AI IN COMMUNITY HEALTH MONITORING AND EARLY WARNING SYSTEMS

Kesiena Temisere-Bethel & Doris Eseoghene, Ikogho
Department of Health and Safety Education, Delta State University, Abraka.

Abstract
AI is a transformative tool in global health and education, which is contributing to the rapid shift from conventional reactive practices to proactive data-driven approaches, leading to improvement in these sectors. In many high-income countries, AI has been efficient in rendering assistance to disease detection, remote monitoring, treatment optimization, and personalized learning experiences. However, the adoption of AI has not yet reached a comparable level in some countries thus, this study investigated how AI can be leveraged upon the Nigerian context to enhance community health monitoring and early warning systems within the domain of health education and preventive practice. Drawing on recent literature and case examples, the paper specifically identified and discussed the current applications of AI technologies for community health monitoring and early warning and examined the barriers and enablers to implementing AI-driven monitoring and early warning systems for community health education. The results revealed that although there have been some early AI applications in Nigerian health and educational system, a large portion of the community health education sector is still ill-prepared to incorporate AI tools into monitoring and early warning systems. Low digital literacy, disjointed data systems, inadequate infrastructure, and a lackluster integration of AI into health education practices are major obstacles. In conclusion, the paper highlighted the significant role of artificial intelligence in strengthening community health monitoring systems. Also, that integrating AI innovations with community health education frameworks can enhance community resilience, strengthen preventive health measures, and support the early identification of potential health risks. Additionally, the potential of multi-source environmental and health data platforms, alongside educational partnerships, demonstrates promising opportunities for improved capacity development and more responsive community health systems.

Keywords: Artificial intelligence, Community health monitoring, Early warning systems, Health education, Community health, Nigeria

Introduction
Globally, Artificial Intelligence (AI) is recognized as a revolutionary force across various fields, and sectors, including education and health. In many high-income settings, AI is transforming the way health services are provided, especially in specialist care (Schwalbe & Wahl, 2020), detecting/monitoring diseases, including medical diagnosis and treatment management (Lee et al., 2024). One of the tactics for enhancing community health systems (CHS) is the enhancement of health care delivery at the local level, as stated in the Nigerian 2016 National Health Policy document (Ozor, Etiaba, &Onwujekwe, 2024). As a concept, the idea of a community health system is still developing, hence, there is no

agreement on its definition. The notion of community health, which stresses the value of multidisciplinary approaches, community involvement, and local and international initiatives to understand and improve health outcomes, therefore, encompasses all of a population's different determinants of health (Chuah et al., 2018; WHO, 2023). Schneider and Lehmann in Egan et al., (2017) defined community health as the collection of local actors, relationships, and processes involved in promoting, and sustaining health in households and communities that are not part of but have a connection to formal health structures. However, the health system in Nigeria is lagging behind at the community level.In fact, the concept of community health system is far-fetched from the reality. The health system in Nigeria has yet to establish a distinct between CHS and the primary healthcare (PHC) system, while both concepts have occasionally been used interchangeably (Egan et al., 2017).

There is a disconnect between the data's accessibility and its conversion into prompt preventive measures or early health threat detection (Okanlawon et'al, 2025). These difficulties are made worse by the fact that many environmental, community, and school health educators work with little access to digital platforms that could aid in early risk assessment or behaviour modification, or real-time monitoring technologies (Ezema et al., 2025). Modern epidemic surveillance systems have been created to identify early indicators of epidemics by analyzing open-source data, such as news stories and social media data, thanks to the quick development of AI and machine learning algorithms (MacIntyre et al., 2023). In rural areas, for instance, AI-enabled remote patient monitoring has been demonstrated to facilitate ongoing monitoring and early identification of deterioration in disorders including diabetes and cardiovascular diseases (Igwama et al., 2023). Therefore, incorporating AI into community health monitoring and early warning is in line with global public health priorities, which include using data analytics to support public health decision-making, detecting health threats earlier, and using resources more efficiently.

While many developed nations have used AI in their health and education systems, Nigeria has a large number of community-level health data systems, but their use for targeted intervention, early warning, and preventive education is still limited (Ogunboye et al., 2023). This can lead to missed opportunities for early warning that could stop outbreaks or intensify preventative action, poor health literacy, delayed detection of new health hazards, and limited scalability of preventive educational initiatives. Thus, in line with the background of the study, this study investigates how AI can be leveraged to enhance, community health monitoring and early warning systems within the context of health education and preventive practice in Nigeria. The objectives of the paperwere: (a) to identify current applications of AI technologies for community health monitoring and early warning; and (b) to examine the barriers and enablers to implementing AI-driven monitoring and early warning systems for community and environmental health education.

Artificial Intelligence

Artificial intelligence (AI) has evolved into a suite of transformative technologies revolutionizing clinical practice, public health monitoring, and education. According to the

World Health Organization (WHO, 2021), AI refers to "the performance by computer programmes of tasks that are commonly associated with intelligent beings." It involves algorithms that learn from data to perform automated tasks without explicit human programming (Nutbeam& Milat, 2025). AI encompasses diverse methodologies such as computer vision, natural language processing, and machine learning, which are useful for pattern recognition, prediction, and large-scale data analysis (David-Olawade et al., 2025).

AI is increasingly viewed as a tool capable of transforming health systems. Machine learning (ML), natural language processing (NLP), and computer vision now perform tasks such as image interpretation, automated triage, predictive risk stratification, and data synthesis. AI has been applied to disease diagnostics, infectious disease forecasting, and drug discovery. It also enhances Health Professions Education (HPE) through simulations, virtual reality (VR), and AI-powered training environments. Systematic reviews confirm AI's diagnostic and operational gains while emphasizing the need to address generalizability, bias, and governance challenges (Panteli et al., 2025). The WHO warns that without equitable access and sound data governance, AI may reinforce existing disparities. Moreover, overreliance on AI tools could reduce learners' critical thinking and clinical reasoning (Lucas et al., 2024).

In education, AI's presence spans decades, from rule-based algorithms and expert systems to modern generative AI models. It supports reasoning, decision-making, and adaptive learning, while fostering dynamic and community-oriented educational environments (Zysberg& Schwabsky, 2021). The advent of ChatGPT and similar systems like DeepSeek, Claude, Gemini, and Copilot has redefined digital learning in what is now termed the post-ChatGPT era (Garzón et al., 2025). AI-based analytics tools can assess students' progress and personalize instruction.

AI can also advance health literacy by tailoring interventions to cultural and linguistic contexts. Integrating AI literacy into health curricula is vital for future health workers to responsibly interpret AI outputs. However, studies in Nigeria show varying levels of AI readiness among students and health workers, highlighting the need for capacity building to ensure safe community-level adoption (David-Olawade et al., 2025). Altogether, these developments position AI as a driver of proactive, data-driven healthcare and education, provided that infrastructure, governance, and workforce competencies are adequately supported.

Community Health as a Concept

Individual members' health and illness are influenced by a community's infrastructure and resources, but focusing on the general well-being of the community benefits everyone (Richardson & Dubé, 2022). Communities are essential providers, coordinators, and custodians of health care in addition to being its recipients (WHO, 2025a). A community's general safety can significantly affect its general health in either a positive or bad way (Richardson & Dubé, 2022). Community members provide vital services, facilitate continuity of care, and close gaps between the people they serve and official health systems worldwide (WHO, 2025a). Communities are essential for promoting health, preventing sickness, and reacting to emergencies. This includes skilled community health

professionals, traditional caregivers, local volunteers, and peer support networks (WHO, 2025a). Since community health services encompass a wide variety of activities, it can be challenging to define them precisely, with localities having different service configurations and scopes. They are offered by numerous professional groups and typically address a broad range of needs for individuals of various ages (Charles & Wickens, 2024).

A defined population, accessibility and acceptability of services, a focus on prevention and health promotion, active community participation, and multisectoral integration of services with primary care and broader social determinants are the characteristics that define community health (Charles & Wickens, 2024). A whole-of-society approach that brings necessary services, multisectoral actions, and community engagement closer to where people live and work is emphasized in the World Health Organization's contemporary framing of primary health care (PHC) and community health. This places community health as the operational backbone for achieving universal health coverage and many Sustainable Development Goals (WHO, 2025b). This conceptualization emphasize the need of considering community health within its larger social, environmental, and economic contexts and places local actors, such as community health workers, volunteers, local NGOs, and schools, as key implementers of prevention, surveillance, outreach, and education. Thus, communities that focus on public health can reduce inequality and reduce health disparities from race or ethnicity, social status, income, and any other issues discovered in this community (Richardson & Dubé, 2022).

Theoretical Review

Behavioral Change Theory (BCT)

Behavioral change theory, include a variety of models that highlight beliefs, attitude, self-efficacy, social factors, and environmental cues. El Kirat et al., (2024), affirms that motivation, ability, prompt or cue, and the larger sociotechnical environment are all important factors in behaviour change in health context. Thus, one of the foundational approaches in BCT, is that, it provides insight into how, why and when people adopt new health habits or preventive practices. According to Sharma, Awan and Kapukotuwa (2024), interventions based on behavioural change theory have demonstrated efficacy in encouraging preventive behaviors in a variety of areas, such as community health education, vaccination uptake, and non-communicable illnesses. When new technologies, like AI-driven monitoring systems, are included into community health systems, the significance of this notion is further highlighted. Without considering how people will interact with, trust, understand, and respond to AI-generated data, the technical advancement would not reach its full preventive potential.

BCT help conceptualize how community members and health educators' transition from prior states (for example, limited awareness or passive risk-behaviours) to proactive engagement with health monitoring, risk-recognition, and preventive action. A number of systematic reviews show that interventions anchored in behavior change models tend to yield better outcomes than those lacking a theoretical basis (Sharma et al., 2024). BCT emphasis that the mere availability of information does not guarantee behaviour change; factors such as perceived risk, perceived benefit, social norms, self-

efficacy, and the structural environment are equally critical. Consequently, merely installing sensors or mobile applications won't guarantee adoption unless community members think the system is beneficial, feel comfortable using it, and have faith in the usefulness of its results. Thus, behavioral change theory offers the framework for developing, putting into practice, and assessing AI-based monitoring systems in a way that promotes actual behavioural uptake and preventive results.

AI in Community Health Monitoring

According to Zeng et al., (2021), the integration of AI into community health monitoring and surveillance, marks a transformative shift in public health from reactive, facility-based systems to proactive, data-driven, and community-centered surveillance. AI makes it possible to continuously gather, analyze, and interpret behavioural, environmental, and health data, which improves illness prevention and early detection. Artificial intelligence (AI)-powered systems examine vast datasets, including as biological, socioeconomic, and meteorological data, to identify new health risks and facilitate prompt grassroots responses. As an example of how mobile-based AI tools can facilitate real-time disease surveillance in low-resource settings, an AI-assisted diagnostic interpretation system for malaria rapid diagnostic tests (RDTs) in Kenya obtained a weighted F1 score of 0.975 and a Cohen's Kappa of 0.92 (Bahati et al., 2025).

Among AI's most important contributions to community health monitoring are machine learning (ML) and predictive modeling. In Ghana, Aheto et al. (2021) identified age, anemia status, and rural location as important predictors of malaria prevalence among children under five using machine learning techniques like LASSO, Ridge, and Elastic Net regression. In a similar vein, Adamu (2021) evaluated a number of machine learning algorithms, including Random Forest, Support Vector Machine, and Decision Tree, and discovered that the Random Forest approach had the best predictive accuracy (97.72%) for predicting malaria cases. These strategies enable decision-makers to foresee epidemics, distribute resources for prevention, and carry out prompt responses.

The predictive uses of AI are not limited to vector-borne illnesses. Daisy et al. (2020) showed how AI time-series models might be used to study climate factors like temperature and rainfall in order to forecast cholera outbreaks in Dhaka, Bangladesh. Similarly, Degadwala, Vyas, and Soni (2024) forecasted cholera incidence using hybrid Random Forest and Polynomial Regression approaches, using socioeconomic and environmental factors to improve accuracy. Perez-Saez et al. (2022) used Bayesian modeling to examine cholera seasonality at the continental level in sub-Saharan Africa, connecting outbreaks to changes in temperature, rainfall, and flooding. When taken as a whole, these studies demonstrate how AI-powered prediction models may pinpoint environmental triggers, enhance readiness, and direct the allocation of medical resources.

Beyond forecasting, AI technologies improve screening and health accessibility in marginalized areas. Even in places where access to doctors is limited, smartphone-based AI diagnostic systems can evaluate sensor data for early disease identification. According to Mantena et al. (2021), these mobile platforms can identify medical issues at a low cost and large scale, which is important in nations like Tanzania where more than 80% of

people may never visit a doctor. In a similar vein, Panahi and Farrokh (2025) emphasized how telemedicine, real-time patient monitoring, and customized health education initiatives for rural communities provide proactive, individualized, and equitable healthcare when AI and IT are integrated.

Syndromic surveillance systems, which combine various data streams, hospital visits (Burkom et al., 2021), pharmacy sales, internet search trends, and social media (Aiello et al., 2020), in order to detect new health abnormalities, are another example of how AI can be used to monitor community health (Xu & Beard, 2021). These technologies identify anomalous disease clusters and notify public health authorities in real time using heuristic algorithms and machine learning (Zeng et al., 2021). By enabling constant, localized monitoring of health indicators, the combination of AI with Internet-of things (IOT)devices and mobile data improves surveillance even further (Zeng et al., 2021). Thus, the applications of AI in community health monitoring, from syndromic and IoT-based surveillance to smartphone diagnostics and predictive modeling, show how data-driven strategies might revolutionize the identification and treatment of health issues. AI technologies have the potential to promote health inequities, prevent disease, and build robust community health systems by fusing real-time data with local action.

AI in Early Warning System

An innovative approach to disease prevention and outbreak response is the use of artificial intelligence (AI) in early warning systems (EWS) and community health monitoring. While AI-powered predictive analytics have made it possible to detect health concerns in real time through continuous data processing and pattern identification, traditional surveillance systems frequently rely on delayed case reporting (Villanueva-Miranda et al., 2025). A narrative review by Mendes et al. (2025) highlighted how AI-based systems such as *BlueDot* successfully integrated diverse data sources to detect the emergence of COVID-19 ahead of formal international alerts. Also, in Tanzania's Ministry of Health implemented an AI-powered alert-triage module within the *District Health Information Software 2 (DHIS2)* platform, reducing average triage time from 36 hours to near real-time analysis and enabling faster identification and tracking of outbreak signals (University of Oslo & HISP, 2025). Globally, DHIS2-based systems now incorporate AI analytics to support emergency preparedness, event-based surveillance, and automated alerts (Abdelrahman et al., 2024). However, another review indicate that the success of AI integration depends not only on algorithmic accuracy but also on data governance, interoperability, and alignment with existing health workflows (University of Oslo & HISP, 2025). A pilot project combining climate-informed early warning with DHIS2 found that the absence of integrated data pipelines limited sustainability, highlighting that technical innovation must be matched with organizational and infrastructural readiness (Zerfu et al., 2025).

The human element of AI-driven early warning is equally important. In order to comprehend and operationalize AI-generated findings, community health workers (CHWs), educators, and district surveillance officers play a crucial role. By gathering data, maintaining AI tools, and tying digital insights to conventional healthcare services, CHWs

play a "pivotal role in implementing AI-based health solutions," according to Emeihe (2024). AI alarms run the risk of being ignored or misinterpreted if they are not interpreted by humans. The usefulness and adoption of AI-generated alerts are also strongly impacted by trust, comprehensibility and workflow integration, according to research by Henzler et al. (2025). This emphasizes that technology by itself cannot guarantee efficient illness monitoring; rather, human comprehension, training, and contextual adaptability are necessary for its effectiveness.

Obstacles to Application of AI in Community Health

Although artificial intelligence (AI) holds great promise for community health monitoring and early warning systems, major technological and infrastructural barriers persist, especially in low- and middle-income countries (LMICs) like Nigeria. Key challenges include inadequate digital infrastructure, unstable electricity, poor internet connectivity, outdated hardware, and fragmented health data systems (Mwogosi et al., 2025). Many rural health facilities still rely on paper-based records, making real-time data capture and integration into AI pipelines difficult (Muñoz Parry & Aneja, 2022). Even where digital systems exist, weak interoperability, limited computational capacity, and poor connectivity restrict scalability and performance (Oguche et al., 2025).

Ethical and privacy issues also constrain AI's application in community health. As AI draws on mobile data, sensors, and social media, the risks of re-identification, bias, and exclusion increase (Suarjana et al., 2023). Models trained on urban or homogeneous populations often perform poorly in rural or culturally diverse settings (Mwogosi, 2025). Weak regulatory and governance frameworks further obscure issues of consent, accountability, and transparency (Kaushik et al., 2025). Low digital literacy among health workers and communities compounds these challenges. Many lack skills to interpret AI-generated data or use digital tools effectively (Kaushik et al., 2025; Moyo, 2025). Furthermore, limited funding, unsustainable financing, and weak policy frameworks hinder progress, keeping many AI initiatives from scaling beyond pilot stages (Hassan et al., 2024; Salihu, 2024; Mukherjee, 2025).

Conclusion and Recommendations

Though AI has the potential to transform early warning systems and community health monitoring, its success is far from assured. The implementation and scaling of AI solutions in community health, particularly in LMICs, are complicated by a number of factors, including lack of financing and policy support, ethical and privacy concerns, low digital literacy and capacity, and technological and infrastructure deficiencies. More than just creating better algorithms is needed to address these issues; long-term funding models, governance, workforce development, infrastructure, and equity-focused design must all be invested in. To guarantee that AI becomes a tool of empowerment rather than a cause of increasing inequality, Nigeria must match AI programs with local realities, build skills at the community level, establish clear ethical and legal frameworks, and secure sustainable financing.

References

Abdelrahman, H. H., Hamza, M., Essam, W., Adham, M., AbdulKafi, A., &Baniode, M. (2024).Electronic oral health surveillance system for Egyptian preschoolers using District Health Information System (DHIS2): Design description and time motion study. *BMC Oral Health, 24*(1), 807. https://doi.org/10.1186/s12903-024-01807-4

Adamu, Y. A. (2021). Malaria prediction model using machine learning algorithms. *Turkish Journal of Computer and Mathematics Education 12*(10), 7488–7496. https://doi.org/10.17762/turcomat.v12i10.2234

Aheto, J. M. K., Duah, H. O., Agbadi, P., &Nakua, E. K. (2021). A predictive model, and predictors of under-five child malaria prevalence in Ghana: How do LASSO, Ridge and Elastic net regression approaches compare? *Preventive Medicine Reports, 23,* 101475.

Aiello, A. E., Renson, A., &Zivich, P. N. (2020). Social media–and internet-based disease surveillance for public health. *Annual Review of Public Health, 41*, 101–118. https://doi.org/10.1146/annurev-publhealth-040119-094402

Sharma, M., Awan, A., &Kapukotuwa, S. (2024). Mini review: possible role of the multi-theory model of health behavior change in designing substance use prevention and treatment interventions. *Frontiers in Public Health*, *12*, 1298614.

Bahati, F., Owuor, K. O., Milimo, E., Onyuka, N., K'Oloo, A., Koyuncu, C., Gomez, P., Maricich, N., Frade, S., Smedinghoff, S., Schutte, L., Houben, N., Owino, W., Dayoo, L., Ganda, G., Kariuki, S., Reboud, J., Cooper, J. M., & Rinke de Wit, T. F. (2025). Artificial intelligence (AI)-driven rapid diagnostic test interpretation in a Connected Diagnostics (ConnDx) system for dynamic malaria surveillance. *BMC Digital Health*, 3, Article 62. https://doi.org/10.1186/s44247-025-00197-x

Burkom, H., Loschen, W., Wojcik, R., Holtry, R., Punjabi, M., Siwek, M., & Lewis, S. (2021). Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE): Overview, components, and public health applications. *JMIR Public Health and Surveillance, 7*(6), e26303. https://doi.org/10.2196/26303

Charles, A., & Wickens, C. (2024). *Community health services explained*. The King's Fund. https://www.kingsfund.org.uk/insight-and-analysis/long-reads/community-health-services-explained#what-are-community-health-services?

Chuah, F. L. H., Srivastava, A., Singh, S. R., Haldane, V., Koh, G. C. H., Seng, C. K., ... &Legido-Quigley, H. (2018). Community participation in general health initiatives in high and upper-middle income countries: a systematic review exploring the nature of participation, use of theories, contextual drivers and power relations in community participation. *Social Science & Medicine*, *213*, 106-122.

Daisy, S. S., Saiful Islam, A. K. M., Akanda, A. S., Faruque, A. S. G., Amin, N., & Jensen, P. K. M. (2020). Developing a forecasting model for cholera incidence in Dhaka megacity through time series climate data. *Journal of Water and Health, 18*(2), 207–223. https://doi.org/10.2166/wh.2020.008

David-Olawade, A. C., Wada, O. Z., Adeniji, Y. J., Aderupoko, I. V., &Olawade, D. B. (2025). Artificial intelligence readiness among healthcare students in Nigeria: A

cross-sectional study assessing knowledge gaps, exposure, and adoption willingness. *International Journal of Medical Informatics*, 106085.

Degadwala, S., Vyas, D., & Soni, M. (2024, January). Unveiling cholera patterns through machine learning regression for precise forecasting. In *2024 5th International Conference on Mobile Computing and Sustainable Informatics (ICMCSI)* (pp. 39–44). IEEE. https://doi.org/10.1109/ICMCSI57547.2024.00012

El Kirat, H., van Belle, S., Khattabi, A., &Belrhiti, Z. (2024). Behavioral change interventions, theories, and techniques to reduce physical inactivity and sedentary behavior in the general population: a scoping review. *BMC Public Health*, *24*(1), 2099.

Egan, K. F., Devlin, K., & Pandit-Rajani, T. (2017). *Community health systems catalog country profile: Nigeria*. Arlington, VA: Advancing Partners & Communities.

Emeihe, E. V. (2024). The role of community health workers in implementing AI-based health solutions in rural areas. *International Journal of Business, Psychology and Research Utilisation, 4*, 1–12.

Ezema, H. C., Iweama, C. N., Jones, C. M., &Ugwumah, I. M. J. (2025). Enhancing public health education through the use of technology in Nsukka Local Government Area, Enugu State. *International Journal of Human Kinetics, Health and Education, 10*(1), 1–15.

Fisher, S., & Rosella, L. C. (2022). Priorities for successful use of artificial intelligence by public health organizations: A literature review. *BMC Public Health, 22*(1), 2146.

Garzón, J., Patiño, E., & Marulanda, C. (2025). Systematic review of artificial intelligence in education: Trends, benefits, and challenges. *Multimodal Technologies and Interaction, 9*(8), 84. https://doi.org/10.3390/mti9080084

Henzler, D., Schmidt, S., Koçar, A., Herdegen, S., Lindinger, G. L., Maris, M. T., Bak, M. A. R., Willems, D. L., Tan, H. L., Lauerer, M., Nagel, E., Hindricks, G., Dagres, N., & Konopka, M. J. (2025). Healthcare professionals' perspectives on artificial intelligence in patient care: A systematic review of hindering and facilitating factors on different levels. *BMC Health Services Research*, 25, Article 633. https://doi.org/10.1186/s12913-025-12664-2

Kaushik, A., Barcellona, C., Mandyam, N. K., Tan, S. Y., & Tromp, J. (2025). Challenges and opportunities for data sharing related to artificial intelligence tools in health care in low- and middle-income countries: Systematic review and case study from Thailand. *Journal of Medical Internet Research, 27*, e58338. https://doi.org/10.2196/58338

Lee, Y. J., Park, C., Kim, H., Cho, S. J., & Yeo, W. H. (2024). Artificial intelligence on biomedical signals: Technologies, applications, and future directions. *Med-X*. https://doi.org/10.1007/s44258-024-00043-1

Lucas, H. C., Upperman, J. S., & Robinson, J. R. (2024). A systematic review of large language models and their implications in medical education. *Medical Education.* Advance online publication. https://doi.org/10.1111/medu.15402.

Igwama, G. T., Olaboye, J. A., Maha, C. C., Ajegbile, M. D., & Abdul, S. (2024). Big data analytics for epidemic forecasting: Policy Frameworks and technical

approaches. *International Journal of Applied Research in Social Sciences*, *6*(7), 1449-1460.

MacIntyre, C. R., Chen, X., Kunasekaran, M., Quigley, A., Lim, S., Stone, H., … &Gurdasani, D. (2023). Artificial intelligence in public health: The potential of epidemic early warning systems. *Journal of International Medical Research, 51*(3), 03000605231159335. https://doi.org/10.1177/03000605231159335

Mantena, S., Celi, L. A., Keshavjee, S., &Beratarrechea, A. (2021). Improving community health-care screenings with smartphone-based AI technologies. *The Lancet Digital Health, 3*(5), e280–e282. https://doi.org/10.1016/S2589-7500(21)00081-3

Mendes, V. I. S., Mendes, B. M. F., Moura, R. P., Lourenço, I. M., Oliveira, M. F. A., Ng, K. L., & Pinto, C. S. (2025). Harnessing artificial intelligence for enhanced public health surveillance: A narrative review. *Frontiers in Public Health*, 13, Article 1601151. https://doi.org/10.3389/fpubh.2025.1601151

Moyo, M. T. G. (2025). Bridging the digital health divide: AI-powered telemedicine, policy barriers, and equity solutions for underserved communities. *Digital Health Equity Review, 3*(1), 1–15.

Muñoz Parry, C., & Aneja, U. (2020). Artificial intelligence for healthcare: Insights from India. Centre for Universal Health & Asia-Pacific Program, Chatham House. https://www.chathamhouse.org/sites/default/files/publications/research/2020-07-30-artificial-intelligence-for-healthcare-munoz-parry-aneja.pdf

Mwogosi, A. (2025). Ethical and privacy challenges of integrating generative AI into EHR systems in Tanzania: A scoping review with a policy perspective. *Digital Health*. https://doi.org/10.1177/20552076251344385

Mwogosi, A., Simba, R. M., Kayya, A., Abdallah, S., Mkane, P., Lugaba, A., & Hussein, H. (2025). AI-IoT integration in Tanzania's primary healthcare system: A narrative review. *Journal of Health Organization and Management*. https://doi.org/10.1108/JHOM-01-2025-0013

Nutbeam, D., & Milat, A. J. (2025). Artificial intelligence and public health: Prospects, hype and challenges. *Public Health Research & Practice, 35*(1), 1–6. https://doi.org/10.17061/phrp3512525

Oguche, D. E., Dimka, B. T., Godwin, T., Mallo Jr., S., Mangai, M. J., &Oguche, S. (2025). AI-driven health applications in Africa: A structured literature review with a focus on Nigeria. *International Journal of Research and Innovation in Applied Science*, 10(6), 596–606.

Ogunboye, I., Adebayo, I. P. S., Anioke, S. C., Egwuatu, E. C., Ajala, C. F., & Awuah, S. B. (2023). Enhancing Nigeria's health surveillance system: A data-driven approach to epidemic preparedness and response. *World Journal of Advanced Research and Reviews, 20*(1), 1–15. https://doi.org/10.30574/wjarr.2023.20.1.0123

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

Ozor, O., Etiaba, E., &Onwujekwe, O. (2024). Strengthening the effectiveness of community health system: Assessing the factors that enhance or constrain the delivery of health services within communities in Nigeria. *Health Research Policy and Systems*, *22*(1), 124.

Panahi, O., & Farrokh, S. (2025). Building healthier communities: The intersection of AI, IT, and community medicine. *International Journal of Nursing and Health Care, 1*(1), 1–4. https://doi.org/10.5281/zenodo.8024012

Panteli, D., Adib, K., Buttigieg, S., Goiana-da-Silva, F., Ladewig, K., Azzopardi-Muscat, N., … & McKee, M. (2025). Artificial intelligence in public health: Promises, challenges, and an agenda for policy makers and public health institutions. *The Lancet Public Health, 10*(5), e428–e432. https://doi.org/10.1016/S2468-2667(25)00120-9

Perez-Saez, J., Lessler, J., Lee, E. C., Luquero, F. J., Malembaka, E. B., Finger, F., … & Azman, A. S. (2022). The seasonality of cholera in sub-Saharan Africa: A statistical modelling study. *The Lancet Global Health, 10*(6), e831–e839. https://doi.org/10.1016/S2214-109X(22)00136-7

Richardson, L., & Dubé, D. T. (2022). Healthy Communities: A Physician Assistant's Perspective. *Physician Assistant Clinics*, *7*(1), 103-116.

Sarker, I. H. (2021). Deep learning: A comprehensive overview on techniques, taxonomy, applications and research directions. *SN Computer Science, 2*, 420.

Schwalbe, N., & Wahl, B. (2020). Artificial intelligence and the future of global health. *The Lancet, 395*(10236), 1579–1586.

Suarjana, I. W. G. (2023). Artificial intelligence in public health: The potential and ethical challenges. *Journal of Public Health, 45*(4), e834.

University of Oslo & HISP. (2025). AI-driven alert triage with DHIS2 transforms disease surveillance in Tanzania. *DHIS2*. https://dhis2.org/ai-driven-alert-triage-tanzania/

Villanueva-Miranda, I., Xiao, G., & Xie, Y. (2025). Artificial intelligence in early warning systems for infectious disease surveillance: A systematic review. *Frontiers in Public Health*, 13, 1609615. https://doi.org/10.3389/fpubh.2025.1609615

World Health Organization. (2021). *Ethics and governance of artificial intelligence for health*. https://www.who.int/publications/i/item/9789240029200

World Health Organization. (2023). *Working together for equity and healthier populations: sustainable multisectoral collaboration based on health in all policies approaches*. World Health Organization.

World Health Organization. (2025a). *Community-based care*. https://www.who.int/teams/integrated-health-services/clinical-services-and-systems/emergency-and-critical-care/community-based-care

World Health Organization. (2025b). *Primary health care*. https://www.who.int/health-topics/primary-health-care?

Xu, F., & Beard, K. (2021). A comparison of prospective space-time scan statistics and spatiotemporal event sequence-based clustering for COVID-19 surveillance. *PLoS One*, *16*(6), e0252990.

Zeng, D., Cao, Z., & Neill, D. B. (2021). Artificial intelligence–enabled public health surveillance—from local detection to global epidemic monitoring and control. In P. D. Wang, J. D. Duncan, & R. Paton (Eds.), *Artificial intelligence in medicine* (pp. 437–453). Academic Press.

Zerfu, T. A., Asressie, M., Tareke, A. A., Begna, Z., Habtamu, T., Werkneh, N., & Genta, A. (2025). Contributions of District Health Information Software 2 (DHIS2) to maternal and child health service performance in Ethiopia: An interrupted time series mixed-methods study. *Archives of Public Health, 83*, 173. https://doi.org/10.1186/s13690-025-01145-1

Zysberg, L., & Schwabsky, N. (2021). School climate, academic self-efficacy and student achievement. *Educational Psychology, 41*(4), 467–482.