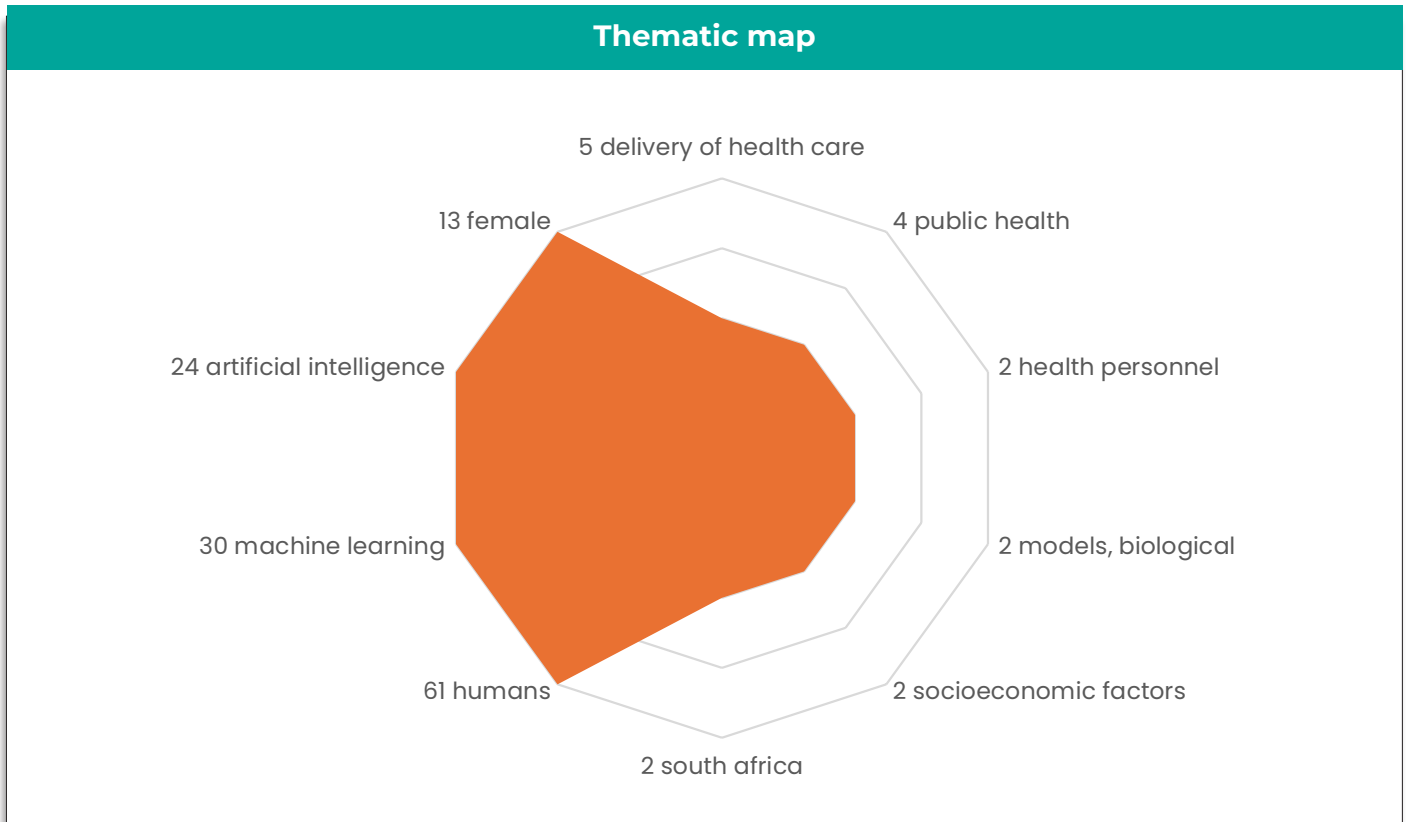


Figure 3: Conceptual structure showing the thematic map on artificial intelligence & data science research in global health.

OVERVIEW OF SURVEY ON GOVERNANCE OF AI IN AFRICA

In navigating the dynamic and complex terrain of AI in global health, it is crucial to recognise that the technology's potential extends far beyond technical advancements—it encompasses profound opportunities to reshape healthcare equity across Africa. As we develop regulatory frameworks and policies, let us ensure they are as inclusive and forward-thinking as the technologies they aim to govern. It is only through such holistic governance that we can truly harness AI's capacity to deliver transformative health outcomes for all.

Barbara Glover, AUDA-NEPAD

OVERVIEW OF SURVEY ON GOVERNANCE OF AI IN AFRICA

A written survey (Annex1) was launched in July 2023[1], in both French and English, to provide empirical data on the status of AI for global health in Africa, enriching findings from the regional convenings identifying trends in the governance of AI and data science. There were 301 respondents to the survey. Survey respondents' self-identified as AI experts or non-experts across researchers, policymakers, private sector and civil society. Respondents were from 46 African countries; Kenya, South Africa, Mali, Cameroon and Nigeria had the greatest number of respondents (fig 4)

1 A Survey of the Landscape of Artificial Intelligence and Data Science Policy for Health in Africa

Thematic map

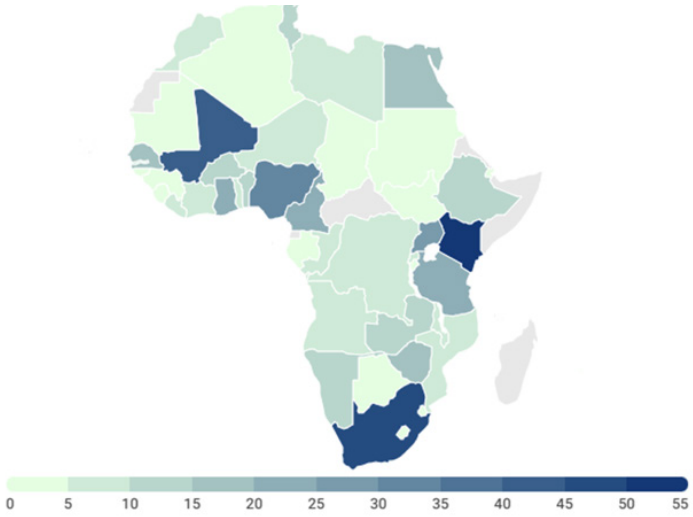


Fig 4 Heat map of survey responders from Africa Member states

Survey analysis focused on: (a) respondent awareness of existing national and regional policy and regulatory frameworks for AI; (b) respondent perception of the adequacy of existing frameworks; (c) respondent-recommended AI governance priority issues and problems, and (d) respondent suggestions to strengthen governance of AI for global health in Africa.

Across the regions there was very limited awareness of any existing AI policy/ strategy/ SOP (fig 5). With the highest level of awareness (30% of respondents) in Western Africa, followed by Northern Africa (24%), Eastern Africa (20%), Southern Africa (15%) and Central Africa (11%).

Regional AI policy awareness (YES)

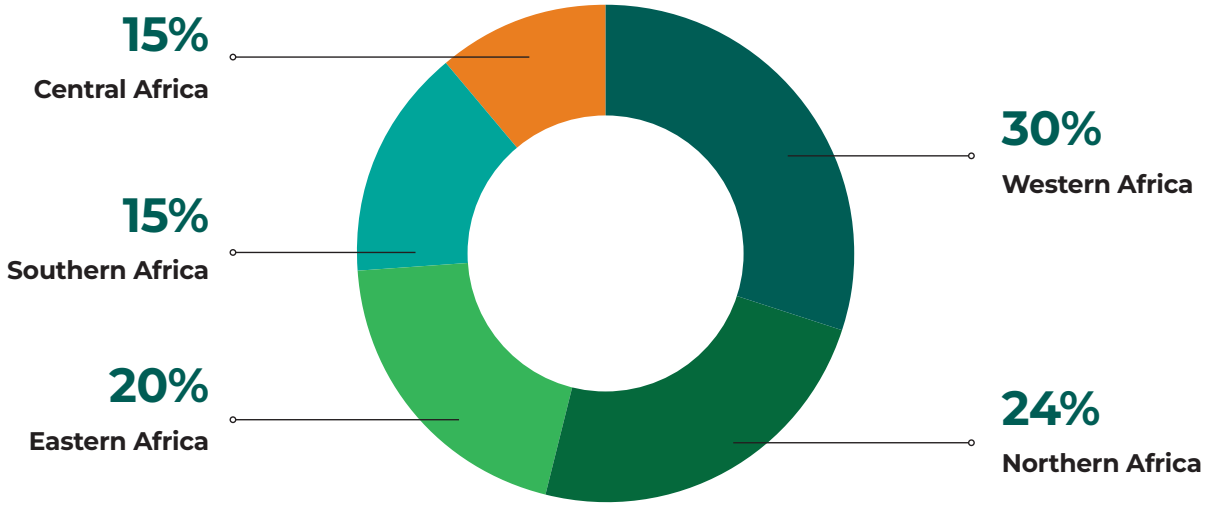


Figure 5 Illustrates the policy awareness level of the respondents across Africa.

The regional differences in policy awareness were also reflective at the self-identified expert level with Northern Africa experts 40% being aware of AI policy while 0% of experts in the Southern Africa region were aware of the same (fig 6a). Policy awareness differences are also evident in the non-expert group (fig 6b). Furthermore, overall comparing awareness between experts and non-experts regardless of region there was still very low policy awareness with the 228 respondents who respondent to the question only 15 experts and 16 non-experts being aware of AI related policy (fig7).

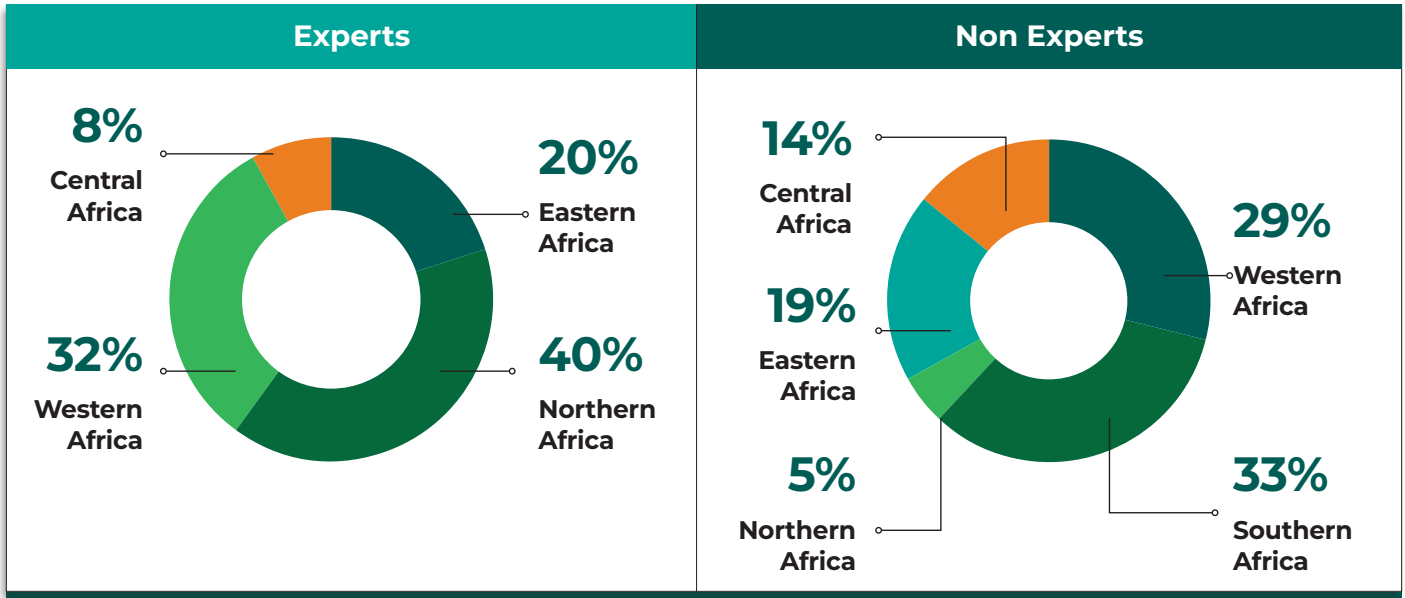


Fig 6a & 6b: Pies chart illustrating the policy awareness level across regions and expert (6a) and non-expert (6b) groups

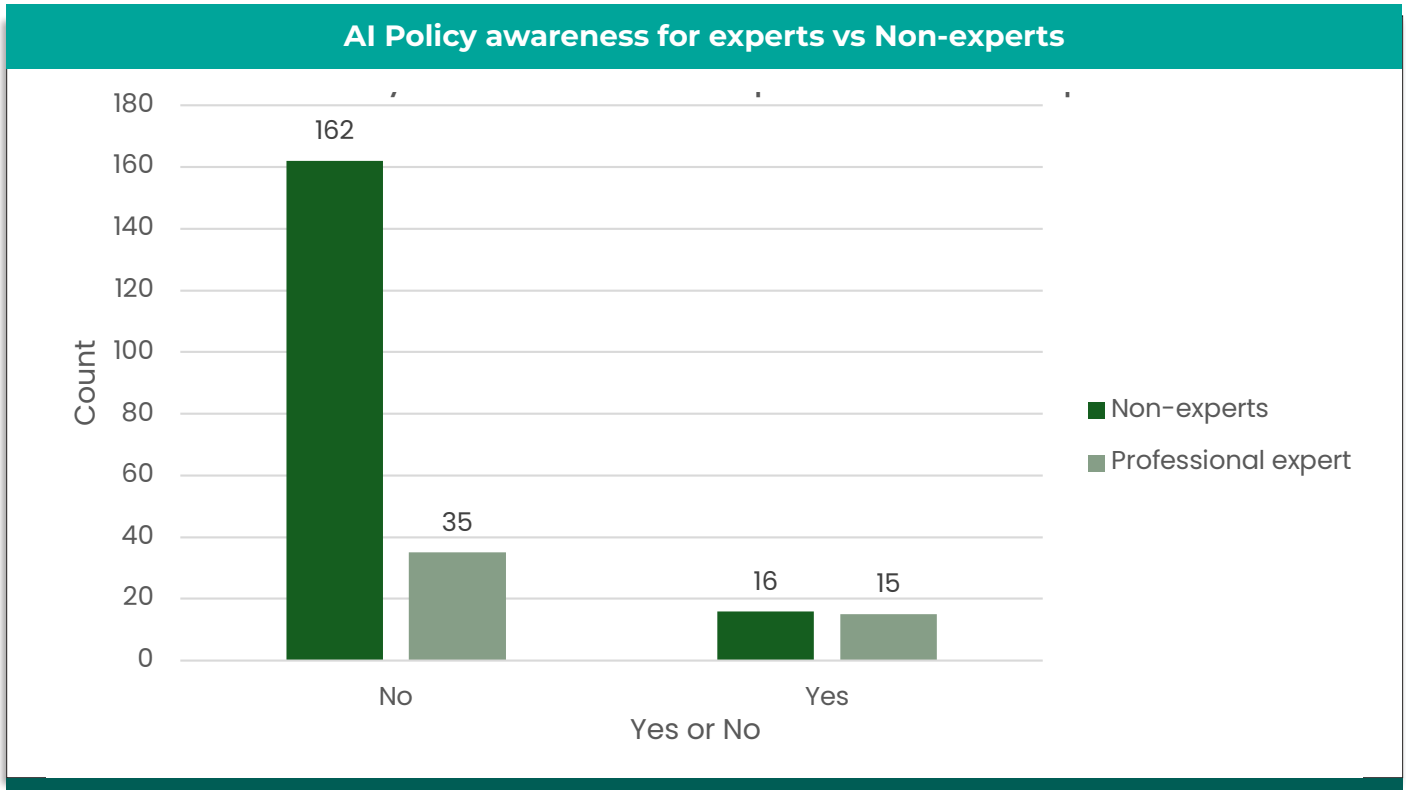


Figure 7 Shows the AI policy awareness across the experts and the non-experts.

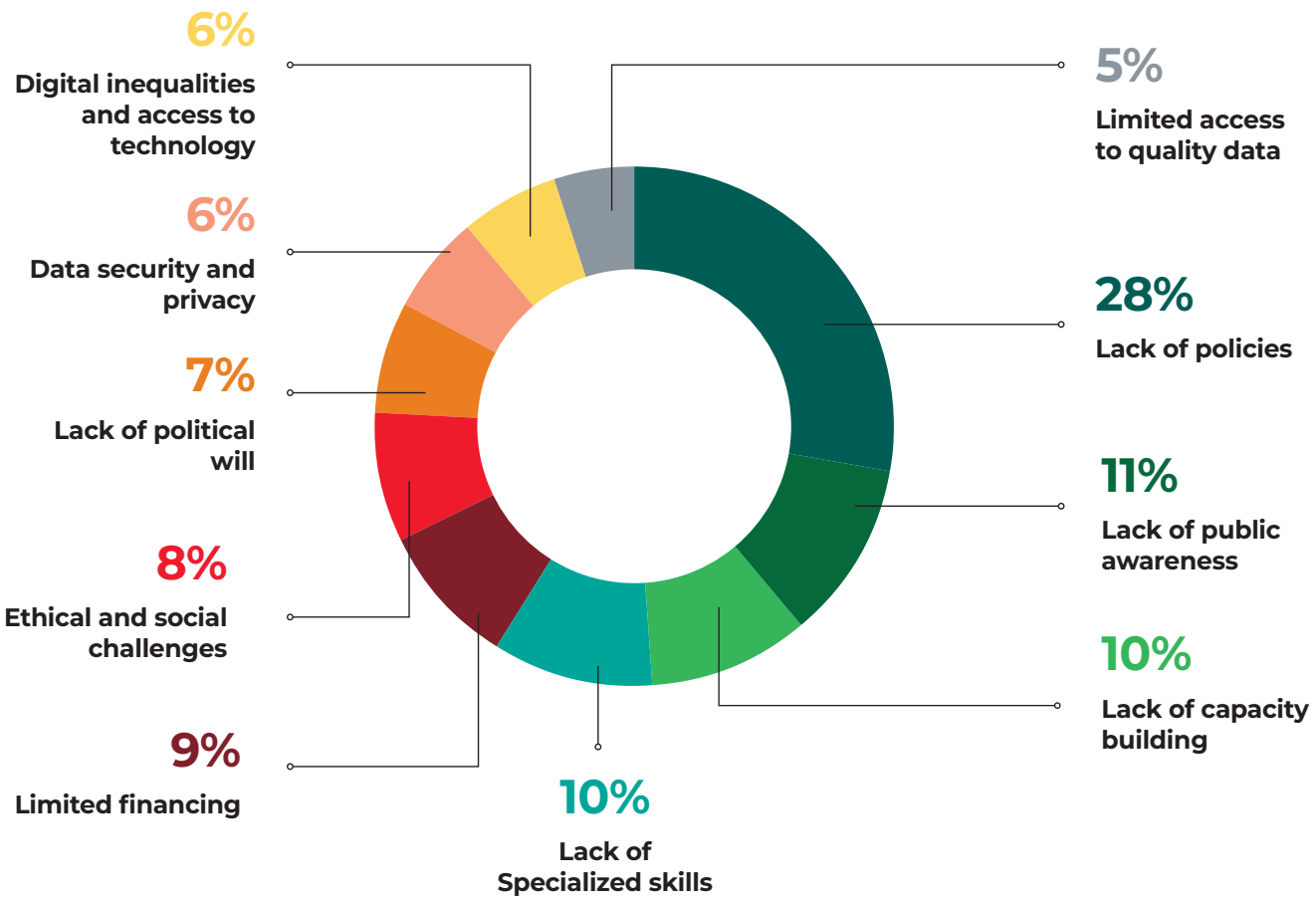
Analysing the challenges to governance of AI across Africa the experts and non-experts identified several potential points which can be broadly grouped into the following seven thematic areas (a) Policy and Governance (b) Awareness and Education (c) Funding and Resources (d) Ethical and Social Issues (e) Data and Technology (f) Community Engagement and (g) Collaboration and Innovation. Table 7 highlights summary of the challenges across the thematic area and possible impact and recommendations. In terms of recommendations these were further augmented from the process of hybrid regional convenings, key informant interviews and policy analysis (section below). Comparative analysis also showed that these recommendations are aligned to major AI policy frameworks in developmental globally including OECD principals, EU AI strategy and the AI for development framework. Importantly, the recommendations enhance these frameworks by providing further suggestions that are reflective of the African continent (highlighted) and its member states engaged in this process

Category	Challenge	Impact	Recommendation
Policy	Lack of policies, divided priorities, lack of political will	Weak governance, fragmented efforts	• Formulate and implement detailed AI policies ***That align with national and regional priorities***. • ***Need for sector-specific policies while recognizing the cross-cutting nature of AI e.g. health***. • ***Strengthen and update existing frameworks that affect AI R&D, implementation, etc., e.g., data sharing across borders***. • *Promote collaboration among African nations to share knowledge, experiences, and best practices.* • Establish task forces consisting of ***cross-sectorial stakeholders to shape policies.*** • Implement a framework for the periodic review and updating of AI policies to ensure that they remain relevant in the face of rapid technological advancements and emerging challenges. • ***Any AI policy in Africa must consider gender, the urban-rural divide and informal sector***.
Awareness	Lack of public awareness, capacity building, AI knowledge	Low adoption, mistrust	• Launch awareness campaigns in ***local languages***. • Develop and implement AI literacy programs targeting diverse segments of the population. ***Include integration into use cases e.g AI for business owners, AI for community health workers***. • ***Use of African art forms and local culture e, g spoken word, plays, and radio as platforms for awareness creation***. • Use of community leaders to disseminate information and raise awareness about AI. • ***Establish mechanisms for co-creating AI initiatives with community input*** • **Launch targeted awareness campaigns and training programmes to address disparities related to the urban-rural divide, gender inequalities, and the needs of the informal sector**.
Funding	Limited financing	Slow R&D, limited scalability	• Create pathways for Public-Private Partnerships, e.g., tax breaks, CSR, etc. • ***Allocate substantial national funding specifically for science, technology, and innovation initiatives to support AI research and development***. • ***Establish Regional AI Hubs linked with diaspora to leverage expertise and resources. While finding solutions to common African problems***. • ***Fund policy development and science diplomacy***. • Fund innovation sandboxes. • ***Establish equitable North-South partnerships***. • Cross-sectorial approach to leverage shared resources.
Ethical / Social	Ethical challenges, cultural beliefs	Resistance to AI	• Establish ethical guidelines. ***Define ethics within African philosophy and society***. • ***Conduct cultural sensitivity training***. • Involve ethicists in AI development. • ***Provide general ethics training for policymakers, AI developers etc***.
Data/Tech	Data security, digital inequalities, quality data	Data breaches, unequal access	• Provide subsidies or public programmes to make digital tools accessible to all segments of the population, reducing digital inequality. • Strengthen data sharing. • Enhance measures to protect data security. • Implement standardised data protocols to ensure consistency and reliability. • Promote data interoperability. • Support open data initiatives to promote transparency, innovation, and accessibility. • *Integrate local knowledge*. • ***Address Data bias and representation of African data***.
Community	Poor public engagement, safety concerns	Lack of local support, safety risks	• Foster community involvemen. • Address safety. • ***Create local advisory boards***. • ***Create communities of practices and platforms for engagement, information feedback etc.*** • ***Create space for dialogue using pre-existing spaces e.g. town halls, markets***.
Collaboration	Lack of collaboration, emerging AI	Duplication of efforts, slow progress	• Promote partnerships, support innovation. • Encourage cross-disciplinary collaboration. • Participate in global AI forums and networks. • ***Linkages with diaspora***.

Table 7: Summary of challenges to governance of AI across Africa and potential impact and recommendations

It is important to note that lack of polices and capacities were also cited as the most common area for gap in the implementation of AI (fig 8). This is of importance given that across sector and expertise level the most important areas for AI impact in Africa was identified as health (fig 9) which is an area with high-risk when it comes to AI and need for guardrails.

Figures 8 & 9 illustrate top regulatory challenges to AI implementation & thematic analysis of AI impact areas respectively



Thematic analysis of AI impact areas respectively

GENDER CONSIDERATIONS IN THE GOVERNANCE OF AI FOR HEALTH

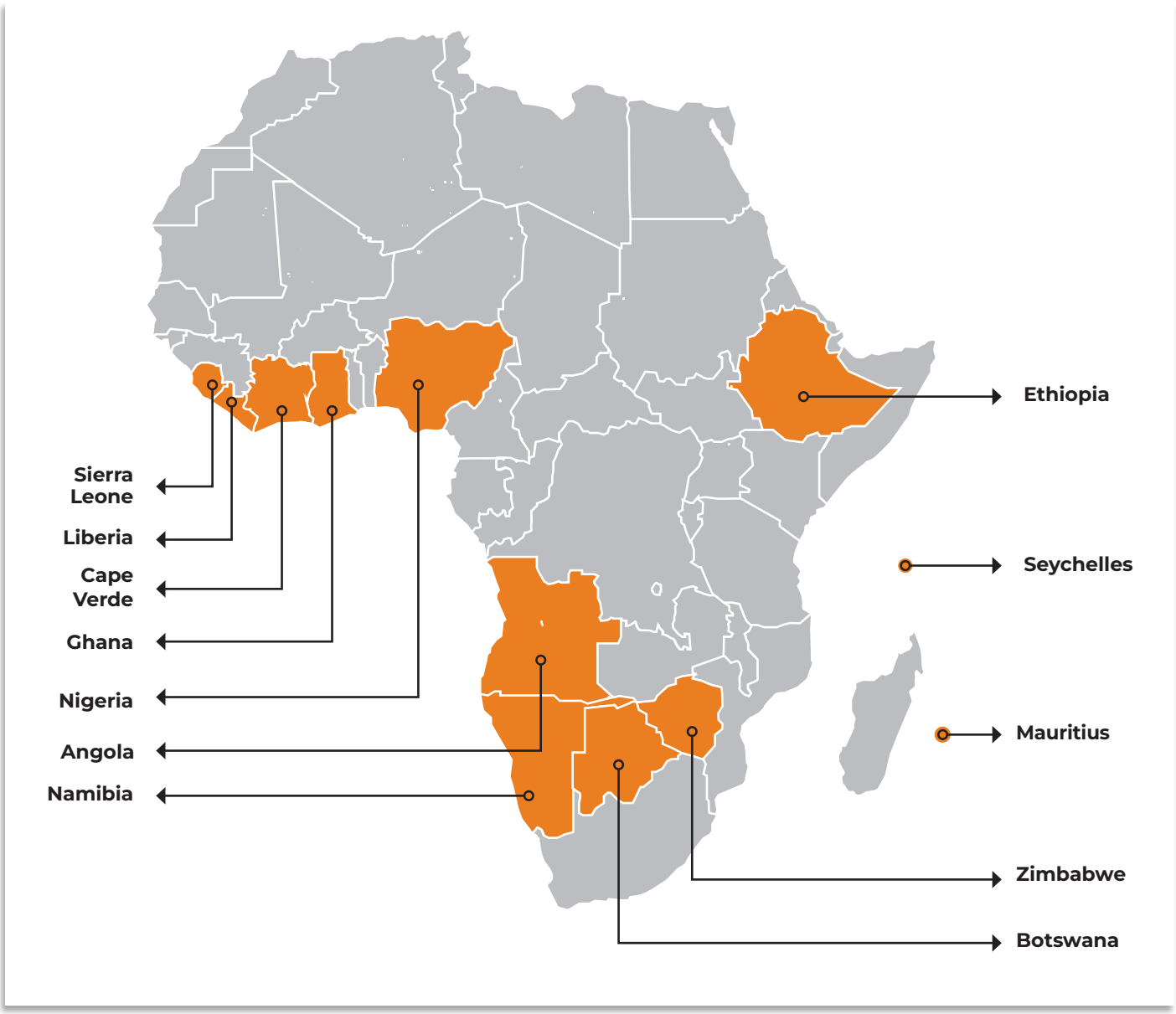
GENDER CONSIDERATIONS IN THE GOVERNANCE OF AI FOR HEALTH

Gender, defined as the socially constructed roles, behaviours, skills, and interests expected of men and women based on their biological sex, plays a crucial role in shaping societal norms and opportunities. These constructions often dictate the opportunities and limitations individuals face in various aspects of life. As such, gender inclusivity is essential to achieving the Sustainable Development Goals (SDGs) and fulfilling the aspirations of Agenda 2063 alongside the African Union's Digital Transformation Strategy for Africa 20/30. All these frameworks promote the use of STI not only addresses systemic inequalities but also ensures that women can fully contribute to and benefit from the digital and technological advancements driving Africa's future.

Woman-specific privacy issues include sexual and reproductive health, potential for the discrimination of women by or using AI, development of AI applications that focus on addressing women's health problems, and the involvement of women in the design and development of AI for health techniques as well as in the overall decision-making processes for AI. These issues are covered in international AI principles and guidelines such as the UNESCO Recommendation on Ethics of AI and the WHO Guidelines on Responsible AI. African countries are required to ensure that gender considerations are well integrated in national AI policies and regulations.

For this report a sub section of publicly available AI policy documents (policies, strategies, development, and regulatory frameworks) from African member states, were analysed to map the strengths, weaknesses, opportunities, and threats existing in the context of mainstreaming gender and youth empowerment (Fig 10, Annex 2). Countries included in nonspecific order are Sierra Leon, Namibia, Carbo Verde, Nigeria, Angola, Zimbabwe, Botswana, Liberia, Seychelles, Mauritius, Ethiopia and Ghana.

Figure10: Map highlighting the countries represented in the policy analysis for gender and youth mainstreaming.



The analysis illustrated that policy documents provide very limited references to gender, women, and youths, and when mentioned, these are usually mere statements of intent lacking detailed plans. Furthermore, most policy documents are housed within the line Ministries of ICT with no reference to the Ministries of Gender, Finance, or Education, indicating a lack of cross-sectoral integration. This is like our findings from regional convenings and the survey which showed that despite health being seen as the most impactful area for deployment of AI in Africa, AI policy documents are housed within ICT. Nonetheless, there has been considerable progress in promoting the uptake of STEM disciplines and coding skills among women and youths.

Additional findings (validated in the convenings and by the survey) point to a limited capacity for policy formulation, relying heavily on expertise from the global north and the absence of an evaluation framework and measurable indicators. These are risks in failing to contextualize the needs on the ground, measuring progress, and ensuring accountability in these initiatives.

Key Recommendations

1. **Development of Standardized Regional Policy Blueprints, Strategies, and AI Regulatory Frameworks:** Building the capacity of policymakers and experts to understand and address country-specific needs and landscape across Africa.

2. **Development of context-specific Gender Mainstreaming Instruments in AI and Data Science:** Clearly define measurable targets and identify specific groups of women, youth, and at-risk populations, their skills, sets, implementation matrix, and budgets for operationalisation.

3. **Multi-Stakeholder Consultation for Gender Policy Development:** -Collaboration among responsible ministries for Technology and Innovation, Gender, and Finance to co-develop, co-implement, and co-monitor gender policy, strategies, and instruments with multi-stakeholder engagement from the design stage onwards.

4. **Awareness Campaigns and Advertising Opportunities for Vulnerable Communities:** Most of these policies targeting women and youths are not popularized. Prioritising awareness campaigns and advertising opportunities to reach vulnerable communities in rural areas without well-established technology infrastructure.

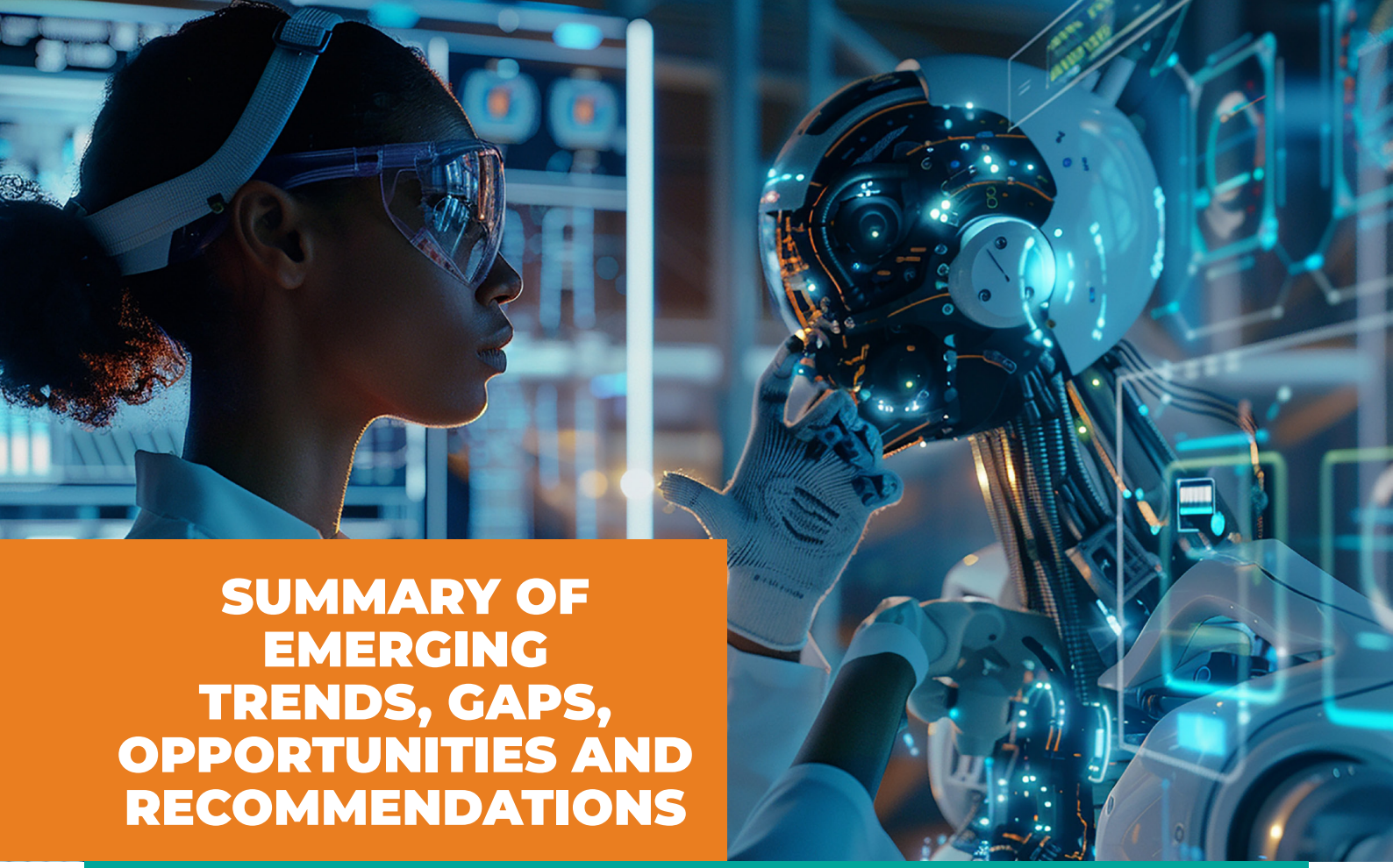
5. **Synchronisation of Global and Regional Policy Frameworks:** Adapting global policies to regional and national contexts and considering structural differences among countries to own the policy formulation process. To achieve this is a need to own the policy formulation process by financing it, providing the technical expertise across gender and age groups to influence the terms and references of these instruments

6. **Multilateral Science Policy & Practice Assessment:** Collaboration across and beyond Africa to promote science policy and practice assessment.

7. **Promotion of Inclusivity, Equity, and Bridging the Digital Divide:** Leveraging enhanced capacity to drive inclusivity and equity and connecting technology and innovation to address challenges across various socio-economic, environmental, and political contexts.

8. **Embedding a Culture of Learning and Sharing Best Practices:** Promoting a culture of learning and sharing best practices supported by sound governance through exchange programmes in Africa.

9. **Reinforcement of Science Diplomacy for Socio-Economic Development:** Positioning science diplomacy at the heart of Africa's socio-economic development and growth.



SUMMARY OF EMERGING TRENDS, GAPS, OPPORTUNITIES AND RECOMMENDATIONS

Eight groups of findings emerge from this study's review of reports, survey results, policy analysis, bibliometric analysis, regional convenings and interviews.

1 **There is a growing constituency of co-funding investing in responsible AI for development.** An increasing number of African countries, RECs, and the AU are recognising the critical importance of investing in responsible/ethical AI and data science. Examples include Mauritius, Nigeria, Malawi, Ethiopia Benin, Ghana, Rwanda, Senegal, and Tunisia, which have developed dedicated national AI programmes. In mid-2023, at least 39 Africa countries had AI R&D related projects focusing different areas such as health genomics and use of big data analysis in clinical trials.

Rwanda's Seed Investment Fund, which was established to foster an environment for co-investment between the government, angel investors and venture capital in AI startups. Nigeria has established the National Centre for AI and Robotics (NCAIR) under the National Information Technology Development Agency. Ethiopia has set up the Ethiopian Artificial Intelligence Institute, which has the mandate for the legislation and regulatory frameworks. Likewise, Malawi has established a Centre of Excellence for Artificial Intelligence at the Malawi University of Science and Technology (MUST). Egypt has initiatives such as the Egyptian AI Observatory and Tunisia has the Tunisian AI Academy.

2 **Demand for AI policy and regulatory capacities is high in Africa but requires gender and equity considerations.** Egypt, Mauritius and Rwanda have developed and adopted dedicated policies and/or strategies for AI. Egypt and Mauritius have national strategies with policy provisions, while Rwanda has a more explicit AI policy with an implementation plan being finalised. Egypt and Rwanda's policy frameworks only make passing reference to health. Only Mauritius has outlined specific health R&D and innovation priorities in its AI policy framework. Mauritius's National AI Strategy, adopted in 2018, puts emphasis on e-health, use of genomics to address various diseases and challenges of the aging population, and promote the development of personalised medicine and treatments of cancers. The Mauritius Artificial Intelligence Council (MAIC) was established to oversee the implementation of the strategy.

As much as these to some extent, are guided by or based on international guidelines or recommendations they have also been contextualised to the local context. Importantly, the process of development attempted engagement with varied stakeholders. Additionally, several other African countries are in the process of developing national AI polices e.g. Kenya, Nigeria.

Likewise, several other African countries have varying levels of strategy documents. Unfortunately, within the existing policy documents very limited references to gender, women, and youths. Despite this there has been considerable progress in promoting the uptake of STEM disciplines and coding skills among women and youths. Addressing GEDI in AI polices is a critical gap if not addressed will exacerbate gender inequity and not allow Africa to harness AI for its developmental goals if all genders and at-risk populations cannot fully contribute to and benefit from the digital and technological advancements driving Africa's future.

Demand for AI policy and regulatory capacities is high in Africa. According to a survey by UNESCO (2021)[58] at least 21 African countries have identified the need to build policy capabilities as a priority for effective, good application of AI. This sentiment was echoed in this study with an emphasizes by stakeholders on efforts being African lead anchored on trust and contextual understanding.

3 **Health has been identified as a priority area for AI yet no health specific AI governance frameworks.** This study has identified health as one of the priority sectors in which AI and data science are to be developed and deployed to address

specific national and global challenges. Within health; mental health, pandemics and one health where further identified as impost sub-topics. However, no health specific AI strategy or policy exists. In countries with AI polices and strategies the focus is more on healthcare applications and supporting AI startups. This is a critical gap given that its essential to include redlines for governance of AI in health since they promote responsible and ethical use of AI by balancing innovation with ethical, safety, and societal considerations.

Additionally, most of these AI polices and strategies are housed in line Ministries of ICT and the immediate risk of this is (a) challenges in understanding the nuanced requirements of healthcare systems, potentially affecting the design and implementation of AI solutions tailored to healthcare needs and (b) challenges with ensuring compliance with healthcare regulations, leading to potential legal and ethical concerns regarding patient safety and data protection.

4 **There are existing policy frameworks on which to build and/or consolidate governing of responsible AI and data science.** At least 35 African countries have national STI and ICT as well as health research and innovation policy frameworks that contain policies applicable to the development and deployment of AI and data science. Some STI policy frameworks (e.g., Namibia and South Africa) require governments to formulate regulatory regimes (policies, regulations and sometimes agencies) for responsible and ethical AI and to protect data in the era of data sharing, open science and open innovation. Kenya's country's Digital Master Plan (2022-2032) includes extensive references to AI. Furthermore, there are several regional strategies and frameworks that can be utilised for the development of AI policies. These include the African Union's Agenda 2063 and Digital Transformation Strategy, the Smart Africa Alliance, the African Data Protection and Privacy Framework, and UNECA's AI Ethics Guidelines. While AUDA-NEPAD is in the process of developing an AU-AI blueprint.

Additionally, The SFA Foundation survey and regional consultations found that 22 countries have regulatory frameworks for (personal) data protection. Moreover, regional data protection laws and frameworks are also present that can be leveraged, including the African Union Convention on Cybersecurity and Personal Data Protection, and the African Data Governance Initiative.

All these frameworks prioritise leveraging AI to drive sustainable development, digital transformation, and inclusive growth across the continent while promoting ethical AI practices and safeguarding individuals' privacy right. Furthermore, by focusing on these continental frameworks allows African Union Member states to develop comprehensive AI policies that address their unique socio-economic challenges and maximise the benefits of AI for their citizens. However, it is critical that these efforts integrate global health security considerations.

5 **There is a surge in African research on health AI and data science (big data) raising the need for equitable North-South R&D partnerships.** A preliminary bibliometric analysis shows that, though still a small portion of the global total, African (or Africa-based and/or -focused) international peer-reviewed journal articles on health AI and data science have increased considerably in the past decade or so, particularly in data science such as genomics and clinical trials research. However, like the survey findings illustrating that Western and Northern Africa have the highest level of self-identified experts, there is a gap in the R&D output from across the African regions. This gap calls for intra-African collaboration and equitable north-south partnerships. South Africa's balanced approach to single- and multiple-country publications can serve as a model for other African nations, as can the consortium model used for grant-making by the SFA Foundation. Importantly, in the African context were published literature is not equally represented there is need to provide funding for open access initiatives in Africa, particularly for researchers conducting research on AI in global health. As is the need for establishing geo-fenced African research & data repositories that can be hosted by institutions or organisations and can provide a centralised platform for researchers to share their research papers and data.

Additionally, there is an increasing number of health AI research and innovation networks and partnerships of various kinds emerging in Africa, such as the Artificial Intelligence for Development (AI4D) Africa-Canada Artificial Intelligence and Data Innovation Consortium However, these initiatives are not sharply focused on strengthening national policy and regulatory capacities.

6 **Generally, AI and data science R&D is moving faster than governance.** This raises issues including whether ethical, social and technical impacts are being considered in the AI R&D being conducted in Africa. There is concern that, because most of the health AI and data science R&D in Africa is funded by foreign companies and international organisations, it may not be aligned with national health priorities of African countries. Nonetheless, this trend can be leveraged to translate AI research findings into actionable policy recommendations

This involves close collaboration between researchers and policymakers, facilitated through initiatives like the SFA Foundation's SPEAR program. Also, this momentum can be accelerated by supporting and incentivizing research in AI in Africa.

7 **There is a growing number of local and international actors in AI and data science for global health in Africa** A mapping of actors in health AI and data science shows that there is an increasing number of small firms and start-ups in health AI in Africa, mostly concentrated in Kenya, South Africa, Nigeria, Ghana, Uganda and Senegal. Most of these are affiliated with big companies such as Microsoft and are mainly focused in the healthcare sector. Universities in Algeria, Egypt, South Africa, Uganda, Kenya and Mauritius are playing key roles in R&D focusing on AI applications in health genomics and clinical trials. This provides an opportunity for forming public-private-partnerships.

8 **Low trust and literacy in AI.** Our findings show that policy literacy levels are low. Most participants, including self-identified experts, have limited awareness and knowledge of external and international policy frameworks. This lack of trust and knowledge poses significant challenges to the adoption and regulation of AI in healthcare. This calls for raising public policy literacy through science-policy engagement and community-public engagement initiatives

Eke, et al (editors, 2023)[55], Owoyemi et al (2020)[56] and Gaffley et al (2022)[57] provide some indication of the effectiveness of different data protection policy frameworks, concluding however that most countries have weak enforcement mechanisms, low levels of public awareness of the regulations and limited judicial experience to deal with violations of data protection.

Policy Recommendations for AI for Health Governance in Africa

1. Focus on Health Governance

- **Integrate Global Health Security Considerations**: Ensure AI initiatives align with global health security measures to enhance resilience against pandemics and other health threats.
- **Leverage and Strengthen Existing Frameworks**: Strengthen Africa regional data sharing and collaboration frameworks e.g. ratification of the Malabo Convention.
- **Gender Considerations**: Incorporate gender-sensitive approaches in AI health governance to ensure inclusivity and equity.
- **Urban-Rural Considerations**: Governance frameworks must consider the urban-rural divide in Africa.
- **Adaptive Regulations**: Implement flexible regulatory approaches that can adapt to the fast-evolving nature of AI technologies and accommodate the unique characteristics of the informal sector while promoting innovation and formalisation e.g. temporary relaxations or modifications of existing regulations within the sandboxes.
- **Balance Innovation with Access:** Regulations must balance IP protection with the need for widespread access to AI technologies that can improve health outcomes.
- **Harnessing Endogenous Knowledge**: Integrate local and indigenous knowledge into AI health governance policies. Ensure that these perspectives are included in the development, implementation, and monitoring of AI health initiatives.

2. Address Trust Concerns

- **Raise Policy Literacy**: Raise public policy literacy through initiatives to educate both the public and policymakers about the benefits and applications of AI and data science in health governance.
- **Community Public Engagement and co-creation**: Promote engagement between science policymakers and the community to build trust and ensure public involvement in AI initiatives and policy development.
- **Leverage Social Sciences and Arts**: Engage through local languages and communication mediums e.g. plays, local language radio.
- **Dialogue and Impact Assessments**: Facilitate regular dialogue and conduct impact assessments to promote evidence-based governance approaches.
- **Cross Ministry Approach**: Collaboration among different line ministries e.g. ICT, health, finance, gender etc.
- **Cross-Learning Initiatives**: Support initiatives to promote cross-learning among African nations e.g. SPEAR programme at the SFA Foundation.

3. Innovative Funding For R&D and Governance

- **Centers of Excellence for AI Governance**: Establish dedicated centres and networks for AI in global health policy and connect them with AI R&D hubs
- **AI Funding Mechanisms**: Create innovative funding instruments to support AI research and development. Examples include:

A group photo of a section of participants at the Science Policy Engagement with Africa's Research SPEAR programme. Artificial Intelligence and Data Science Policy Convening held in Pretoria, South Africa from 28-29 June 2023. PHOTO | SFA Foundation PHOTO | SFA Foundation

Policy Recommendations for AI for Health Governance in Africa

» Social bonds can be used to raise funds for projects with clear social outcomes

» Equity instruments which can be pooled into an AI for Global Health R&D fund

» Blended finance public private partnerships

» Leverage financial instruments at the nexus of global health such for climate change

» African AI governance fund established by AU to support low-income countries in developing technical and policy capabilities for AI governance.

> **The pandemic has taught us the indispensable role of legislative agility and the need for a balanced and equitable partnership between science and politics to enhance future pandemic preparedness - a topic discussed at the timely policy round-table hosted by the SFA Foundation in Cairo.**
>
> Hon. Neveen El-Antouny

- **Leverage Innovation Hubs to Create Regulator Sandboxes:** Kenya, South Africa and Nigeria's ecosystem to be linked and supported in AI regulation to create regional regulator sandboxes.
- **Recognise and Integrate Informal Sector Contributions:** by providing market linkages, infrastructure support etc to encourage innovation that leverages local knowledge, practices, and networks.

4. Science Policy and Science Diplomacy

- **Strengthen Science Policy Capacity:** Fund science-policy engagement programmes to ensure that AI technologies for global health are developed and deployed in ways that maximise benefits while minimising risks, are contextualised to Africa priorities and context and to ensure that Africa is represented in the development of international standards and agreements on AI governance
- **Reinforce Science Diplomacy**: Enhance efforts to use science diplomacy for socio-economic development through AI. Ensure African representation in bilateral and multilateral agreements such as international data sharing agreements, IP, equitable access etc. Also to build cooperation around AI governance and R&D in global health.
- **Promote Open Access**: Advocate for open access to data repositories for AI research, following models that prioritise community over commercialisation, such as those in Latin America.
- **Science Envoys**: Appoint science envoys who can represent countries in international forums, advocate for global health priorities, and facilitate cross-border collaboration on AI initiatives.
- **Science-Policy Platforms**: Create platforms for AI researchers and practitioners to interact with policymakers and legislators. Platforms to also include local knowledge.

5. AI Policy Analysis and Evidence Gathering

- **Support Think Tanks**: Strengthen African think tanks in developing evidence-gathering and analysis programmes.
- **Inform Governments**: Ensure that national governments have access to accurate information about AI for health governance, utilising local languages and knowledge systems.
- **Evidenced Based Decision-making Training Workshops**: Provide training for policymakers, parliamentarians, and regulators on African data sets to enhance their ability to use evidenced based decision making.

Annex 1 Survey

A Survey of the Landscape of Artificial Intelligence and Data Science Policy for Health in Africa

Introduction

The Science For Africa Foundation (SFA Foundation) is a non-profit, public charity organisation that supports, strengthens and promotes science innovation in Africa. The goal of the SFA Foundation is to address the continent's most pressing developmental needs by generating scientific knowledge that solves problems and informs decision-making.

SFA Foundation is seeking to build an understanding of the gaps in national, regional and continental policies for the development, application and governance of Artificial intelligence (AI) and Data Science in global health across the continent. Emphasis is placed on but not limited to policies for data science and AI applications for Genomics, Epidemics and Pandemics, Clinical Trials, and Drug development. Understanding of the policy trends and gaps will inform stakeholders to influence policy, and strengthen the research and innovation landscape. The SFA Foundation will convene key stakeholders to dialogue and develop interventions to address policy gaps in AI and Data Science for global health in Africa.

You have been identified as a key stakeholder in AI and Data science. It is in this regard that we are requesting you to participate in the survey. Your responses will be kept confidential, and we assure you that your personal information will not be shared with any third party. The estimated time to complete this survey is no more than 10 minutes.

Your participation is greatly appreciated, and we thank you in advance for your valuable feedback.

If you have any questions regarding the survey, or how your responses will be stored or used, please contact Dr. Uzma Alam at u.alam@scienceforafrica.foundation

Click "Next" to navigate to the next page. You should be able to change your survey responses on any page by clicking the "Prev" button.

Once you complete the survey, click "Done" to ensure your responses are accessible.

Introduction

For the purpose of this survey we define the terms policies, Artificial Intelligence and Data science as follows:

- **Artificial intelligence:** Is the use of algorithms to make human-like predictions. Data science - Is the use of data for decision making.
- **Policy:** By policy we mean; policy readiness, policy pipelines which includes budget, best practices, strategy, policies, frameworks and regulations, policy recommendations etc.

Part 1

Basic information

* 1. Gender

- ☐ Male
- ☐ Female
- ☐ Prefer not to say
- ☐ Other (please specify)

2. What is the name of the organisation you work for? (Optional)

* 3. Which country/countries in Africa do you do most of your work in? You can name up to 5

* 4. Which category/classification below best describes you?

- ☐ Researcher
- ☐ Funder of science, technology and innovation
- ☐ Policymaker
- ☐ Civil society and advocacy
- ☐ Private sector
- ☐ Entrepreneurs and innovators
- ☐ Other (please specify)

Annex 1 Survey

A Survey of the Landscape of Artificial Intelligence and Data Science Policy for Health in Africa

* 5. What thematic area below best describes your work?

- ☐ Genomics / Genetics
- ☐ Clinical trials and diagnostics
- ☐ Drug design and development
- ☐ Epidemic / pandemics
- ☐ Socio-economic issues of AI and Data Science
- ☐ Innovation and entrepreneurship
- ☐ Policy research on AI and Data Science
- ☐ Policy development
- ☐ Policy oversight
- ☐ Policy advocacy
- ☐ Legal aspects of AI and Data Science Other (please specify)

Part 1

Questions on AI and Data Science

* 6. In relation to Artificial Intelligence and Data Science, would you describe yourself as :

- ☐ A professional expert
- ☐ A generally interested person Other (please specify)

* 7. In your area of practice, what are the most common top three uses in the application of Artificial Intelligence in Africa? (in order of importance)

Impact area 1

Impact area 2

Impact area 3

* 8. In the areas of practice mentioned above are you aware of any policies governing Artificial Intelligence in Africa (Y/N)

- ☐ Yes
- ☐ No

* 9. If yes, can you please provide the name and/or link

* 10. Are you aware of any of the benefits of the polices mentioned above? Please list them

Annex 1 Survey

A Survey of the Landscape of Artificial Intelligence and Data Science Policy for Health in Africa

* 11. In your understanding what are the gaps not covered by the policies?

* 12. In your area of practice, what are the most common top three uses in the application of Data science in Africa? (in order of importance)

Impact area 1

Impact area 2

Impact area 3

* 13. In the areas of practice mentioned above, are you aware of any policies governing Data science in Africa (Y/N)

- ☐ Yes
- ☐ No

* 14. If yes, can you please provide the name and/or link

* 15. Are you aware of any of the benefits of the polices mentioned above? please list them

* 16. In your understanding what are the gaps not covered by the policies?

* 17. In countries where implementation of AI and Data science policies is ongoing, in your opinion what are the emerging trends?

* 18. In your opinion, what are the main policy and regulatory challenges to the development and application of AI and Data Science in your country or African countries in general?

* 19. In your opinion what are the two top priority issues of concern for civil society that need critical attention in the development, design and application of AI in Africa?

Issue 1.....

Issue 2.....

* 20. Anything else you would like to share with us regarding AI and data science policy from an African perspective?

.....

21. Would you like to stay updated on the progress of the project? If Yes provide us with your email.....

Annex 2: List of countries, policy framework, evidence, & comments on gender mainstreaming policy gaps

Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Sierra Leon	National Cyber Security and Data Protection Strategy 2017 -2022(Draft)	The strategy emphasises the need to include cyber security and data protection fundamentals in the curriculum. Everyone studying computer science, technology, or digital skills will learn the fundamentals of cyber security and will be able to bring those skills into the workforce. As part of these efforts, the country will address the gender imbalance in cyber-focused professions and reach people from more diverse backgrounds, to make sure they are drawing from the widest available talent pool. We will work closely with the Devolved Administrations to encourage a consistent approach across the SL. These initiatives include the mainstreaming of women in these studies.	0.04% coverage 8 references.	There is very limited focus on women and almost no existence of information about youths and those living with disabilities.
Namibia	Task Force on the Fourth: Industrial Revolution "4IR as an Enabler of Green and Inclusive Industrialisation" Final Report August 2022.	The report details that the 4IR could not only potentially deepen the digital divide at the global scale, and in Namibia between regions, but also increase existing gender inequalities and racial bias, as well as deepen job insecurity and income and wealth disparities.	0.01% coverage and references 7 references picked.	Very limited gender consideration but the report refers to addressing gender inequalities, racial biases as well as income and wealth disparities.
Namibia	Task Force on the Fourth: Industrial Revolution "4IR as an Enabler of Green and Inclusive Industrialisation" Final Report August 2022.	A SWOT analysis was compiled from secondary data sources and stakeholder engagements. The global ranking profile of Namibia also informs the SWOT analysis. Gender equality rating is good.	0.01% coverage and references 7 references picked.	One of the notable progresses was that the report speaks to a good rating of Gender equality.
Namibia	Task Force on the Fourth: Industrial Revolution "4IR as an Enabler of Green and Inclusive Industrialisation" Final Report August 2022.	Network Readiness Index top-ranked and bottom-ranked indicators of Namibia2. Gender inequality....11 strongest The digital divide particularly affects women – only 24% of women are using the Internet versus 35% of men 29. Digital access in remote and poorer areas, as well as by informal enterprises, is also a challenge.	0.01% coverage and references 7 references picked.	Of particular reference were statistics showing women's limited access to the internet and digital technologies.
Namibia	Task Force on the Fourth: Industrial Revolution "4IR as an Enabler of Green and Inclusive Industrialisation" Final Report August 2022.	Namibia is particularly vulnerable to the effects of climate change, which have been especially visible in the form of droughts in recent years.	0.01% coverage and references 7 references picked.	
Africa report	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	The 32 Member States who responded to the survey have underlined the importance of UNESCO's work concerning AI in the field science of education, sciences, cultural communication, and information. It is also relevant to note that many Member States have identified gender equality and related biases, discrimination, and divides in the development and use of AI as a priority theme. The gender issue in particular has previously been put into a global spotlight through the 2019 publication of UNESCO's pioneering report "I'd blush, if I could (AI Needs Assessment Survey Preface).	0.19% Coverage, 89 Reference picked.	The report points out that most African member states are aware of the gender disparities that exist in their respective countries. The is a general agreement that the emergence of AI could exacerbate the existing inequalities hence the need for policy.

Annex 2: List of countries, policy framework, evidence, & comments on gender mainstreaming policy gaps

Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Even as 22 countries have reported having legal frameworks concerning personal data protection, it may be noted that these legal provisions may need to be updated to the new uses and applications of data engendered by AI to offset biases and discriminations, including on the basis of race and gender, or loss of personal privacy through predictive analysis among others (AI Legal and Regulatory Framework).	0.19% Coverage, 89 Reference picked.	Formulation of personal data protection policies to enhance personal privacy, reduce discrimination.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	The majority of the responding countries have identified addressing gender-related bias and discrimination in the development and use of AI as a priority (AI priorities for countries in Africa).	0.19% Coverage, 89 Reference picked	Majority of the countries have reported prioritising addressing gender-related bias and discrimination in the development and use of AI.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Member States have requested UNESCO's support for standard setting, policy advise, capacity building, network development and for addressing gender equality related concerns in the development and use of AI (AI Support Requested from UNESCO by Countries).	0.19% Coverage, 89 Reference picked.	
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	This report aims to bridge the information gap concerning the strategic priorities, policy measures, developmental challenges, human and institutional capacity needs, legal frameworks concerning AI in African countries and to highlight questions related to gender equality in the development and use of AI.	0.19% Coverage, 89 Reference picked.	The report intended to bridge the information gap concerning strategic partners, policy measures related to gender equality across the African continent.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Develop policy guidelines to address gender bias and discrimination in AI algorithms in cooperation with governments, the private sector, academia and civil society (Recommendations for policy initiatives for AI governance to intergovernmental organisations, development organisations and UNESCO Member States).	0.19% Coverage, 89 Reference picked.	The report envisages the development of policy guidelines by African member states.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Ex ante level: Ensure there is no discrimination in the selection of datasets and programmers' design choices and make explicit the values informing these choices, including related to implicit and explicit gender biases (Recommendations for legal and regulatory frameworks for AI governance to intergovernmental organisations, development organisations and UNESCO Member States).	0.19% Coverage, 89 Reference picked	

Annex 2: List of countries, policy framework, evidence, & comments on gender mainstreaming policy gaps

Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Integrate programmes for sensitisation around AI and its human rights and legal implications as part of ongoing trainings for government decision makers. Information on the risks of potential propagation of gender biases through AI systems, and how to avoid such propagation, should be part of the training modules. Develop and launch training modules for judicial actors to address legal implications of AI and the use of AI in judicial systems and for law enforcement, in ways that respect the fundamental rights to freedom of expression, access to information, privacy, and non-discrimination. As part of these training modules raise awareness about gender biases and stereotypes that risk being embedded and propagated through the use of AI systems Develop policy guidelines to address gender bias and other forms of implicit and explicit discrimination in AI algorithms in cooperation with governments, private sector, academia and the civil society (Recommendations for building capacities to address legal implications of AI and uphold fundamental human rights to intergovernmental organisations, development organisations and UNESCO Member States)	0.19% Coverage, 89 Reference picked.	
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Train journalists on uncovering and reporting on explicit or implicit gender biases that can be embedded and propagated through the use of AI systems. Train journalists to report accurately on issues related to AI and its social impacts, including science gender equality and other structural power issues, as well as to understand the opportunities and challenges of integrating AI tools in the production of news content (Raising public awareness and understanding of AI).	0.19% Coverage, 89 Reference picked.	The need to train investigative journalists to unpack the implicit gender biases through AI and also to raise public awareness.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Ensure equal participation of men and women in the development of standard data science for products and services through multi-stakeholder processes and ensure that the standardata science developed have measures against potential gender biases and stereotypes that can be embedded and propagated through AI products and services (Recommendations for strengthening capacities for the development of standardata science for AI products and services).	0.19% Coverage, 89 Reference picked	Strengthen equal participation of women and men to deal with potential gender biases and stereotypes likely to be induced by AI and other digital technologies.

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Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Facilitate knowledge exchange on ethical dimensions of digital technologies among policymakers, including on the gender digital divide in terms of participation of women in STEM field data science and the gender biases and stereotypes that can be propagated through the use of AI systems if not designed in an ethical manner (Recommendations for strengthening capacities to address the ethical challenges of AI).	0.19% Coverage, 89 Reference picked.	The report also speaks to the ethical dimensions of digital technologies among policy makers including along gender lines, especially with regard to STEM field participation by women. Ethics regulation and compliance will need to be reconsidered and find ways of enhancing compliance without posing harm and injustice to participants.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Addressing the gender biases in the development and use of AI systems (AI Priorities For Countries in Africa).		
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Gasp in women from the Global South (and in humanitarian contexts) setting global technology norms and enjoying technology benefits. Positive and negative impacts on women and gender equality. Persistent: challenges in social norms and violence against women (capacity gaps for AI education, research, training and data).	0.19% Coverage, 89 Reference picked.	
	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Ensure equal participation of men and women in the development and use of educational content and facilitate the participation of girls and women in AI education and training programmes to bridge the gender divide in terms of participation of women in AI development and use. At the same time ensure that the educational content is at minimum gender-sensitive, and does not propagate or perpetuate gender stereotypes, for example by highlighting examples that undermine or discourage participation of women in STEM fieldata science (Recommendations concerning AI educational resources to intergovernmental organisations, development organisations and UNESCO Member).	0.19% Coverage, 89 Reference picked.	The report pointed to the need for equal participation and training of women and girls in educational programmes especially in the STEM field data science.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Closing the gender divides in digital skills is the subject of UNESCO publication "I'd blush if I could: closing gender divides in digital skills through education" that provides further recommendations on how to facilitate the participation of women in STEM field data science and also to address gender biases in AI systems (EQUALS - UNESCO 2019) (Recommendations concerning Research capacities for AI).	0.19% Coverage, 89 Reference picked	
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Data plays an important role in development and training of AI algorithms; on the other hand, the misuse of the same data can also create concerns about individual privacy, autonomy, bias, and discrimination against certain groups, including on the basis of gender (Leveraging Digital Cooperation is Essential for AI Governance).	0.19% Coverage, 89 Reference picked	Technical training in coding and development of AI algorithms and machine learning.

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Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Gender equality within AI systems, in the form of embedded biases and discrimination, and how to enhance gender equality through the use of AI, is another common area of concern expressed by a majority of the countries (AI Priority areas for African Countries).	0.19% Coverage, 89 Reference picked.	
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	This could notably include the use of AI to enhance gender-disaggregated data (Recommendations for intergovernmental organisations, development organisations and Member States to address the implications of AI in the priority areas).	0.19% Coverage, 89 Reference picked.	Develop policy guidelines to address issues related to gender equality and AI, including bias and discrimination in AI algorithms, in cooperation with governments, the private sector, academia, and civil society. Regional intergovernmental organisations, member states, development organisations, and civic society to collectively organize and manage the AI implementation and policy.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Support training for the development and implementation of AI technical standard data science for the development of products and services using AI in a manner that respects human rights and promotes gender equality (Capacities to Develop Standard data science for AI Products and Services).	0.19% Coverage, 89 Reference picked.	There is an element of valuing respect for human rights and eventually promoting gender equality.
Africa	Artificial Intelligence Needs Assessment Survey in Africa: United Nations (2021)	Encourage the creation of public repositories of computer codes, text and speech taxonomies that are at minimum gender-sensitive (Recommendations for intergovernmental organisations, development organisations, and Member States to address the implications of AI in the priority areas: Data and AI Development).		
Carbo Verde		Cabo Verde has launched its Digital Strategy, focusing on establishing itself as a regional hub for connectivity, capacity building, and service provision. Under the strategy, Broadband connectivity would be strengthened with new fiber optic cables connecting Cabo Verde to other regions and through the establishment of data centers. Knowledge and skills to develop and use ICTs would be enhanced through a train the-trainer approach as well as training for government leaders, civil servants, women entrepreneurs, and youth (Cabo Verde's strategy to become a regional hub in digital connectivity, capacity and services).		The digital strategy for Cabo Verde is not explicitly clear with science to gender, women, girls and youths mainstreaming int the 4IR era.
Sub-Saharan Region of Africa	POLICY BRIEF Foresight in Science, Technology and Innovation in Sub-Saharan Africa (February 2022)		There was no Coverage or Reference found (Gender, Women and Youth).	No information relating to gender, women and girls was retrieved from the document.

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Nigeria **National Blockchain for Nigeria (May 2023)**	Nigeria ICT Innovation and Entrepreneurship Vision (NIIEV)	It became apparent that there needs to be specific policies and incentives for the different sectors of the ecosystem to encourage entrepreneurship, increase access to digital infrastructure, increase research and development, bridge the digital gender divide, and increase affordable internet access for all and soon. Bridge the digital gender divide by creating initiatives and incentives to encourage women entrepreneurs and innovation.	0.02% coverage (8 references picked).	Minimal gender mainstreaming initiatives reported
		There was no Coverage or Reference found (Gender/Women and Youth).		
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	In Angola, around 89.5 percent of entrepreneurs started a business to earn a living because jobs were scarce, and over 76 percent of these were in consumer services and over 51 percent, were women (Bosma et al., 2021).	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	More women (51%) ventured into entrepreneurship signifying women empowerment.
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	The increase in supply was reflected in an increase in the student population, from 7,845 in 1999 to 308,309 in 2019, and the annual increase in the number of graduates, which was 21,310 in 2018, of which 9,711 were in public higher education and 11,599, private higher education (Ministry of Higher Education, Science, Technology and Innovation, 2018; Ministry of Higher Education, Science, Technology and Innovation, 2020). The number of graduates is evenly distributed by gender, namely, 10,629 men and 10,681 women.	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	In public universities, there are more men graduates (5,511) than women (4,200) and in private universities, there are more women graduates (6,481) than men (5,118).
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	The Programme for the Development of Science and Technology is financing research projects and postgraduate scholarships and carrying out activities to promote and strengthen the participation of women in science and technology. (The Government efforts to increase the scientific capacity of the national innovation system).	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	With regard to field data science, natural sciences and agriculture and veterinary sciences account for 57.2 per cent of the total and with regard to gender, women make up less than 30 per cent of the total.	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	

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Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	Current national STI policy efforts date to 2011, with the issuance of the national STI strategy 2011–2016, the national STI policy and the coordinating mechanism of the national system of STI (Government of Angola, 2021). The main activities include constructing a science and technology park; funding scholarships and research projects; involving women in STI; developing STI competencies in secondary schools; and providing support related to intellectual property. In Angola 250 secondary scholarships for girls (Gender disparity studies) were offered & started after 2018.	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	A change that could initiate a paradigm shift began in 2018–2019, when the budget increased from 0.3 to 1.5 per cent, although it remained below the value in 2009. This is in line with efforts made since 2017–2018 to diversify the economy. The aims of the increased public investment in the agricultural sector and recognise and valorise family farming, with an emphasis on the position of rural women, enhancing support to the rural population and empowering young people, thereby reducing unemployment and, consequently, the exodus to urban centres, and strengthening social networks and family bonds.	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	The digital transformation in economies in Africa has the potential to create jobs in the formal sector, encourage youth entrepreneurship, facilitate the participation of women in the labour force and increase farmer productivity (Calderon et al., 2019).	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	Among the medium-term to long-term challenges, Angola aims to accelerate economic diversification, reduce structural vulnerability, improve the quality of education and professional skills among youth and sustain technology transfer to promote more sustainable and resilient development. (Action in Angola towards data science achieving the Sustainable Development Goals based on the National Development Plan 2018–2022).	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	
Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	Goal 5, gender equality. (Angola: Sustainable Development Goals index).	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	

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Angola	Angola Science, Technology & Innovation Policy Review (UNDP, 2022)	Successful entrepreneurships arose not so much among youth in search of employment but as a result of mature, qualified and experienced individuals starting a business after having worked for someone else (Embassy of the United States, Angola, et al., 2019). (results from public and private entrepreneurship initiatives).	Coverage 0.01% (8 references)/ 0.02% (23 References) (Gender or Women and Youth).	
South Africa	No. 4 of 2013: Protection of Personal Information Act, 2013. Government Gazette,	Personal information' means information relating to an identifiable natural person, including, but not limited to— (a) information relating to the race, gender, sex, pregnancy, marital status, national, ethnic or social origin, colour, sexual orientation, age, physical or mental health, well-being, disability, religion, conscience, belief, culture, language and birth of the person.	3 references, coverage was 0.01% (Gender or Women and Youth).	No provisions were made to speak to gender in the Act.
Botswana	Botswana Institute for Technology Research and Innovation Intellectual Property Policy (2018)	No information on women and gender and other diverse groups such as the disabled.	No Reference or Coverage found on (Gender/ Women and Youth).	No information related to gender mainstreaming.
Zimbabwe	Zimbabwe National Policy for ICT 2016	The interests of men and women, youths, children, disabled people, the elderly, Orphans and Vulnerable Children (OVC) feature in all the sectors of the economy and the social and political life of the nation. Gender mainstreaming is a strategy to ensure that concerns and experiences of both men and women are integrated into the design and implementation of ICT programmes so that all benefit equally. Youths and children constitute a high proportion of ICT users and opportunities should be created to ensure their full participation. Studies indicate that the elderly respond slowly to change and shun the use of new technologies. ICTs should be developed in such a way as to accommodate this demography with emphasis on accessibility.	14 references, 0.04% coverage (women or gender and youths).	Gender mainstreaming is superficially mentioned.
		Bridge the digital divide in relation to men and women, the youths, elderly, disabled people and OVC by promoting sector specific policies that promote the effective use of ICTs. (18.1 Policy Statements: Develop ICT Policy to Cater for Marginalised People).		
		The policy examines issues relating to capacity building and content development, research and development, gender and other marginalised groups. (Key implementation programmes on specific projects, which are critical in achieving the desired results)		

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Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Zimbabwe		Promote, support and enhance the development and use of ICTs and ensure equitable access to attendant benefits across gender, youths, children, people living with disabilities and the elderly. (6.6 Innovation and Partnership – Lead, improve and adapt to the changing telecommunications/ICT environment).		
		This policy recognises that ICTs contribute significantly to the reduction of social, political and economic inequalities, increase national productivity, and enhance wealth creation and entrepreneurship and increase efficiency in public administration. ICTs also strengthen democratic values and promote gender equality and the interest of marginalised groups. (26 Conclusion: Zimbabwe National Policy for ICT 2016).		
Zimbabwe	Second Science, Technology and Innovation Policy of Zimbabwe March 2012	Practical experiments should exploit the background experiences of students and encourage interest across gender. (1. STRENGTHENING CAPACITY DEVELOPMENT IN STI: EDUCATION, the goals to complement efforts of the education sector ministries).	1 Reference, 0.01% Coverage (Gender or Women and Youths).	The policy speaks about the strengthening of capacity to educate women in Science Technology and innovation.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Use ICT to drive inclusion of women, marginalised and indigenous groups (The key objectives of the policy).	Coverage 0.14%, References 90.	The Liberian ICT Policy (2019-2024) was crafted with the objective of driving the inclusion of women and other marginalised groups of people such as the disabled.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Mainstreaming Gender and Women in ICT; 8. Access and Use for Mainstreaming ICT for Youth; (1.1 Thematic Policy Focus Areas).	Coverage 0.14%, References 90.	Of particular interest in this particular policy was the focus not only on women but also on youths.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	To ensure that this policy is successful, it has been aligned with the Government's existing development agenda – the Pro-Poor Agenda for Prosperity and Development (PAPD). More specifically, it seeks to support the key pillars of the country's long-term vision for socio-economic development "Liberia Rising 2030", including economic transformation, human development, governance, and cross-cutting issues (e.g., gender equality and persons with disabilities). (1.3 Alignment of ICT Policy and Liberia's Socio-Economic Development Agenda).	Coverage 0.14%, References 90.	The ICT policy also provided the space for inclusion for people living with disabilities. These are included also in the human development agenda, good governance and economic transformation.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Gender inequalities in ICT access can be a key barrier, as shown in a 2015 study by the Web Foundation's Women's Rights Online initiative which found that poor urban women in the developing world are nearly 50% less likely to access the internet than men. (1.4 Global, Regional, National Trendata science and Commitments).	Coverage 0.14%, References 90.	The policy acknowledges the limitations that gender inequalities pose to socio-economic development. This policy also simultaneously guides the regulation and use of artificial intelligence hence it is important to consider in all sectors of the economy including health.

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Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Gender and Women and ICT; Baseline research on national access and use of ICT including among women, girls, and other marginalised groups. National plan to improve gender equity in access and use (2.3 Summary of Targets and measurable targets).	Coverage 0.14%, References 90.	The Liberian government has shown the willingness to improve gender equity in access and use of ICTs by investing in research through baseline studies to benchmark the mainstreaming of women, girls and other marginalised groups within the policy framework.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	To drive inclusive development of women, marginalised and indigenous groups (4.1 Broad Policy Objectives).	Coverage 0.14%, References 90.	The policy was crafted to drive inclusive development of women and marginalised groups such as the disabled, youths and the old
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Facilitating the increased role and participation of women, youth and persons with disabilities in ICT; (4.2 Policy Key Action Areas).	Coverage 0.14%, References 90.	The policy provided for inclusivity of women and other diverse groups.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Establish a national cybersecurity advisory committee made up of a cross section of stakeholders including private sector, women and youth. (5.5.1 Policy Objectives).	Coverage 0.14%, References 90.	The youth are critical catalysts in Liberia's socio - economic development plans and are acknowledged as an ICT-oriented generation. For Liberia to harness the huge potential that ICT offers, it is important to leverage ICT for positive youth orientation and development, as well as to ensure that the youth use ICT responsibly and productively. According to population statistics9, 44.3% of Liberia's populations fall under the 15 years group, making it necessary to ensure a strong ICT foundation critical to National development. (5.8 Mainstreaming ICT Youth).
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Encourage the development and implementation of the government's cyber-security objectives in partnership with private sector and civil society and youth organisations wherever possible; Establish a cyber-security advisory council drawing on experts within government, the private sector, academia, judiciary, security services, youth organisations and civil society to best advise the government on the implementation of these policy objectives while also raising awareness within government of the latest cyber-security concerns and issues; Ensure government and private sector abide by these cyber-security policy objectives in order not to undermine the fundamental human rights of any citizen, particularly those most likely to be subject to online abuse and harassment such as women and girls (5.5.2 Policy Strategies Summary).	Coverage 0.14%, References 90.	The policy also refers to the empowerment of youths within the ICT sector. It also emphasises on convening various stakeholders that key in policy formulation and policy implementation, among them civil society groups, private sector, and youth organisations so as to protect fundamental human rights as a result of online harassment and abuse.

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Country	Policy/Strategy/ Development Plan	Themes emerging (gender & diversity related)	Evidence	Comments
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	Secure Affordable and Universal Access to both voice and broadband services for all citizens, with special attention to vulnerable and disadvantaged populations such as women, rural dwellers, those with disabilities and the poor. In order to increase the level of access to ICT, the Government will provide the enabling environment for private sector entities to play a complementary role towardata science achieving universal access targets, including specific targets to close the rural-urban and gender digital divides. (5.6. Universal Access and Service, Policy Objectives).	Coverage 0.14%, References 90.	The policy made commitment to provide universal and affordable voice and broad band services for all citizens with special attention to women, rural dwellers.
Liberia	Liberia Information and Communications Technology (ICT) Policy (2019-2024)	The policy objectives are to: 1. Ensure that all analysis conducted for the purposes of developing ICT policies and plans integrate gender and gender considerations, from network deployment analysis to universal access strategies and priorities. 2. Endeavour to improve the availability of gender disaggregated data on access and use of ICT. 3. Involve gender advocates and experts in the policy and planning process from the start to ensure women-centric policy development. 4. Establish time-bound targets to achieve gender equality in access across all areas of policies and plans, from skills building to adoption and use. 5. Consider allocating a percentage of the resources available to support women-centered activities, including resources to promote and support women ICT entrepreneurs, digital literacy training for women and girls, and targeted public access and other projects to support access and use for women and girls. 6. Ensure that all skill building and training programmes are developed considering women and girls across all educational levels. These programmes should consider what themes would be most relevant to participants; offer training opportunities for all levels, from basic skills to more advanced coding and design; consider the location of programmes and the gender of trainers. 7. Establish quotas to ensure the equal participation of women and other disadvantaged groups in all programmes supported by national policies and plans, especially rural and poor populations (5.7 Mainstreaming Gender and Women in ICT).	Coverage 0.14%, References 90.	The objectives of the Liberian ICT policy were very explicit about gender mainstreaming and the modalities of implementation were spelt out. These include the allocation of resources, skills building programmes, experts for women-centric policy formulation, improving availability of gender disaggregated data and establishment of quotas to ensure women participation in policy, programmes entrepreneurship.

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		Women are 50% less likely to be online than men, and this gender digital divide looks to be getting worse with time. The effects extend beyond access (the cost to connect to the Internet, and to afford the devices) to other barriers to women's access and use of the web which include lack of digital literacy as well as norms and attitudes presenting cultural barriers to the uptake of Internet by women and girls in communities. This divide is impacting how women use and appropriate digital technologies. One ten-country survey found that women are 30-50% less likely than men to speak out online, or to use the web to access information related to their rights. Women are also 25% less likely to use the Internet for job seeking than men. (5.7 Mainstreaming Gender and Women in ICT).	Coverage 0.14%, References 90.	The policy is also broad enough to include digital literacy, norms values and attitudes as well as cultural barriers that do affect uptake of internet by women and girls in communities.
		Gender-responsive ICT policies are a strategic opportunity to curb and close the digital gender divides. These are policies designed with the specific challenges women faced in mind, and that commitment to setting clear, time bound targets on connecting women, budgetary allocation to support the implementation of the set targets, as well as research that is disaggregated by gender. If Liberia is to achieve universal access for all its citizens, then it is imperative that existing gender gap in access and use of ICT are progressively minimised. (5.7 Mainstreaming Gender and Women in ICT).		
		Conduct a gender gap audit to offer a preliminary baseline assessment of the state of access and use of the internet by women and girls in Liberia. Invest in household survey research that will help inform how Liberian citizens access and use the internet. This research should be designed to have gender-disaggregated data that assists with analysing how access and the use of the Internet varies by gender, income level, education level, age and other identified demographic factors. (Summary of Strategies).	Coverage 0.14%, References 90.	
		The Government will: 1. Promote the use of ICT, in partnership with Youth-focused bodies particularly Ministry of Youth and Sports (MoYS) and relevant MDAs to deliver information and content that emphasize citizen agency and socio-economic development. 2. Support the delivery of programmes designed to ensure that the youth focus on productive application of ICT. 3. Promote incentive and support schemes targeted at youth entrepreneurship initiatives in ICT. 4. Ensure the online safety mechanisms are in place to support youth use of technology; and increase awareness among youth about cyber-security issues. (5.8.1 Policy Objectives).	Coverage 0.14%, References 90.	

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		The government will give special attention to providing new learning and ICT access opportunities for women and youth, the disabled and disadvantaged, particularly disenfranchised and illiterate people, in order to address social inequities. (Human resource development, Policy Objectives).		
		The Government will support the creation of the necessary capacity by creating opportunities and providing assistance for the disadvantaged, people with special needs, women and the youth to acquire IT skills. Engaging of women, youth and children, communities in underserved areas, and other disadvantaged groups, including people with disabilities, through e-inclusion and e-accessibility activities and programmes. (Summary of Strategies, Human development).		
		During the drafting phase of the ICT policy, a number of consultations were undertaken with various ministries from Commerce, Health, Education, Public Works, Finance Development and Planning, Internal Affairs, Gender. These consultations revealed various levels of ICT development either in regulation or policy at different stages within ministries and agencies that need to be harmonised under one policy (Document Conclusion).		In Liberia, consultations were done across different ministries including Gender and Finance during the drafting of the ICT policy.
Seychelles	National ICT Policy: Seychelles	Encourage gender mainstreaming - in ICT programmes and development. (Policy Statement on Human Resource Development).	Coverage 0.01%, References 1.	The National ICT policy for Seychelles provides a statement on encouraging gender mainstreaming in ICT programmes and development. The seeks to enhance human resource development with a particular focus on women although no finer details on how this could be done was provided.
Mauritius	The Republic of Mauritius Health Sector Strategic Plan (2020-2024)	The overall policy objective of the Government is to achieve the highest attainable level of health regardless of gender, age, disability, geographical location, social status and ability to pay. (Executive Summary).	Coverage 0,05% References 64 (Gender/ Women and Youth).	The Strategic Plan provided inclusion for women and youth but did not speak to AI/ICT aspect.

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Mauritius	The Republic of Mauritius Health Sector Strategic Plan (2020-2024)	HSSP 2020-2024 also incorporates strategic goals and actions related to promoting health through the life course, which includes maternal health, neonatal, child and adolescent health, women's health, family planning services, vaccination, and elderly care. (Strategic Priorities 2020-2024).	Coverage 0,05% References 64 (Gender/ Women and Youth).	
Country	**Policy/Strategy/ Development Plan**	**Themes emerging (gender & diversity related)**	**Evidence**	**Comments**
Mauritius	The Republic of Mauritius Health Sector Strategic Plan (2020-2024)	Regional Hospitals to cater to increasing demand for neonatal services, introducing new therapies for the management of neonatal care, collaborating with the Ministry of Gender Equality and Family Welfare to sensitise communities on the value of good parenting and on the prevention of child abuse, strengthening the follow ups of children on their healthy development from pre-primary to primary and secondary schools and ensuring that modern contraceptives are available, accessible and affordable for women and girls. Mauritius is moving towards data science in the elimination of Mother to Child Transmission (MTCT) through the Prevention of Mother to Child Transmission Program (PMTCT) which has a coverage of >95% for the past four years. The number of paediatric remains low at less than 5 cases per year. Implementation of new strategies to reach pregnant women has resulted in an increase to almost 98% in the compliance rate of PMTCT programme. (Rationale for Five-Year Health Sector Strategic Plan 2020-2024).	Coverage 0,05% References 64 (Gender/ Women and Youth)	In Mauritius, they have an established Ministry of Gender Equality and Family Welfare to sensitise communities on the value of good parenting and on the prevention of child abuse, strengthening the follow-ups of children on their healthy development. All AI and health related 4IR issues that required gender mainstreaming will be addressed through this Ministry.
Mauritius	The Republic of Mauritius Health Sector Strategic Plan (2020-2024)	In 2015, the standardised prevalence of type 2 diabetes in the population aged 20 -74 years was 20.5% with a slightly higher proportion among women (21.3%) compared to men (19.6%) The NCD Survey 2015 also provides evidence-based information on the prevalence of hypertension, estimated at 28.4% - 27.0% for women and 30.3% for men and the prevalence of elevated total cholesterol (³5.2 mmol/l) estimated at 44.1% - 41.8% for women and 47.1% for men. The increasing trend of cancer incidence has continued over the past years till 2016 when 2,607 new cases were registered, since then a decreasing trend has been observed. In 2018, 2,380 new cases of cancer (959 male and 1421 female) were registered by the Mauritius National Cancer Registry (MNCR). The age standardised incidence rate among men is 124 per 100,000 and 155 per 100,000 among women. Early attendance for antenatal care in the first trimester is a challenge mainly due to employment conditions of women. (Mortality Rate due to NCDs, Main Island of Mauritius, 2019).	Coverage 0,05% References 64 (Gender/ Women and Youth).	

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Mauritius	The Republic of Mauritius Health Sector Strategic Plan (2020-2024)	Poor mental health is associated with many factors such as rapid social change, stressful work conditions, gender discrimination, social exclusion, unhealthy lifestyle, risk of violence, physical ill-health and human rights violations (Mortality Rate due to NCDs, Main Island of Mauritius: Mental Health, 2019).		
Mauritius	The Republic of Mauritius Health Sector Strategic Plan (2020-2024)	Women have specific health needs throughout their lifespan, including emotional sexual, maternal and reproductive health, cancers, menopause and the pathology of ageing. Maternal health refers to the health of women before and during pregnancy, at the time of delivery and during the postpartum period. Timely detection and management of symptoms during pregnancy reduce the risk of other morbidities and complications, mortality and disability. Besides, some women because of their vulnerability are exposed to domestic violence and even sometimes to prostitution (Mortality Rate due to NCData science, Main Island of Mauritius: Women Health, 2019).		
		In Mauritius, the social determinants responsible for the increase in morbidity, disability and premature mortality associated with are unhealthy lifestyle and dieting, physical inactivity, tobacco, alcohol, illegal drugs, gender-based inequality and stress (Social Determinants of Health).		
		In collaboration with the Ministry of Gender Equality and Family Welfare prevention and management of all forms of gender-based violence, including sexual and other forms of exploitation and the elimination of gender barriers to receiving essential health services will be strengthened (HSSP 2020-2024 Core tenets of the SDGs through mainstreaming the right to health: SDG 5 on Gender Equality).		
		(HSSP 2020-2024 Core tenets of the SDGs through mainstreaming the right to health: SDG 16 on Inclusive Societies).		The health sector will collaborate with other sectors to monitor financial risk protection, promote education on sexual and reproductive health rights, increase access to contraceptive methods, control and prevent Sexually Transmitted Diseases (STD) and HIV and will contribute to the implementation of the National Strategy on Gender-Based Violence.
		Develop drug resilience skills among students and youth (A National Drug Control Master Plan 2019-2023 (NDCMP).		
		Maternal health refers to the health of women before and during pregnancy, at the time of delivery and during the postpartum period.		

Annex 2: List of countries, policy framework, evidence, & comments on gender mainstreaming policy gaps

		Sensitize pregnant women and future mothers on the importance of ante natal care. Provide echography services at regular intervals to pregnant women for the early detection of foetal abnormalities and complications. Strengthen monitoring of all pregnant women upon their admission in the labour ward science and pre-natal ward for early detection of foetal complications and other health issues and for their timely management. (Communicable Diseases: Vector-Borne, HIV and AIDS, Hepatitis C and Coronavirus, CoVID-19).		
Country	**Policy/Strategy/ Development Plan**	**Themes emerging (gender & diversity related)**	**Evidence**	**Comments**
		Step up efforts to prevent adolescent pregnancies and ensure that modern contraceptives are available, accessible and affordable for women and girls. Make extensive use of Youth Friendly Health Centres and set up additional ones. Collaborate with relevant Ministries to impart knowledge and build skills of the youth cadre/peer educators, teachers and counsellors on adolescent health issues, such as, STI and HIV/AIDS and teenage pregnancy (Neonatal, Child and Adolescent Health).		
		The health of women and girls has a significant contribution on the quality of life, well-being and the overall health status of a nation. Women and girls have specific health needs throughout their lifespan, including emotional, sexual, maternal and reproductive health, cancers, menopause and the pathology of ageing. Article 12 of the Convention on the Elimination on all forms of Discrimination against Women (CEDAW), which is the principal international human rights treaty addressing the rights of women, stipulates the right and access to healthcare services for all women on a basis of equality. (Strategic goal 11: Improve women's health and their well-being).		
		Safe food is key to sustaining life and promoting good health and wellness of a population. Unsafe food poses health threats and creates a vicious cycle of disease and malnutrition affecting, particularly infants, young children, pregnant women, the elderly and the vulnerable (Strategic Goal 21: Ensure sustainable access to affordable, safe, cost effective and quality medicine and health technologies to accelerate progress towards SDG 3).		
		The HPV vaccines for the prevention of cervical cancer in girls aged 9-13 were introduced in 2016. The Rodrigues Cervical Cancer Screening Project was launched in October 2017. This Project aims at screening sexually active women aged 30 to 60 for the early detection of cancer and for the promotion of preventive medicine.		

Ethiopia	National Science, Technology and Innovation Policy: The Federal Democratic Republic of Ethiopia, October 2010	No information related to gender mainstreaming in this policy was retrieved.	No evidence found. (Gender or Women and Youth).	Gender issues in AI and ICT related policies are not well captured in the said policy in Ethiopia
Ghana	Data Protection Act, 2012	No information related to gender mainstreaming in this policy was retrieved	No evidence found. (Gender or Women and Youth).	Gender issues in AI and ICT related policies are not well captured in the said policy in Ethiopia.

Annex 3: Organisations engaged

Southern Africa Satellite Event	University of Limpopo; South Africa
	Statistics South Africa; South Africa
	Stellenbosch University; South Africa
	Western Cape: Provincial Department of Human Settlement; South Africa
	Academy of Science of South Africa (ASSAf); South Africa
	Human Sciences Research Council; South Africa
	Nelson Mandela University; South Africa
	Gauteng Provincial Government; South Africa
	Department of Social Development; South Africa
	SFA Foundation; Kenya
	Hadithi Ya Africa; South Africa
	Northwest University; South Africa
	University of Johannesburg; South Africa
	Central University of Technology; South Africa
	Department of Basic Education; South Africa
	Wits Health Consortium; South Africa
	South African National Blood Service; South Africa
	Chinese Academy of Sciences
	Northwest University; South Africa
	Stellenbosch University; South Africa
	Walter Sisulu University; South Africa
	Rhodes University; South Africa
	Centre for the AIDS Programme of Research in South Africa; South Africa
	mDoc digital health company; Nigeria
	African Alliance; Swaziland
	University of the Western Cape; South Africa
	University of South Africa; South Africa
	Stellenbosch University; South Africa
	Desmond Tutu Health Foundation; South Africa

Annex 3: Organisations engaged

SOUTH AFRICA	• Lupane State University
	• COSTECH
	• National Center for Scientific Research (CNIC), Luanda, Angola
	• National Commission on Research, Science and Technology (NCRST)
	• Namibia University of Science and Technology (NUST) DVC
	• Logos Open Culture
	• Program Officer – DIT Unit, National Science and Technology Council
	• Tshwane University of Technology
	• Wits University
	• Nelson Mandela University
	• Research ICT Africa
	• mDoc Healthcare
	• Addis Ababa science and technology
	• SARIMA
	• National Commission for Science and Technology
	• Agriculture Research Council
	• NRF South Africa
	• Human Sciences Research Council
	• Cochrane South Africa
	• Science For Africa Foundation
	• University of Pretoria
	• ICT4D
	• CEO of the National Research Foundation of South Africa.
	• CISA Scientific Coordinator.
	• Head of the Department of Project Management and Interinstitutional Cooperation
	• Higher Institute of Health Sciences (ISCISA), Agostinho Neto University (UAN), Luanda, Angola
	• Makerere University college of Health sciences
	• African Center of Excellence in Bioinformatics (ACE-B) / USTTB
	• University of Birmingham
	• Moi University

Annex 3: Organisations engaged

SOUTH AFRICA	• Armauer hansen research institute
	• University of Kinshasa
	• Muhimbili University of Health and Allied Sciences
	• Mbarara University of Science and Technology
	• eLwazi Open Data Science Platform / UCT
	• African Center of Excellence in Bioinformatics
	• MAKERERE UNIVERSITY
	• Clinical research unit of Nanoro
	• Farhat Hached University Lab
	• Institute of Human Virology Nigeria
	• Armauer Hansen Research Institute (AHRI)
	• African Population and Health Research Center
	• IFAIN
	• College of Medicine University of Nigeria
	• Kenya Medical Research Institute and The nairobi Hospital
	• University of Botswana
	• Kenya Medical Research Institute and The Nairobi Hospital
	• Jean Lorougnon Guede University, Daloa
	• Centre of Biotechnology of Sfax
	• University of Dschang
	• Sydney Brenner Institute for Molecular Bioscience
	• University of Nairobi
	• University of Cape Town/Data Science in Africa Coordinating Centre
	• Institute of Human Virology, Nigeria
	• University of Ilorin
	• HealthDart
	• University of Zambia
	• Nigerian Institute of Medical Research Yaba Lagos
	• Africa CDC / Africa Union
	• Utrecht University Ethics Institute

Annex 3: Organisations engaged

EAST AND CENTRAL AFRICA	• Higher Institute for Scientific and Medical Research
	• Triangle Research Foundation - TRIFT
	• University of Yaounde 1
	• Centre Suisse de Recherches Scientifiques en Côte d'Ivoire
	• UNITE DE PHARMACOLOGIE CLINIQUE ET DE PHARMACOVIGILANCE - University of Kinshasa
	• Centre de recherche en maladies tropicales (CRMT),Rethy
	• University of Kinshasa
	• Addis Ababa University
	• London School of Health and Tropical Medicine
	• Center for Epidemiological Modelling and Analysis (CEMA-Africa)
	• Aga Khan University
	• IAVI
	• Washington State University Global Health Kenya
	• Neopenda
	• Unaitas
	• Burn Manufacturing USA LLC
	• Gertrude's Hospital
	• University of Nairobi
	• Nyandarua County
	• Infospective Research LTD
	• Carnegie Melon University
	• International Centre for Insect Physiology and Ecology
	• Africa Union
	• Kenya Medical Research Institute and The nairobi Hospital
	• Buni Banda
	• APHRC
	• Moi University
	• Nairobi Hospital
	• Kenyatta University
	• Bayero University Kano
	• University of Nigeria, Nsukka, Enugu State, Nigeria.
	• Obafemi Awolowo University
	• University of Ibadan
	• Access Bank Plc
	• Volte Health
	• université de Kinshasa/ Unité de pharmacologie clinique et pharmacovigilance
	• EDCTP
	• National Health Institute Carlos III (ISCIII)
	• Muhimbili University of Health and Allied Sciences
	• IAVI
	• Makerere University
	• HASH
	• US National Institutes of Health
	• University of Zimbabwe

Annex 3: Organisations engaged

WEST AFRICA	• Centre National de la Recherche Scientifique et Technologique
	• AI Ghana
	• WHO
	• Nigeria Health Watch
	• University of Illinois Chicago
	• Ministry of Higher Education, Research, and Innovation (MESRI SENEGAL)
	• Ministry of Health and Sanitation, Sierra Leone
	• Africa Open Data and Internet Research Foundation (AODIRF)
	• Ghana Health Service
	• Ministry of Health, Sierra Leone
	• Federal University of Technology, Akure, Nigeria
	• Medicinal Organic Chemistry Laboratory
	• Institut de Mathématiques et de Sciences Physiques
	• Ministry of Vital statistics - Liberia
	• Ministry of Higher Education and Research of Togo
	• HSRC
	• mDoc Healthcare
	• Rapport Alternatif Sur l'Afrique (RASA)
	• Liberia Field Epidemiology Training Program
	• CERRHUD
	• Personal Data Protection Authority of Côte d'Ivoire
	• Ecologie Forestière et Gestion des Ressources Naturelles
	• CENTRE DE SUIVI ECOLOGIQUE (CSE)
	• ACTS
	• POLICY ADVISOR TO THE MINISTER
	• University of Pretoria
	• African Centre for Disease Control
	• IDRC ESARO Nairobi
	• Open Society Initiative for West Africa (OSIWA), Senegal
	• Microsoft
	• MEA Emerging Markets
	• Africa Centre, Atlanta Council
	• AI4Health
	• UNESCO
	• Ministry of Higher Education, Scientific Research and Innovation

Annex 3: Organisations engaged

NORTH AFRICA	• School Net Chad
	• EDCTP
	• CAPDA
	• Nyandarua County Assembly
	• Centre for Infectious Disease Research in Zambia
	• University of Rwanda
	• D-Tracker
	• Digital Youth Impact
	• MRTC/USTTB
	• Entreprise Forward
	• Malawi University of Science and Technology
	• South African Medical Research Council
	• Libyan International University for Medical Sciences.
	• North African Human Microbiome Consortium
	• Libya's Observatory of Science Technology & Innovation Indicators.
	• Institut Pasteur de Tunis
	• The University of Sfax - Tunisia
	• Advisor of the minister of higher education, Scientific Research and innovation expert in AI strategies
	• Faculty of Medicine and Pharmacy at Hassan II University in Casablanca
	• National Higher School of Electricity and Mechanics at Hassan II University in Casablanca
	• University in Rabat
	• Science for Africa foundation
	• Institute of National Planning
	• Presidential Advisor for Health and Prevention Affairs
	• Chairman of the Health Committee of the Egyptian Parliament
	• Academy of Scientific Research and Technology
	• Office of Assistant Minister of Health and Population for information systems and digital transformation
	• Medical Microbiology and Immunology Military Medical Academy
	• Minister of Health and Population for public health projects and initiatives
	• Head of the Affairs Sector of the Office of the Minister of Health and Population
	• Assistant Minister of Health and Population for information systems and digital transformation
	• Assistant Minister of Health and Population for Preventive Medicine and Endemic Diseases
	• Director of Medical Research and Regenerative Medicine Center
	• Director of Egyptian Science, Technology and Innovation Observatory (ESTIO) at Academy of scientific research and technology, ASRT
	• Communication Engineering - Faculty of Engineering - Cairo University
	• Computer engineering -Faculty of engineering and technology-Badr University
	• Innovation Management - Strategic Management - Chamber of Information Technology & Telecommunication (CIT)
	• Insects -Faculty of Science - Ain Shams University
	• International Law -Faculty of Law – Zagazig University
	• Chest diseases -Consultant of the president of the Republic for Health Affairs, Faculty of Medicine and surgery-Ain Shams University
	• Pharmacology - Academy of Scientific Research & Technology
	• Infectious diseases, gastrointestinal tract, liver - The representative of Faculty of Medicine and surgery-Cairo University
	• Endemic diseases - Faculty of Medicine and surgery-Helwan University

Annex 3: Organisations engaged

NIGERIA
• Advantage Health Africa
• AFIDEP
• African Institute for Development Policy (AFIDEP)
• Arcitura Education Inc (Freelance)
• Care Global
• CareOne
• Central Public Health Labs
• Clinton Health Access Initiative
• Corona Management Systems
• Covenant University
• DGI Consult
• DTH-Lab
• Ekiti SMOH & HS
• Embassy
• ENF
• Equitable Health Access Initiative
• Erasmus University Rotterdam Netherlands
• Esibiti
• Federal Ministry of Health
• Federal Ministry of Health and Social Welfare
• Fertitude
• FHI360
• FIND
• FMoH
• Genika
• health.enabled
• Helix Biogen Institute
• HFN
• Homnics
• Human Rights Journalists Network Nigeria
• Information DataHub
• Institute of Child Health University of Ibadan
• Instrat Global Health Solutions
• Jhpiego
• JSI
• K&C Partners
• Lagos State Primary Health Care Board
• LifeBank
• LSE
• M3D Preparedness and Response Consulting
• Massachusetts Institute of Technology
• mDoc Healthcare
• Medbury
• Media Career Development Network
• MEDICAID CANCER FOUNDATION
• Ministry of health and social welfare
• Ministry of Health, Ekiti State

NIGERIA
• Ministry of Mines and Steel Development
• Mozilla Foundation
• Mpharma
• MSD for Mothers
• NASCP
• National Assembly
• National Information Technology Development Agency
• National Institute for Pharmaceutical Research and Development
• National malaria Elimination programme
• Network for Health Equity and Development
• Network for Health Equity and Development
• NHIA
• Nigeria Health Watch
• NMEP
• NMEP ABUJA
• NPHCDA
• Obafemi Awolowo University Teaching Hospital Ile-Ife, Nigeria
• PF
• PharmAccess
• PharmAccess Foundation / Medical Credit Fund
• PolicyLab Africa
• Private Sector Health Alliance of Nigeria
• Research Enterprise Systems
• Results for Development
• RHM
• Salient Advisory
• SCIDaR
• Society for Family Health (SFH)
• Society for Telemedicine & eHealth In Nigeria
• ST Timothy's Catholic Hospital.
• Standards organisation of Nigeria (SON)
• Strathmore University
• The Hearmax Centre Ltd
• The Lancet
• The Presidential Initiative for Unlocking the Helathcare Value Chain
• The Technical University of Kenya
• TNP
• University of Cape Town
• University of Health and Allied Sciences
• University of Johannesburg/AUDA-NEPAD
• University of Nairobi
• USAID LHSS/DGI
• Wellahealth Technologies Limited
• Wits University
• Youth and Mind Alignment Development Center

Annex 3: Organisations engaged

MALAWI

- AfricaBrief
- African Bible College
- African Centre of Excellence in Internet of Things
- Ambassadors Charity Trust
- Angle Dimension
- AR Marketing
- ARIN
- Beijing Forestry University
- Berdicom
- Bhp foundation
- Buildings Department
- Business Development Facility
- Centre for Excellence and Integrity in Education
- Chisapi Schools
- Citizen
- Civil Society Education Coalition
- Companion Insurtech
- COSOMA
- DEC Construction ltd
- Department of Arts - Censorship Board
- Derek Cheshire
- Design and Build Group
- Directorate of Open Distance and eLearning
- Directorate of Road Traffic and Safety Services
- Dmi
- DMI Blantyre campus
- DMI St John The Baptist University
- DMI St John the Baptist University
- DMI St JOHN THE BAPTIST UNIVERSITY, Malawi
- DMI St John The Baptist University, Mangochi, Malawi
- DMI university (Blantyre campus)
- Education
- EIFL
- ESCOM
- FHI 360
- Generations Horticulture Group LTD
- GNA INITIATIVE
- GoDigitalSA Foundation
- H&E Consulting Group
- HSRC
- ICBS
- SARIMA r
- inq Digital Limited
- insideout inc
- Inspirelearnmw
- Kamuzu University
- Kamuzu University of Health Sciences
- Karonga Teacher Training College
- Kaseye Girls Secondary School
- Katoto Secondary school
- Lilongwe University of Agriculture and Natural Resources
- LUANAR
- LUANAR NRC
- Luke International
- M3D Preparedness and Response Consulting
- Magritech limited

MALAWI

- Makerere University
- Malawi Adventist University
- Malawi Daily Telegraph Publications
- Malawi Institute of Education
- Malawi National Commission for UNESCO
- Malawi Research and Education Network
- Malawi Stock Exchange
- Malawi University of Science and Technology
- Mchinji District Hospital
- MI Technologies
- MileSoft
- Ministry of Education
- Ministry of Education Science and Technology
- Ministry of Health Digital Health Division
- Ministry of Justice
- Ministry of Local Government, Unity and Culture
- MoE
- Mudziwathu Community Radio Station
- Multicsystems
- MUST
- Mzuzu city counci
- Mzuzu E-Hub
- Mzuzu University
- National Commission for Science and Technology
- Natural Resources Justice Network
- Neno Institute of Technology
- Nextgen
- NICO Technologies
- Pan African University
- Philia Technologies LTD
- Plan Malawi
- Qubix Robotics
- Rays of Hope
- Salima Technical College
- SEEFAR
- South African Medical Research Council
- Southern Region Water Board
- SPACEAI
- Student @ LUANAR, created Agrera Platform
- Student, Unima
- TAMVA Friends for the Deaf
- Teacher
- Tech women connect
- Teveta
- Tony Blair Institute for Global Change
- Turnkey Engineers
- Ubuntu Education
- Umoyo community radio
- UNDP
- University of Livingstonia
- University of Malawi
- WHO
- Word Alive Ministries International
- YONECO
- Youth advisory panel
- Youth Net and Counselling

Annex 3: Organisations engaged

SURVEY
• MISAU - HOSPITAL CENTRAL DE QUELIMANE
• Faculty of Medicine and Pharmacy Hassan II University Casablanca Morocco
• pharmacy of monastir
• Institute of national planning
• Libyan International Medical University (LIMU)
• Ministery of Health and Population
• Libyan International Medical University
• Africa Clinical Trial Solutions
• Libya's Observatory of Science Technology Innovation Indicators
• Center for Bioethics in Eastern and Southern Africa
• National Obstetric Fistula Center Katsina
• Centre for intervention science in maternal and childhood health (CISMAC)
• institute of medical research and medicinal plant studies
• Ghana Health Service
• IntraHealth International
• Medesafe hospitali
• Equip Africa Institute
• NSU Global Health Institute
• Department of Parasitology-Mycology, Faculty of Medicine, Université des Sciences de la Santé, Libreville - Gabon
• ENSIAS College of engineering, Mohammed V University in Rabat
• UNIKIN
• Nairobi Hospital
• Addis Ababa University
• Isatou Sarr, Scientific Officer in the DIAMONDS project at MRCG@LSHTM.
• Nyandarua County Assembly
• Access Bank Plc
• Al Mughtaribeen University
• Centric Research and Data Centre
• J'étudie la biochimie clinique et biologie moléculaire à l'université de Douala
• Centre de recherche en maladies tropicales
• Moi University
• Data for African Impact
• University of Dschang
• Sfax Faculty of Medicine - University of Sfax - TUNISIA
• Libyan International Medical University
• Addis Ababa Science and technology university
• AASTU
• medicacom and minister of health tunisia
• Wellahealth
• Addis Ababa Science and Technology University
• Epidemiology and Disease Control Unit, Ministry of Health
• MINISTRY OF HEALTH
• Epidemiology and Disease Control
• South African medical research council
• French National Research Agency

SURVEY
• mrtc
• Malaria Research and Training Center
• University of Sciences, Techniques and Technologies of Bamako, Mali
• Laboratoire de Pharmacognosie et phytothérapie/FSS COTONOU/AUC
• MRTC
• Pan African University in Kenya
• African Center of Excellence in Bioinformatics/University of Sciences Technics and Technologies of Bamako (USTTB)
• Africa Open Data and Internet Research Foundation
• MRTC
• National institute of research (INRS), Lomé, Togo
• SistraTechnologies
• Ghana Health Service
• Ministry of Health (National Leprosy and Tuberculosis Control Program)
• University of Illinois/Axum AI
• Ministry of Health
• RobotsMali
• Nigeria Health Watch
• University of Science Techniques and Technologies of Bamako
• Africa Open Data and Internet Research Foundation
• UNISA
• Ministry of Health and Sanitation
• University of Michigan
• The Thomas Gbamanja Science Foundation
• Co-creation Hub Ltd
• Biomedical Research and Training Institute
• MAGRABI ICO Cameroon Eye Institute
• LocateIT
• University of Science Techniques and Technologies of Bamako (USTTB), Bamako, Mali
• HIV FREE PROJECT
• FONDATION CONGOLAISE POUR LA RECHERCHE MÉDICALE
• University of Yaounde 1
• CBCHS
• The Global Health Network (FCRM)/ Fondation Congolaise pour la Recherche Médicale (FCRM)/ University of Yaounde-I (UYI)
• Jembi Health Systems
• Mauritius Emerging Technologies Council
• Unité de Pharmacologie Clinique et Pharmacovigilance Université de Kinshasa
• NuST
• Cospharm
• Namibia University of Science and Technology
• NUST
• The Infectious Diseases Institute
• Tech Care For All
• Evelyn Hone College of Applied Arts and Commerce

Annex 3: Organisations engaged

SURVEY
• Institut Pasteur Dakar
• Institut Pasteur de Dakar
• IQVIA
• MARCAD-Plus / University Cheikh Anta Diop, Senegal
• National commission for Science and Technology
• Midlands State University
• university of Dodoma
• mDoc Healthcare
• University of Witswatersrand
• Population Services International Angola
• Division of Science Technology and Innovation
• SAMRC
• Research Council of Zimbabwe
• National Center For Scientific Research - Angola
• Lupane State University
• National Commission on Research, Science and Technology (NCRST)
• KEMRI-Wellcome Trust Research Programme
• National Research Foundation of South Africa (NRF)
• School of Public Health University of the Witwatersrand
• Biomedical Research and Training Institute
• The Fobang Institutes for Innovations in Science and Technology
• Private practice
• KEMRI-Wellcome Trust
• Kilimanjaro Christian Medical University College
• Right to care
• University of Namibia
• Université de Lomé
• University of Sciences Techniques and Technologies of Bamako
• MARCAD University Cheikh Anta Diop Dakar
• University of Copenhagen
• UCAD
• University Cheikh Anta Diop
• MRCG at LSHTM
• National Commission for science and Technology
• The Biotechnology Centre, University of Yaounde 1
• HSRC
• University of Sciences, Techniques and Technologies of Bamako, Mali
• Kintampo Health Research Centre
• Makerere University
• aga khan university hospital nairobi
• University of Manitoba
• Fiverr
• ClinWin Research Services
• ARC
• Middlesex University Mauritius and Mauritius Emerging Technologies Council
• africarxiv
• Makerere University

SURVEY
• Science for Africa Foundation
• University of Yaounde 1
• University of Zimbabwe AND Organisation for Women in Science for the Developing World Zimbabwe National Chapter (voluntary)
• Uganda National Institute of Public Health
• Vitalstreams and Austin Community College
• Wits University
• IntraHealth International
• UNZA
• Malaria Research and Training Center ,Mali
• Mwanza College of Health and Allied Sciences
• AHRI
• CisBiztech
• Utrecht University Ethics Institute (Ethics of Socially Disruptive Technologies)
• Africa CDC
• Research ICT Africa
• Air Force Institute of Technology Nigeria
• Immunization Program, Ministry of Health
• Institut National de Santé Publique du Burundi/National Institute of Public Health of Burundi
• Glasgow Caledonian University & European Health CASCADE project
• Centre d'Infectiologie Charles Merieux-Mali
• Kemri-Wellcome Trust Research Programme
• Nathasam Global
• Makerere University, Uganda
• KAMYA Gerald
• Neduchuks Multi -Business Concept
• university of Dschang
• Aga Khan university
• Centre of Biotechnology of Sfax
• University of Zambia
• Kenya medical Research Institute and The Nairobi Hospital
• Institute of Human Virology Nigeria
• Farhat Hached University hospital, Sousse Tunisia
• Mbarara University of Science and Technology
• University of Kinshasa
• Armauer hansen research institute
• DS-I Africa
• University of Sfax. Tunisia
• Sfax University Tunisia
• ASSEMAJI/Share-Net Burundi
• Malaria Research and Training Center
• African Network of Young Researchers
• ICER mali
• Department of Epidemiology and Parasitic Diseases
• UCRC Mali
• Malaria Research and Training Center - Mali (MRTC - USTTB- Mali)
• NMCP

Annex 3: Organisations engaged

SURVEY
• ICER-MALI/CHU Dijon
• University Clinical Research Center (UCRC)/USTTB
• MRTC
• University of Abomey-CAlavi
• Malaria Research and Training Center, University of Sciences, Techniques and Technologies of Bamako (USTTB), Mali
• National Ethics Committee for Health and Life Sciences of Mali
• USTTB
• National Center for Scientific and Technological Research
• Malaria Research and Training Center

SURVEY
• University of Sciences, Technologies and Techniques of Bamako USTTB
• Bamako University of Science and Technology
• Telecommunications Regulatory Authority of Côte d'Ivoire
• Center for Research in Human Reproduction and Demography (CERRHUD)
• eCare Mali
• EVIHDAF
• Ministry of Health
• World Health Organization
• Ministry of Higher Education, Research and Innovation (MESRI SENEGAL)

INTERVIEWS	
	• University of Pretoria
	• African Centre for Disease Control
	• IDRC ESARO Nairobi
	• Open Society Initiative for West Africa (OSIWA), Senegal
	• Microsoft MEA Emerging Markets
	• Africa Centre, Atlanta Council
	• WeRobotics and Flying Labs
	• Microsoft Ethics Division/UNESCO Panel
	• UNESCO
	• World Health Organization Regional office for Africa
	• African Centre for Technology Studies ICIPE Duduville Campus, Kasarani
	• African Centre for Technology Studies ICIPE Duduville Campus, Kasarani

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