POLICY FRAMEWORK

for Artificial Intelligence in Tanzania Health Sector

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

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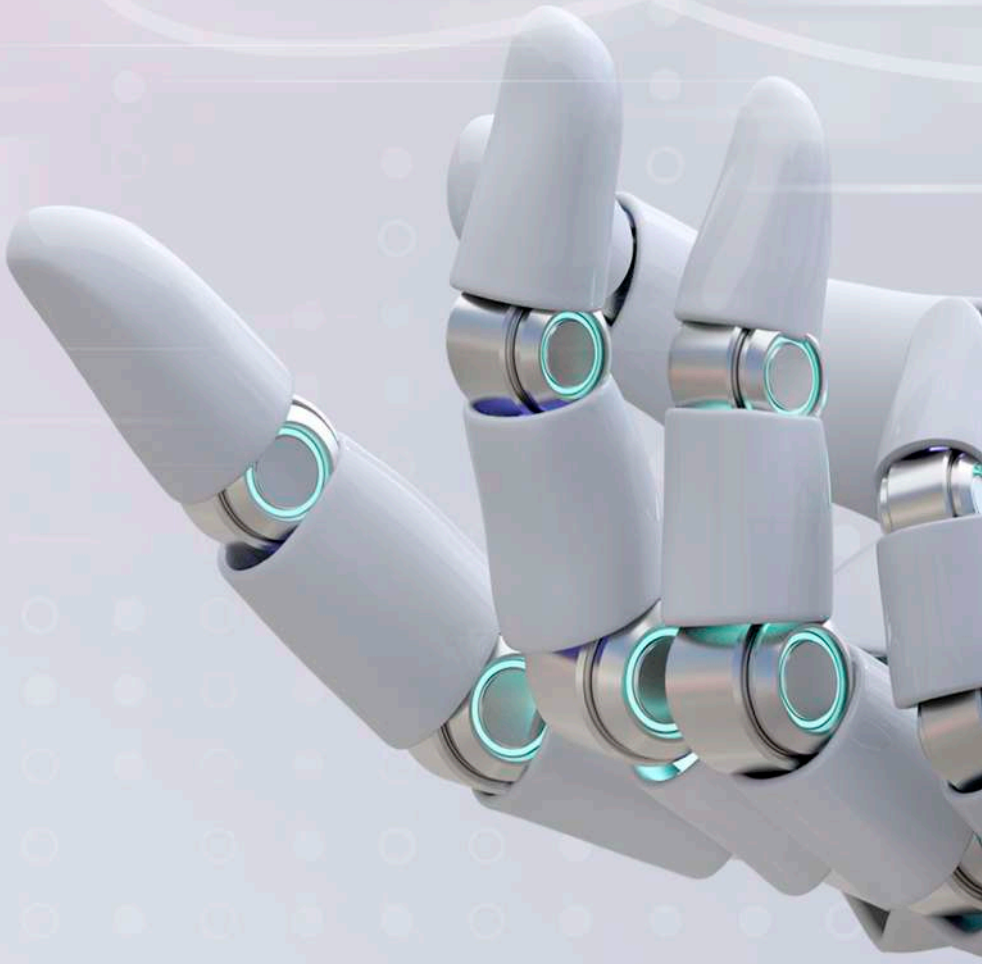

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Acronyms

AI	Artificial Intelligent
AI4D	Artificial Intelligent for Development
CDH	Centre for Digital Health
DCS	Directorate of Curative Services
DICT	Directorate of Information and Communication Technology
DHRD	Directorate of Human Resource Development
GOT	Government of Tanzania
ICT	Information Communication Technology
IHI	Ifakara Health Institute
MHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MIR	Medical International Research
ML	Machine Learning
MOH	Ministry of Health
MUHAS	Muhimbili University of Health and Allied Sciences
ODI	Overseas Development Institute (ODI
PATH	Program of Applied Technologies in Health
PORALG	President's Office, Reginal Administration and Local Government
UDOM	University of Dodoma

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All contributions and efforts are highly appreciated.

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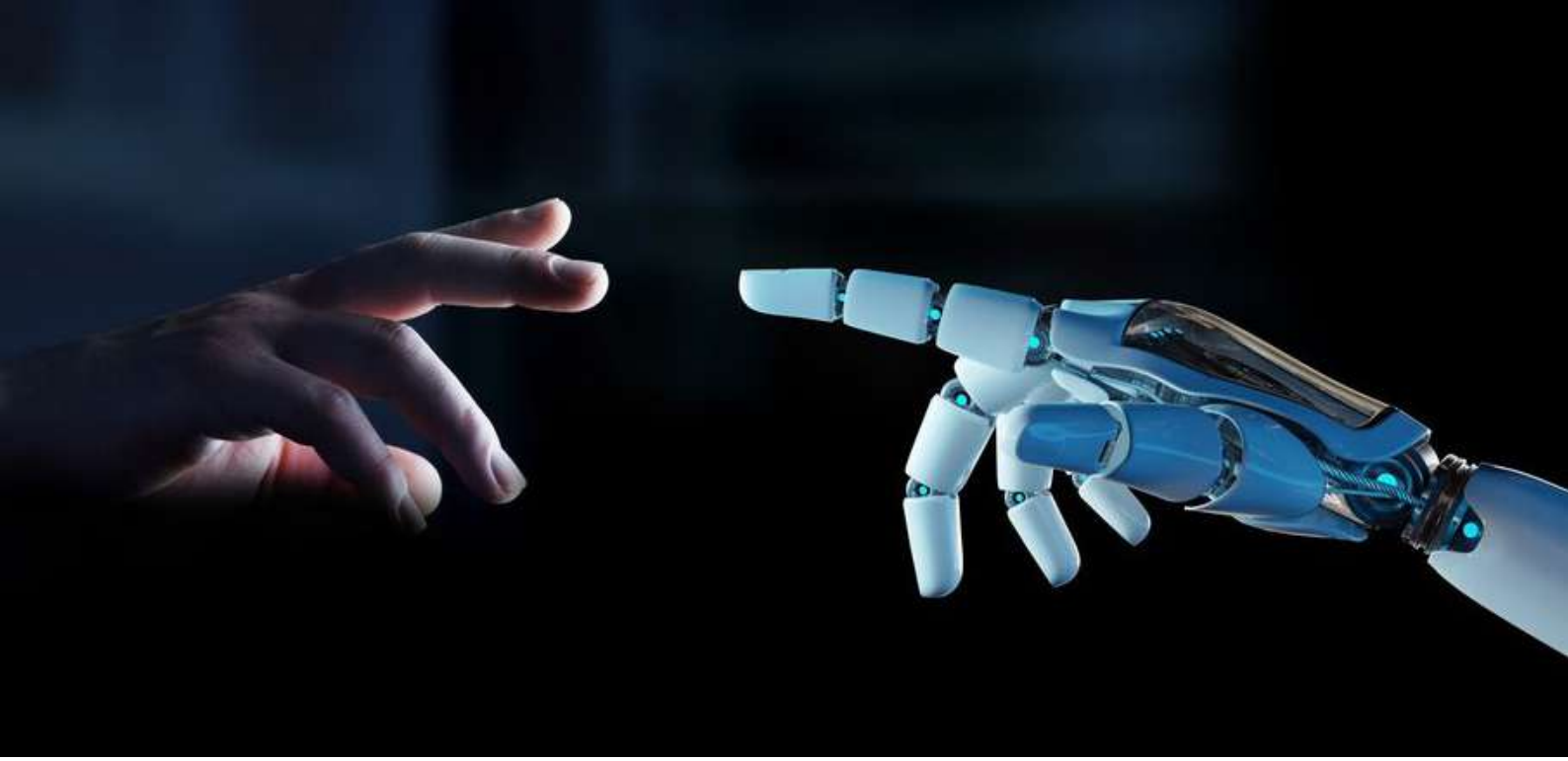


1 Introduction and rationale

The Government of Tanzania (GOT) is spearheading technological innovation and digital transformation in sub-Saharan Africa. The GOT has recognized the significant role those digital technologies play in facilitating high-quality health care service delivery, efficient management of resources, and timely availability of quality health information. The GOT is committed to improving the application of digital technologies to facilitate the attainment of its overall objective of delivering high-quality health care services to all citizens. The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), in collaboration with health sector stakeholders, has been making significant progress implementing digital health initiatives to improve health outcomes. The application of digital health technologies has great potential to create a health system that is more responsive to health sector needs. Digital health presents numerous opportunities for improving and transforming health care by reducing human errors, improving clinical outcomes, facilitating care coordination, improving practice efficiencies, and tracking data over time.

Artificial intelligence (AI) has the potential to further improve the resilience of the health system and how health care is delivered. The use of AI in Tanzania's health sector in everyday practice is still extremely limited. However, the number of AI initiatives are increasing every day. These initiatives range from the use of AI in clinical settings and biomedical research, to health system administration and

management. The potential of AI in health is profound, given the growing volume of digitized data. AI is also well suited to the health sector for the inherent complexity of the health system, its reliance on information to solve problems, and the variability and complexity of how disease interacts with individuals

2 Definitions

Artificial intelligence refers to the simulation of human intelligence in machines with the purpose of learning, reasoning, and perception. AI is being used across different industries including finance, agriculture, and health care. The Tanzania National Digital Health Strategy 2019—2021 has acknowledged the importance of researching and implementing emerging digital health technologies including AI, machine learning, and big data analytics. To ensure this goal is achieved, the government is committed to leveraging digital health technologies in the health sector through the Centre for Digital Health (CDH). CDH, an extension of the Directorate of Information and Communication Technology (DICT), will bring together innovators, technologists, clinicians, and other digital, data, and AI stakeholders in supporting the design, development, testing, and rollout of digital health and AI solutions. They will work to ensure there is proper coordination among digital health stakeholders.

Big data: [1]is a term used to describe a large volume of data, both structured and unstructured that can be analyzed computationally to reveal patterns, trends, and associations.

Machine learning (ML): [2]is a set of methods for getting computers to recognize patterns in big data and use these patterns to make predictions. It focuses on the development of computer programs (models) that can assess and learn from one or multiple data sources and produce meaningful insights. You can think of ML as "data-driven predictions." ML is a subset of AI and enables data-driven predictions to inform decisions.

Artificial intelligence (AI[3]): uses computers for making decisions or recommendations in an automated way. Automated decisions might be directly implemented or suggested to a human decision

1 https://www.sas.com/en_us/insights/big-data/what-is-big-data.html
2 https://www.usaid.gov/sites/default/files/documents/15396/AI-ML-in-Development.pdf
3 https://www.usaid.gov/sites/default/files/documents/15396/AI-ML-in-Development.pdf

maker. You can think of AI as “smart automation.”
Data serves as the foundation of machine learning and AI systems, and decisions about data affect the function of higher-level systems. AI works best when large amounts of data are available, rich data, big data. Having more reliable data, is a determinant of better the algorithm of AI. The more facets the data covers, the faster the algorithms can learn and fine-tune their predictive analyses.

3 Status of AI in the Tanzanian health sector

3.1 Implementation of AI in the health sector

AI is one among many interventions planned to be implemented under the CDH. The MoH, through CDH, is working with digital health stakeholders to ensure there is a detailed plan, proper guidance, and specifications around the implementation of AI in the health sector. Currently, the stakeholders working around AI lack clear guidance which limits its effective implementation. The CDH will support the adoption of AI in the health sector by ensuring there is proper guidance that aligns with the health sector’s needs and goals.

SNo	Project Title	Project Description	Organization
1	Establishment of a Multidisciplinary AI4D Lab in Anglophone Africa	Strengthening the capacity of a public university in Africa to conduct high-quality, multidisciplinary, responsible AI research and teaching.	The University of Dodoma
2	Using machine learning and mid infrared spectroscopy for rapid assessment of blood-feeding histories and parasite infection rates in field-collected malaria mosquitoes	Combining MIR-spectroscopy with machine learning algorithms and validate them for rapid assessment of blood-feeding histories and infectiousness of field collected Anopheles arabiensis and Anopheles funestus, which dominate malaria transmission in Tanzania	Ifakara Health Institute
4	Support for the rapid scale-up of COVID-19 testing in Tanzania and Zanzibar	Enhancing microbiological testing capacity for COVID-19 and other infectious diseases in Tanzania and Zanzibar.	Ifakara Health Institute (IHI)

SNo	Project Title	Project Description	Organization
5	Addressing the mental health needs of adolescents in schools, in the community and at institutional level in Tanzania and Vietnam through the co-creation and application of digital technologies	Addressing the mental health needs of adolescents in schools, in the community and at institutional level in Tanzania and Viet Nam through the co-creation and application of digital and non-digital approaches and technologies.	Overseas Development Institute (ODI), Tanzania, Vietnam
6	Open Skies Fellows: African Tech for African Data	Supporting youth by giving them the power and responsibility to gain technical and social skills to leverage the full potential of fron-tier technologies.	OpenMap Development Tanzania, Inc.
7	Tanzania Open Innovation Organization	Providing hands-on learning experience for young innovators with technical and soft skills to translate ideas and ventures into real projects.	Robotech Labs
8	Transformation of Tanga City Environment for Healthy and Productive Development of Children and Adolescents	Improving the use of technologies for data collection for city development in Tanga.	Tanzania Data Lab

3.2 The Centre for Digital Health

The GOT is establishing the Centre for Digital Health (CDH), which will support the design, development, testing, and rollout of digital health systems and ensure there is proper coordination among digital health implementers. The government has provided a building that will be dedicated to CDH. To ensure the CDH runs smoothly the government has developed operational manuals for the CDH.

The CDH will help bring together innovators, technologists, clinicians, and other digital health stakeholders to collaborate in building digital health innovations from inception to deployment. Partners will be encouraged to work with other stakeholders under government leadership, to design requirements and specifications, and to incorporate these into integrated digital solutions, rather than designing new stand-alone solutions.

Through the CDH, the government will ensure that digital solutions

are in line with the health system's needs and can be deployed and sustained at all levels. Knowledge management will be a critical component, with the overall goal of capturing new knowledge and practices from within the health sector and beyond.

4 Purpose of this framework

This framework intends to outline key aspects that are to be considered, including processes, technologies, capabilities, stakeholders, principles, and recommendations to guide the implementation and use of AI in the health sector to systematically and effectively build on the existing digital health and data landscape to facilitate better health outcomes. This framework will also provide the basis for the development of appropriate national policies and regulatory mechanisms to shape the use and application of AI by all stakeholders within the sector.

In addition, the framework will inform stakeholders at all levels on how to leverage AI in the health sector. Stakeholders include policymakers, health managers, health care providers, funders, training institutions, and implementers.

5 Why invest in AI and machine learning

Health data are increasingly growing and there is a growing need to use available data to make informed decision regarding health care service delivery.

There is greater use of smartphones and smart devices with the ability to store health data and perform basic health diagnoses. Governments and the private sector are optimizing health delivery using digital technologies and generating lots of data as a result. There's a definite need for government guidance on the integration of AI into the health sector that accounts for existing laws and regulations.

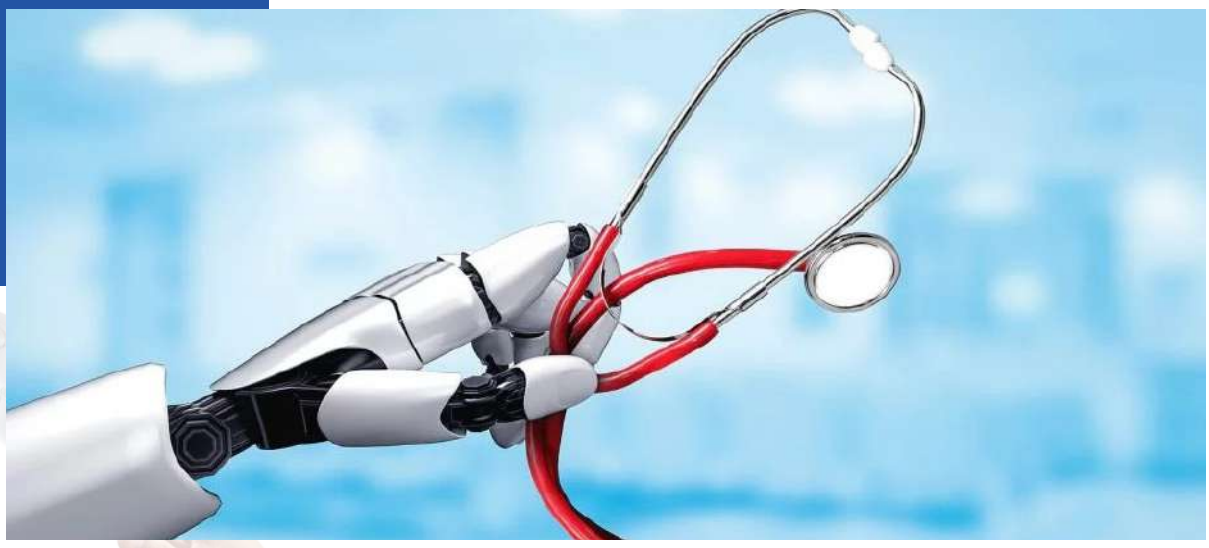
Additionally, the Government is focusing on moving to digital health and this has been well stipulated in the e-health strategy. Through the implementation of the Tanzania Digital Health Strategy 2019—2024, the government, in collaboration with universities, research institutions, and other stakeholders, intends to invest in research to explore how existing and emerging digital technologies can be harnessed to inform the evidence-based and cost-effective

application of digital health technologies.

6 Challenges around AI in the Tanzanian health sector

The literature review and consultative meetings with key stakeholders revealed the following challenges:

- Absence of policy, guidelines and regulations for AI developing and Implementation in the Tanzanian health sector.
- Poorly defined governance structures that bring AI stakeholders together for knowledge sharing and discussion of AI implementation in Tanzania;
- Lack of specifications and an approach to implementing AI in the health sector;
- Limited capabilities and skills to develop appropriate solutions for health sector needs;
- Inconsistent funding for AI;
- Limited capacity to implement AI tools;
- Lack of understanding among local technology firms on the market opportunities;
- Limited research and evidence generation for AI in Tanzania's health sector.
- Availability of relevant, reliable, and quality data
- Usability of available data (how clean/accurate is the data collected)
- Limited opportunity and local environment for knowledge and skills development
- Misconceptions and lack of awareness about AI technology in general



7 What is needed to ensure successful implementation of AI

7.1 Shared vision of AI among digital health stakeholders in the health sector

The government should lead the development of a shared vision for AI in the Tanzanian health sector. This will establish the government as a leader and ensure the commitment of other stakeholders to the shared vision. The shared vision will also provide opportunities to orient health sector leaders and technical teams, development and implementing partners, training institutions, local firms, and other stakeholders

7.2 Enabling policy environment for AI in the Tanzanian health sector

AI should be included in the national health policy to ensure the commitment of actors at different levels, to mobilize resources, and to prioritize AI within various health sector strategies.

7.3 Leadership and coordination of AI in the health sector

AI should be on the agenda for all digital health committee meetings, including the National Digital Health Steering Committee, Sector Wide Approach SWAP meetings, the technical working group for digital health, monitoring and evaluation committee, digital health secretariat, and other committees. Also, there should be a task team for AI which will ensure all AI implementations in the health sector are mapped, tracked, and reported on within key health sector meetings. There should be an AI mechanism to support collaboration and dialogue between health care providers, AI technology firms, training institutions, and other healthcare stakeholders to ensure all perspectives are reflected in AI solutions.

7.4 National Digital Health Strategy and Tanzania Digital Health Investment Roadmap

To ensure proper implementation of AI in the health sector, AI should explicitly be included in the National Digital Health Strategy. The Digital Health Strategy should prioritize AI and include all necessary activities for effective implementation. To facilitate resource mobilization and coordination AI should also be included in the National Digital Health Investment Roadmap as an investment area.

7.5 National Health Information Guidelines and design of the health sector AI

AI should be included in the National Health Information (HIS) Guidelines to capture issues of AI in the health sector. These include data privacy, consent to use data, and access control. The guidelines should ensure an individual's health information is protected. They also should promote secure data access, including open access to appropriate machine-readable public data and a culture of secure data sharing with other health facilities. The HIS should promote periodic review of informed consent. Also, the AI guidelines should inform the design, standards, and development of AI in healthcare.

7.6 Capacity building programs and training curricula for long and short courses

The government should put in place a mechanism for training and capacity-building programs to advance AI. This training should help various stakeholders to be able to respond to emerging opportunities and challenges and build capacity of technical teams in the development and deployment of AI to strengthen the health system, service delivery, and client experience. Training institutions should include a curriculum that will advance health care providers' understanding of and ability to use health AI solutions. Ongoing continuing education should also advance understanding of the safe and effective use of AI in health care delivery. Successful creation and deployment of AI-enabled technologies should help health care providers meet the needs of all clients.

7.7 Quality assurance mechanisms and oversight

Through the CDH structures there should be a mechanism to monitor and evaluate the design and application of AI and its outputs to ensure quality. There's also a need to align AI in the health sector with recognized standards of safety, efficacy, and equity. Providers, technology developers, vendors, and other stakeholders should adhere to these agreed standards.

7.8 Ethical considerations

It will be critical to promote the longstanding, deeply rooted, and well-developed professional ethics of the medical community for broader adherence by technologists, innovators, computer scientists, and

those who use such systems. Health sector AI will only succeed if it is used ethically and protects clients. The government should ensure AI in the health sector is safe, efficacious, and equitable. It should also ensure AI solutions align with all relevant ethical obligations, during its design, development, and use. It will be important to develop new ethical guidelines to address emerging issues with the use of AI in the health sector, as needed.

7.9 Research and innovations

The government should support and facilitate the research and development of AI in the health sector by prioritizing and providing sufficient funding. The government should ensure there are adequate incentives to encourage private sector and non-profit research. Furthermore, public funding and incentives should be conditioned on promoting shared knowledge, access, and innovation.

7.10 Sustainability, stakeholder engagement, and collaboration

The government should ensure AI initiatives are included in the plans at all levels of health care systems. Digital health stakeholders should be sensitized to allocate resources for building infrastructure, preparing personnel and training, as well as developing, validating, and maintaining AI systems. The government should create a culture of collaboration, trust, and openness among all AI stakeholders in the health sector to ensure continuous implementation and support.

7.11 There should be investment in state-of-the-art infrastructure beyond devices and data storage space

The government should ensure that there is an investment that is done beyond devices and data storage space. This will create a suitable environment for implementation of AI in the health care.

7.12 Review of existing policies to support AI implementation and harmonize policies i.e TMDA policies for medical devices

A comprehensive review of existing policies to support the implementation of AI in the health care service delivery.

8 Recommendations and conclusion

The AI ecosystem in Tanzania has the potential to meet health sector goals and advance universal health coverage. Strategic collaboration and partnership will be key to its effective application. There is a need to bring together all digital health stakeholders to agree on a common vision for the future of AI in Tanzania. The government needs to strengthen the AI leadership and governance with clear guidance for AI implementation. A comprehensive AI national workplan will facilitate alignment, coordination, and resource mobilization for AI in Tanzania.

Reference

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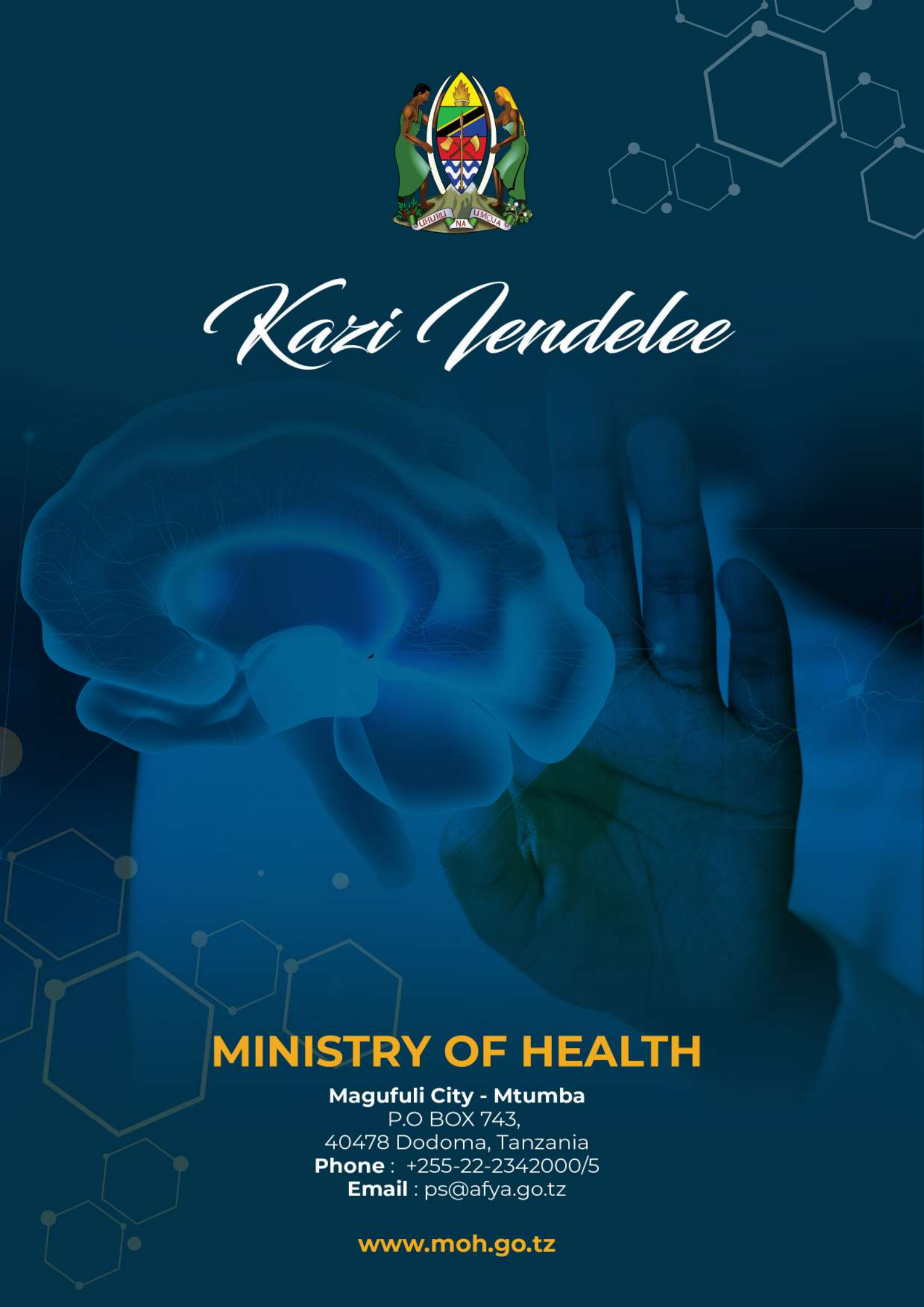
2. The proposal – Botnar Foundation
3. The Digital Health implementation Report MoH 2021 unpublished
4. The Review Report for Digital Health and Data use in Tanzania 2018 unpublished



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