

ARTIFICIAL INTELLIGENCE IN RURAL HEALTH PROMOTION IN NIGERIA: OPPORTUNITIES, CHALLENGES AND POLICY DIRECTIONS

Oredugba Maria Precious*, Iyanda Adisa Bolaji,** Agboola Habib
Olayinka,*Fakorede Kayode Oluyomi** Lukeman Faith Oiza** Osiki Joshua Obazu**
and Amao Sunday Clement**

**Department of Health Promotion and Education, Ogun State Polytechnic of Health and
Allied Sciences, Ilese-Ijebu*

***Department of Health Education, University of Ibadan, Ibadan.*

Abstract

Artificial intelligence (AI) is increasingly recognized as a transformative tool in health education and promotion, offering innovative solutions to enhance disease prevention, behavior modification, and public health surveillance. Yet, in rural Nigerian communities, health promotion outcomes remain constrained by infrastructural deficits, low digital literacy, and limited access to healthcare services. This position paper argues that AI-driven interventions such as mobile health platforms, wearable devices, and predictive analytics have the potential to close critical health education gaps and strengthen preventive health systems in underserved settings. While AI offers significant opportunities, its deployment in rural contexts raises concerns around data privacy, algorithmic bias, and the risk of widening the digital divide. To harness AI effectively, we advocate for deliberate policy action to expand digital infrastructure, promote digital literacy, integrate AI with human-centered health education strategies, and establish ethical governance frameworks. By adopting these measures, Nigeria can leverage AI not only as a technological tool but as a catalyst for equity in health education and promotion. This paper positions AI as an indispensable partner to human expertise in driving inclusive, preventive, and sustainable health outcomes in rural communities.

Keywords: Artificial intelligence, Health education, Rural communities, Health promotion, Digital health

Introduction

Health promotion and education are fundamental components of public health, aimed at empowering individuals and communities to adopt healthier behaviours, prevent diseases, and improve overall well-being. Health education is a systematic process that enables individuals and communities to take greater control over their health by acquiring the necessary knowledge, skills, and positive attitudes required for informed health-related decision-making. According to the World Health Organization (WHO, 2021), health education extends beyond the mere dissemination of information; it focuses on empowering people to adopt healthier lifestyles, prevent diseases, and enhance overall well-being.

In rural communities, however, the delivery of health education often faces significant challenges, including limited access to healthcare services, low health literacy,

inadequate infrastructure, and geographic barriers (Adebayo et al., 2021). These challenges contribute to persistent health disparities between urban and rural populations, underscoring the need for innovative approaches to enhance the reach and effectiveness of health promotion interventions.

Artificial intelligence (AI) has emerged as a transformative tool in public health, offering the potential to enhance health education, disease prevention, and health behaviour modification (Topol, 2019). AI-driven technologies, including wearable devices, mobile health applications, and predictive analytics platforms, provide personalized and real-time feedback that can influence individual and community health behaviours (Ogunyemi et al., 2022; Okanlawon, Moronkola and Iyanda, 2025). In addition, AI facilitates public health surveillance by detecting disease outbreaks, monitoring health trends, and guiding timely interventions, which is particularly critical in resource-constrained rural settings (Chowkwanyun et al., 2020; Adebisi et al., 2021).

Despite the numerous advantages of AI in health promotion in rural communities, studies in it still limited, with most studies focusing on urban populations with higher digital literacy and better access to technology. Although, factors such as infrastructural deficits, ethical considerations, algorithmic bias, and digital literacy gaps may hinder the adoption and effectiveness of AI-driven health interventions in rural areas but that does not make it impossible (Ebenso et al., 2021). Nigeria, with its large population and significant disease burden, presents both a challenge and an opportunity for innovative healthcare solutions. Artificial Intelligence (AI) has the potential to transform health promotion in the country, particularly in rural communities where access to healthcare services is often limited (WHO, 2021). Several Nigerian institutions and startups are already leveraging AI to improve health outcomes. For example, Lagos University Teaching Hospital has developed an AI-based system for early detection of breast cancer using machine learning algorithms to analyze mammograms (Nwoye, Fidelis, and Ogunsolu, 2020). Similarly, Wellvis, a Nigerian startup, offers an AI-driven telemedicine platform that allows patients to consult healthcare providers remotely, improving access to timely health advice and interventions (Health Systems Development Fund, 2024).

The adoption of AI in healthcare is further supported by increased investment from both government and private sectors. Initiatives such as research grant programs by the Nigerian Communications Commission (NCC) aim to foster the development of innovative technologies, including AI applications that can directly enhance health education and promotion (Health Strategy and Delivery Foundation, 2024). By providing personalized health messages, real-time monitoring, and interactive education tools, AI can empower rural communities with knowledge and resources to adopt preventive health behaviors. However, the widespread implementation of AI in rural health promotion faces several challenges. Limited medical infrastructure in rural areas constrains the deployment of AI-enabled tools (Aririguzoh et al., 2021). Low digital literacy among patients and healthcare workers can reduce the effectiveness of AI interventions (Ebenso et al., 2021). Additionally, AI systems handle sensitive patient data, raising concerns about privacy and security. The lack of comprehensive regulatory frameworks governing AI in healthcare further complicates the ethical and safe use of these technologies (Alaranetal., 2024).

Artificial Intelligence is bringing in a revolutionary era in the healthcare industry, shifting the paradigm from a one size-fits-all approach to medicine to a more nuanced, predictive, personalized, and preventive holistic care model as remarked by Witt (2023). Artificial Intelligence has gained increasing recognition as a transformative tool in health promotion and preventive care. Research indicates that AI-powered devices can engage in interactive conversations, provide reminders, and motivate individuals to adopt healthier habits. By tracking real-time personal data, these devices deliver tailored feedback, insights, and individualized recommendations that foster sustained behavioral change (Bickmore and Giorgino, 2006; Wang et al., 2023). The expansion of generative AI technologies spanning natural language processing, data analytics, and image generation is also reshaping how health education and patient engagement are designed and delivered.

In Nigeria, scholars have highlighted the potential of AI-enabled digital platforms to bridge gaps in preventive healthcare delivery. For instance, Ebenso et al. (2021) emphasized that digital and mobile health technologies are improving access to maternal and child healthcare services through remote communication and personalized health support in underserved communities. Similarly, Aririguzoh et al. (2021) noted that information and communication technologies, including emerging AI-supported systems, can strengthen healthcare access and health education in rural Nigerian communities. In addition, diagnostic systems that apply artificial intelligence and machine learning techniques have shown promise in improving malaria detection and disease surveillance in Africa, demonstrating the relevance of AI for infectious disease prevention and control (World Health Organization, 2021). Overall, existing literature suggests that AI is transforming health promotion through personalized interventions, predictive analytics, and targeted digital health education campaigns. This dual impact positions AI as a valuable tool for improving health outcomes, particularly in rural areas where health inequities and healthcare access challenges remain prevalent.

The Role of AI in Health Promotion

The application of Artificial Intelligence (AI) in health promotion has attracted growing attention from scholars, policymakers, and health professionals. Contemporary literature shows that AI is revolutionizing both individual and population-level health promotion strategies by offering personalized interventions, supporting disease prevention, and addressing long-standing health disparities. This review synthesizes current evidence under five key themes:

i. AI for Personalized Health Promotion

One of the most significant contributions of AI to health promotion lies in its ability to deliver personalized and context-specific health education. Research has shown that AI-powered devices can engage in interactive conversations, provide timely reminders, and motivate individuals who are attempting to adopt healthier habits (Bickmore and Giorgino, 2006). By capturing and analyzing real-time personal data, these devices generate

tailored insights and individualized recommendations that encourage positive and sustained behavioral changes (Wang et al., 2023)

The emergence of generative AI tools such as natural language processing systems, chatbots, and automated data-processing platforms has significantly transformed the creation and delivery of health information. These technologies are increasingly being used to improve patient engagement and strengthen the effectiveness of health education interventions, which are essential for promoting long-term healthy behaviours (World Health Organization, 2024). Globally, studies have shown that AI-enabled mobile health applications improve dietary behaviors, physical activity, and medication adherence by customizing feedback to individual needs (Bates et al., 2020). Wearables like Fitbit and Apple Watch are notable examples that use AI to monitor activity levels and nudge users toward healthier choices through gamification and behavioral tracking (Topol, 2019).

In Nigeria, similar trends are emerging. Digital health startups such as WellNewMe integrate AI to provide preventive care insights to users, particularly in urban settings (Aririguzoh et al., 2021). Patel et al., (2015) also observed increasing adoption of wearable devices among Nigerian youths, highlighting their role in promoting fitness and wellness culture. These findings reinforce the global evidence that AI-driven personalization can enhance motivation, accountability, and long-term health outcomes. The personalization of health promotion not only improves engagement but also enhances self-efficacy, as individuals are more likely to act on information that is context-specific and relevant to their unique health profiles. In this sense, AI-enabled personalization aligns with global best practices in health education, which emphasize tailored interventions over generic one-size-fits-all approaches (World Health Organization [WHO], 2022).

ii. Disease Prevention and Early Detection

Another critical dimension of AI in health promotion lies in its role in disease prevention and early detection. AI technologies, particularly predictive analytics, have demonstrated significant potential in identifying risk factors before diseases manifest (Mirbabaie, Stieglitz, & Frick, 2021). For example, machine learning algorithms have been employed in analyzing large-scale health data to predict the likelihood of conditions such as diabetes, hypertension, and certain cancers (Topol, 2019). These predictive tools enable individuals and healthcare providers to adopt preventive strategies much earlier, thereby reducing the burden of disease progression.

Globally, AI-based disease surveillance systems have been instrumental in early detection of outbreaks and epidemics (MacIntyre et al., 2023). During the COVID19 pandemic, AI algorithms were used to model transmission patterns and predict hotspots, allowing governments and health organizations to deploy preventive measures effectively (Garfield, 2023). In the Nigerian context, Oni, Alabi, and Adewale (2021) developed AI-based models for malaria diagnosis and prediction, which proved valuable in reducing diagnostic errors and enhancing community-level prevention strategies. Similarly, Akeju et al., (2022) reported that AI-driven diagnostic support tools are being increasingly

deployed in rural health centers for maternal health monitoring and early detection of pregnancy-related complications.

Moreover, wearable AI devices have been used to generate early alerts for cardiovascular risks, such as irregular heart rhythms, thereby prompting timely medical consultations (Panch et al., 2019). For Nigeria and other sub-Saharan African nations, where the burden of both infectious and non-communicable diseases remains high, AI-based preventive interventions offer a promising avenue for bridging gaps in healthcare access and reducing premature mortality (WHO, 2021).

iii. Reducing Health Disparities and Promoting Equity

Health disparities remain a global concern, especially in low- and middle-income countries (LMICs) such as Nigeria (WHO, 2025). Vulnerable populations often face barriers to healthcare access due to geographical, financial, linguistic, and systemic inequalities. AI, however, offers innovative solutions to bridge these gaps. AI-powered telemedicine platforms, for instance, extend healthcare access to underserved rural communities by enabling remote consultations and health education programs (Iroanyah and Okeke, 2022).

Internationally, AI has been used to design culturally and linguistically appropriate health education content, thereby overcoming language barriers in multicultural societies (Chen et al., 2021). In Nigeria, AI-driven health education chatbots developed in local languages are being tested to promote maternal and child health literacy among women in rural areas (Ebenso et al., 2021). These interventions demonstrate the potential of AI in addressing inequities by ensuring that health promotion messages reach marginalized groups in a context-sensitive manner.

Furthermore, AI applications in global health promotion are increasingly tailored to align with equity-focused frameworks. For example, the WHO (2022) emphasizes the ethical integration of AI into health systems to prevent widening the digital divide. Without intentional equity strategies, there is a risk that AI could exacerbate existing disparities, as those with limited digital literacy or access to technology might be excluded from its benefits (Floridi et al., 2020). Nigerian scholars have also warned that socioeconomic inequalities and infrastructural limitations must be addressed to ensure that AI contributes meaningfully to health equity in Nigeria (Adigwe et al., 2024). In Nigeria, where rural populations face limited access to healthcare professionals, AI-enabled telemedicine platforms have become an important innovation. Studies have shown that telehealth solutions improve access to preventive consultations and strengthen healthcare delivery in underserved communities (Olufunlayo et al., 2023). However, challenges remain, particularly the digital divide, where poor internet connectivity, inadequate infrastructure, and limited digital literacy constrain the equitable adoption of AI and digital health technologies in rural settings (Ebenso et al., 2021).

iv. Public Health Surveillance

Artificial intelligence (AI) tools have become integral to public health surveillance by analyzing large datasets, including social media content, health records, and

environmental information, to detect potential disease outbreaks (MacIntyre et al., 2023). During the COVID-19 pandemic, AI played a critical role in tracking the spread of the virus, identifying misinformation, and enhancing the effectiveness of health communication campaigns both globally and within Nigeria (Adebisi et al., 2021). By providing real-time insights and predictive analytics, AI enables timely public health interventions, supports evidence-based decision-making, and strengthens the capacity of health systems to respond to emerging threats. By fostering inclusive access, generating locally relevant content, and reducing geographical barriers, AI serves as a tool not only for improving health outcomes but also for advancing social justice in healthcare delivery.

Application of Artificial Intelligence in Health Promotion

Artificial Intelligence (AI) is increasingly shaping the landscape of health promotion, enabling machines and computer systems to simulate human behavior such as perception, learning, reasoning, and decision-making. By leveraging advanced data processing and pattern recognition, AI systems can perform complex health-related tasks, including tracking behaviors, predicting risks, and providing personalized interventions. These systems can also engage users in context-sensitive interactions through messaging services, mobile applications, and websites, making health education and promotion more accessible and responsive (Panch, et al, 2018). AI encompasses the capacity of digital computers and computer-controlled systems to carry out tasks typically associated with human intelligence (Russell and Norvig, 2021). It replicates key intellectual processes such as reasoning, learning from past experiences, generalizing knowledge, and analyzing complex health data to inform decision-making (Copeland, 2024).

The effective application of AI in health promotion relies on several interconnected components (Kanade, 2022) listed the following components

i. Input (AI Technologies and Resources):

- a. Machine Learning (ML): AI applications that learn and improve automatically from past experiences without explicit programming.
- b. Deep Learning: A subset of ML that utilizes artificial neural networks to process large datasets and detect patterns.
- c. Neural Networks: Computer systems modeled loosely after human brain neural connections, facilitating deep learning capabilities.
- d. Cognitive Computing: Systems that mimic human thought processes to improve human-machine interactions through understanding language and interpreting images.
- e. Natural Language Processing (NLP): Tools that enable computers to comprehend, interpret, and generate human language and speech.
- f. Computer Vision: Techniques that allow machines to interpret and analyze visual data, including images, videos, graphs, and charts.

ii. Processes (AI-Supported Health Promotion Activities)

Artificial Intelligence (AI) has emerged as a transformative tool in health promotion, providing innovative approaches to improve education, monitor behaviors, support decision-making, and enhance engagement. These processes are central to strengthening public health systems and addressing both communicable and non-communicable diseases, particularly in low- and middle-income countries such as Nigeria which includes; health education, behavioural monitoring, decision support, engagement and interaction

iii. Output (Health Promotion Outcomes)

The integration of Artificial Intelligence (AI) into health promotion activities is expected to generate tangible and measurable outcomes that directly contribute to improved population health, particularly in underserved and rural communities. These outcomes align with global health promotion objectives while addressing challenges such as limited resources, low health literacy, and weak health systems. Key anticipated outcomes include:

- a. **Increased Health Knowledge and Awareness:** AI-driven platforms enhance the dissemination of accurate, culturally relevant, and context-specific health information. By delivering health messages in local languages and simplifying complex medical terms, these technologies improve comprehension and retention of key health concepts (WHO, 2021; Mesko and Györfy, 2019). In rural populations, where health literacy levels are often low, this results in greater awareness of hygiene practices, nutrition, maternal and child health, and preventive measures against communicable and non-communicable diseases. The outcome is an informed community that is better equipped to take proactive steps toward safeguarding health (WHO, 2019).
- b. **Improved Adoption of Preventive Behaviors:** Sustained behavior change is one of the most significant outcomes of AI-supported health promotion. Through behavioral monitoring, personalized feedback, and motivational prompts, individuals are encouraged to adopt healthier lifestyles (Ebenzo et al., 2021). For instance, AI systems can send reminders about vaccination appointments, reinforce sanitation practices such as handwashing and safe water use, and promote adherence to medication regimens (Adebayo et al., 2022). These interventions strengthen preventive healthcare behaviors, thereby reducing the risk of disease transmission and improving community-level resilience.
- c. **Early Detection and Reporting of Health Issues:** AI enables real-time surveillance and predictive analysis of health data, which supports early identification of emerging health problems. Wearable devices, mobile applications, and AI-powered chatbots can detect early warning signs of diseases, prompt timely self-reporting, and recommend immediate medical attention (Okonkwo and Ume, 2024). This not only prevents the progression of illnesses but also reduces delays in treatment-seeking behaviors. In rural communities, where health facilities may be scarce, early detection and reporting facilitated by AI

contribute significantly to reducing disease prevalence and associated mortality rates (PAHO and WHO, 2019).

d. **Enhanced Efficiency of Health Workers through Decision Support:** AI provides frontline health workers with intelligent decision support systems, thereby improving diagnostic accuracy, treatment planning, and patient management. By automating routine tasks such as record-keeping, appointment scheduling, and basic triage, AI allows health workers to dedicate more time to direct patient care. In addition, predictive analytics and evidence-based recommendations assist health workers in prioritizing high-risk cases and allocating scarce resources more effectively (Odugbemi et al., 2021). This improves overall efficiency, reduces burnout, and enhances the quality of healthcare delivery.

iv. Feedback Loop

- a. A critical component is the feedback mechanism, which ensures that AI-driven health promotion interventions remain dynamic, responsive, and tailored to the evolving needs of rural communities. The feedback loop functions by collecting, analyzing, and reintegrating community-level data into the design and delivery of health promotion strategies.
- b. AI-enabled platforms such as mobile health applications, wearable devices, and conversational chatbots collect real-time data on health behaviors, service utilization, and user experiences. This information is then processed using machine learning algorithms to identify trends, gaps, and barriers in health promotion programs (Ebenzo et al., 2021). For instance, if monitoring data shows low uptake of vaccination reminders in a particular community, AI systems can adjust strategies by shifting to local-language voice prompts or community-based engagement models.
- c. The feedback loop is particularly relevant in rural Nigeria, where health needs are heterogeneous and influenced by cultural practices, literacy levels, and resource availability. A case example is the HelloMama project, which used user feedback on message clarity and language preference to refine maternal health messages, resulting in improved adoption of antenatal care practices (UNICEF and FMoH, 2018). By leveraging such iterative processes, AI transforms health promotion into an adaptive system rather than a static intervention.
- d. Collectively, these components highlight the multifaceted nature of AI and its capacity to transform human-computer interaction, decision-making, and data-driven problem-solving. In the Nigerian context, where health education and promotion face challenges such as limited access to resources and information, AI offers a transformative solution. By providing personalized, real-time feedback and facilitating interactive learning, AI can improve awareness, influence healthy behaviors, and enhance the overall effectiveness of health promotion interventions. As such, AI is not only a technological innovation but also a critical enabler for advancing public health, particularly in underserved communities.

Contextual factors inhibiting the use of Artificial Intelligent

While Artificial Intelligence (AI) offers significant potential in health promotion, its effectiveness in rural communities is moderated by several contextual factors. These factors influence the extent to which AI-driven interventions can be successfully implemented, adopted, and sustained. Recognizing and addressing these challenges is critical for achieving equitable health outcomes.

- i. **Infrastructure Limitations:** The success of AI interventions is heavily dependent on the availability of basic infrastructure such as stable electricity, internet connectivity, and access to affordable digital devices. In many rural areas of Nigeria and other low- and middle-income countries (LMICs), irregular power supply and limited broadband penetration constrain the functionality of mobile health applications and wearable devices (Akinyemi and Adejumo, 2021). Without reliable infrastructure, the scalability and continuity of AI-supported health promotion programs remain at risk. Investments in rural electrification, mobile network expansion, and provision of low-cost digital devices are therefore essential enablers.
- ii. **Socio-Cultural Factors:** Literacy levels, language diversity, and traditional health beliefs significantly affect the acceptance and effectiveness of AI-based health promotion. Low digital literacy can hinder the use of mobile applications, while language barriers may prevent communities from fully engaging with digital and AI-generated health content (World Health Organization, 2021). Additionally, traditional beliefs about disease causation and treatment may contribute to resistance toward technology-based medical advice, particularly in rural and underserved communities (Ebenso et al., 2021). Designing culturally sensitive AI tools that incorporate local dialects, voice interfaces, and community-driven approaches can help overcome these barriers and improve trust and participation.
- iii. **Policy and Support Systems:** The presence of supportive policies, governance structures, and community involvement plays a pivotal role in the success of AI in health promotion. Government endorsement and regulatory frameworks are necessary to ensure ethical use of AI, protect patient data, and integrate AI tools into national health strategies (WHO, 2021). In Nigeria, supportive health policies and donor-driven initiatives have begun to encourage digital health adoption, but challenges such as inadequate funding and weak regulatory mechanisms persist (Odugbemi et al., 2021). Community ownership and local leadership support are equally important, as they foster sustainability and increase the credibility of AI-based programs.

Challenges and Ethical Considerations

Despite the potential of artificial intelligence (AI) to enhance health promotion, its adoption faces several significant challenges and ethical considerations. Data privacy is a primary concern, as large-scale collection and processing of personal health information can compromise patient confidentiality and raise ethical questions regarding consent and data security (Floridi et al., 2018). To mitigate these risks, it is essential to implement robust

data protection frameworks, enforce strict access controls, and ensure that AI systems comply with national and international privacy regulations.

The digital divide further limits equitable access, particularly in rural Nigerian communities where inconsistent internet connectivity and low digital literacy impede the effective use of AI-driven health tools (Ebenso et al., 2021). Addressing this challenge requires investment in digital infrastructure, mobile health platforms that can operate offline, and community-based digital literacy programs to ensure inclusive adoption.

Algorithmic bias is another critical concern, as AI systems trained on unrepresentative or biased datasets may inadvertently reinforce existing health inequalities (Mehrabian et al., 2021). Mitigation strategies include using locally relevant datasets, continuously monitoring AI outputs for bias, and involving multidisciplinary teams in system design to ensure cultural and contextual appropriateness.

Finally, there is the risk of overdependence on technology, which may overshadow human-centered approaches, such as community engagement, interpersonal health counseling, and culturally sensitive interventions. Balancing AI integration with traditional health promotion methods ensures that technological solutions complement, rather than replace, the human element essential for sustainable behavior change.

Implications for Contemporary Society

Artificial intelligence (AI) has significant implications for contemporary public health in rural areas, particularly in strengthening preventive health systems and promoting equitable access to health education. Artificial Intelligent technologies support Universal Health Coverage (UHC) by delivering low-cost, scalable health promotion and education interventions, allowing wider reach to underserved populations in both urban and rural settings (WHO, 2021). Through predictive analytics and personalized recommendations, AI can reduce healthcare costs by emphasizing preventive measures over curative treatments, thereby lowering the burden on healthcare infrastructure and resources (Topol, 2019). Moreover, AI enhances population health literacy by providing accessible, timely, and tailored health information, enabling individuals to make informed decisions about their lifestyles and risk behaviors (WHO, 2021; Mesko and Györfy, 2019). By analyzing patterns in behavior, environment, and health data, AI empowers individuals and communities with data-driven decision-making tools, fostering proactive engagement in healthy living (Panch et al., 2018). In developing countries such as Nigeria, where healthcare resources are often limited, these AI-driven interventions can bridge gaps in knowledge and access, promoting equitable health outcomes and supporting community resilience against disease outbreaks.

Overall, the integration of AI into health promotion not only improves individual health behaviors but also contributes to broader societal benefits, including cost-efficient healthcare delivery, strengthened public health infrastructure, and enhanced population-level preventive capacities (Floridi et al., 2018; Ogunyemi et al., 2022).

Conclusion

Artificial intelligence (AI) offers transformative potential in strengthening health education and promoting improved health outcomes in rural communities. This paper argues that AI can bridge gaps in healthcare access by delivering personalized, accessible, and preventive health information, particularly in underserved populations. AI-powered tools, such as chatbots, mobile platforms, and predictive systems, can enhance early detection of risks, support community health workers, and foster sustained behavior change. While challenges such as infrastructural limitations, ethical concerns, and cultural barriers persist, they can be addressed through strategic investment, strong policy frameworks, and participatory approaches. The paper concludes that integrating AI into rural health promotion is not only a technological advancement but also a moral imperative toward achieving equitable global health outcomes. Based on the findings of the study and conclusion, the following recommendations are made;

- i. The Nigerian government, private sector, and development partners should invest in reliable internet, stable electricity, and affordable digital devices to improve access to AI-based health tools, especially in rural areas.
- ii. AI health interventions in Nigeria should be integrated with primary healthcare services, community health workers, and culturally appropriate communication strategies to improve trust and effectiveness.
- iii. In Nigeria, digital literacy programs should be expanded in rural communities, and healthcare workers should be trained to effectively use AI tools to improve health promotion and service delivery.

References

- Adigwe, O. P., Onavbavba, G., & Sanyaolu, S. E. (2024). *Exploring the matrix: Knowledge, perceptions and prospects of artificial intelligence and machine learning in Nigerian healthcare*. <https://doi.org/10.3389/frai.2023.1293297>
- Akeju, D., Okusanya, B., Okunade, K., Ajepe, A., Allsop, M. J., & Ebenso, B. (2022). *Sustainability of the effects and impacts of using digital technology to extend maternal health services to rural and hard-to-reach populations*. <https://doi.org/10.3389/fqwh.2022.6965>
- Akinyemi, O., & Adejumo, O. (2021). Digital health in Nigeria: Infrastructure challenges and opportunities for scale-up. *Journal of Global Health Reports*, 5(e2021032), 1–8.
- Aririguzoh, S., Amodu, L., Sobowale, I., Ekanem, T., & Omidiora, O. (2021). *Achieving sustainable e-health with information and communication technologies in Nigerian rural communities*. *Cogent Social Sciences*, 7(1). <https://doi.org/10.1080/23311886.2021.1887433>
- Bates, D. W., Landman, A., & Levine, D. M. (2020). Health apps and health policy: What is needed? *JAMA*, 320(19), 1975–1976. <https://doi.org/10.1001/jama.2018.14378>
- Bickmore, T. W., & Giorgino, T. (2006). Health dialog systems for patients and consumers. *Journal of Biomedical Informatics*, 39(5), 556–571. <https://doi.org/10.1016/j.jbi.2005.12.004>

- Ebenso, B., Okusanya, B., Okunade, K., Akeju, D., Ajepe, A., Akaba, G. O., Yalma, R. M., Dirisu, O., Tukur, J., Abdullahi, M. K., Okuzu, O., & Allsop, M. J. (2021). *What are the contextual enablers and impacts of using digital technology to extend maternal and child health services to rural areas?* <https://doi.org/10.3389/fgwh.2021.670494>
- Health Systems Development Fund (2024). Trends in Healthcare – AI Spotlight. HSDF. healthcare. *Nigerian Journal of Medical Informatics*, 14(1), 60–70. <https://hsdf.org.ng/trends-in-healthcare-ai-spotlight/>
- Iroanyah, C., & Okeke, P. (2022). Telemedicine and artificial intelligence in Nigerian primary *Journal of Public Health in Africa*, 12(1), 1523.
- Lin, Q., & Chen, Z. (2022). Virtual health assistants in chronic disease management: A systematic review. *Digital Health*, 8, 1–15.
- MacIntyre, C. R., Chen, X., Kunasekaran, M., Quigley, A., Lim, S., Stone, H., Paik, H. Y., Yao, L., Heslop, D., Wei, W., Sarmiento, I., & Gurdasani, D. (2023). *Artificial intelligence in public health: The potential of epidemic early warning systems.* *Journal of International Medical Research*, 51(3). <https://doi.org/10.1177/03000605231159335>
- Mesko, B., & Györfy, Z. (2019). *The rise of the empowered physician in the digital health era: Viewpoint.* *Journal of Medical Internet Research*, 21(3), e12490. <https://doi.org/10.2196/12490>
- Mirbabaie, M., Stieglitz, S., & Frick, N. R. J. (2021). *Artificial intelligence in disease diagnostics: A critical review and classification on the current state of research guiding future direction.* *Health and Technology*, 11, 693–731. <https://doi.org/10.1007/s12553-021-00555-5>
- Nwoye, E. O., Fidelis, O. P., & Ogunolu, O. (2020). *Wearable infra-red pre-screening smartbra for early detection of breast cancer.* *Nigerian Journal of Technology*, 39(2), 506–513. <https://doi.org/10.4314/njt.v39i2.21>
- Odugbemi, T., Ojo, A., & Adeyemi, A. (2021). Leveraging mobile health technologies to improve community health engagement in Nigeria. *Nigerian Journal of Clinical Practice*, 24(6), 789–796.
- Okanlawon, A. J., Moronkola, O. A., & Iyanda, A. B. (2025). AI-Driven Healthcare: Assessing the impact of artificial intelligence in health education, health promotion and health management of Athletes. *Nigerian School Health Journal*, 37(2). Retrieved from <https://journal.shepan.org/index.php/NSHJ/article/view/202>
- Okonkwo, I. C., & Ume, C. A. (2024). Artificial intelligence and primary healthcare delivery in Sub-Saharan Africa. *BMC Health Services Research*, 24, 118.
- Olufunlayo, T. F., Ojo, O. O., Ozoh, O. B., Agabi, O. P., Opara, C. R., Taiwo, F. T., Fasanmade, O. A., & Okubadejo, N. U. (2023). *Telemedicine ready or not? A cross-sectional assessment of telemedicine maturity of federally funded tertiary health institutions in Nigeria.* *Digital Health*, 9. <https://doi.org/10.1177/20552076221150072>
- Pan American Health Organization (PAHO) & World Health Organization (WHO). (2019). *Health Promotion: Concepts and Principles.* WHO.

- Panch, T., Szolovits, P., & Atun, R. (2018). *Artificial intelligence, machine learning and health systems*. *Journal of Global Health*, 8(2), 020303. <https://doi.org/10.7189/jogh.08.020303>
- Patel, M. S., Asch, D. A., & Volpp, K. G. (2015). Wearable devices as facilitators, not drivers, of health behaviour change. *JAMA*, 313(5), 459–460. Retrieved from <https://doi.org/10.1001/jama.2014.14781>
- Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson. Sub-Saharan Africa. *BMC Health Services Research*, 24, 118.
- Topol, E. (2019). High-performance medicine: The convergence of human and artificial intelligence. *Nature Medicine*, 25(1), 44–56.
- UNICEF & Federal Ministry of Health (FMoH). (2018). HelloMama Project: Mobile health messaging for maternal and child health in Nigeria. Abuja: UNICEF.
- Wang, L., Miller, L. C., Just, M., & Horvath, K. J. (2023). Artificial intelligence in health behavior intervention: A systematic review and meta-analysis. *Journal of Medical Internet Research*, 25, e45793. <https://doi.org/10.2196/45793>
- Wellvis. (2024). *Digital health and telemedicine services in Nigeria*. Retrieved from [Wellvis Official Website](#)
- World Health Organization. (2019). Health promotion and the Sustainable Development Goals: A framework for action.
- World Health Organization. (2021). Ethics and governance of artificial intelligence for health.
- World Health Organization. (2022). *Global strategy on digital health 2020–2025*. World Health Organization.
- World Health Organization. (2024). *Ethics and governance of artificial intelligence for health: Guidance on large multi-modal models*. World Health Organization.