REVIEW ARTICLE

Artificial Intelligence Scope and Challenges in Public Health

Tarun Sood, Ekta Sharma, Gurmeet Katoch

Department of Health and Family Welfare, Dharamshala, Kangra, Himachal Pradesh, India

CORRESPONDING AUTHOR
Dr. Ekta Sharma, MPH, District Consultant, Department of Health and Family Welfare, Office of Chief Medical Officer Kangra, at Dharamshala, Kangra, Himachal Pradesh, India – 176215
Email: sharmase25@gmail.com

ABSTRACT
Artificial Intelligence (AI) holds assurance for enhancing the effectiveness of public health initiatives aimed at advancing the well-being of diverse populations. This review article delineates the implementation of AI in the realm of public health, exploring its current applications and discussing potential areas for further development and prospects in future.

INTRODUCTION

By definition, artificial intelligence (ai) is the ability of a machine to mimic human thought processes or software systems which compile, integrate, and analyze the data through different modes of learning and problem-solving mechanisms for achieving predefined objectives (1).

It is also conceptualized as an entity akin to human intelligence, with aspirations to surpass the capabilities of individual technologies. This technological paradigm is perceived as an interactive system that imparts a machine with the capability to execute functions in the capability to execute functions in a manner that appears human-like (2).

Broadly, AI is categorized in two classes: i) "Artificial General Intelligence" (AGI) and ii) "Artificial Narrow Intelligence" (ANI). AGI pertains to a machine's capacity to emulate the human mind as well as execute any intellectual task that humans can perform. This concept was the primary focus of early AI research and the predominant representation of AI. On the other hand, Artificial Narrow Intelligence refers to a machine's proficiency in excelling at a specific task. The majority of AI applications predominantly rely on Artificial Narrow Intelligence (ANI) (3).

Artificial Intelligence (AI) possesses substantial potential to enhance the well-being of millions worldwide. In numerous countries, it is already deployed to enhance the promptness and precision of disease diagnosis and screening, and facilitate various public health initiatives, including disease surveillance, outbreak response, and healthcare systems management. Additionally, AI has the capacity to enable resource-poor countries as well as

rural communities to bridge various gaps in healthcare services accessibility. The realm of AI for health encompasses "Machine Learning (ML)", "Natural Language Processing (NLP)", "Speech Recognition", "Image Recognition", Expert Systems (computational models emulating human decision-making), systems for planning, scheduling, as well as optimization and robotics also (4).

AI-powered big data will enable us to favorably alter population habits while also diagnosing and suspecting illnesses in both individuals and communities. Integrating artificial intelligence with augmented and virtual realities is expected to facilitate the development of virtual medicine services that are easily and directly accessible to communities. (5).

Scope of AI in Public health
The proficiency of AI models to analyze and interpret numerous health datasets at large scale can also be revolutionary for epidemiology and public health. The analysis of large health data from various sources related to person, geography, and time may provide better and extensive insights on the determinants of disease on both individual and community levels which can further strengthen disease surveillance, reform public health policies and implementation activities (6, 7).

Information about several aspects of health, particularly social determinants, can be found via news outlets, social media, and search engines on the web. This information is more sophisticated and complex than found in various conventional sources. Wearable technology allows the recording of vital data and comprehensive information about an individual's activity. Environmental sensors collect geographic information about weather, pollution in the air, the quality of water, noise levels, and green space. The majority of this data is continuously created, and programming interfaces allow for real-time analysis of it, which is a powerful and increasingly available application. Therefore, the potential use of these innovative data sources considerably expands, and new

opportunities for public health have been presented when combined with established public health data sources such as public records, electronic health records, and population and medical survey data (8).

AI can be used in various areas of public health:

Automating public health data summarization

Natural language processing (NLP) methods like analyzing texts and modeling topics can be used to take advantage of it. To create summaries of recent developments in public health, natural language processing (NLP) might be useful in the analysis of health documentation, data from surveys, and other sources. Furthermore, by utilizing natural language processing (NLP) tools, we can extract data regarding disease outbreaks, recognize patterns in the transmission of diseases, and find associations between disease determinants including socioeconomic characteristics and public health data. Therefore, by automating the summary of health-related data, we may improve decisions and policy-making on the present status of public health and achieve improved health results.

Generating Personalized Health Messages

This can be achieved using natural language processing (NLP) algorithms, which process and analyze vast volumes of patient data to identify specific health concerns, provide customized health messages, and suggest therapies that are centered on the needs and desires of each individual. AI can assist in enabling medical personnel to respond to public inquiries in a timely and efficient manner. Additionally, it may give people personalized counsel and promptly and affordably provide data regarding health care.

Simulation of Public Health Policies

By giving users access to comprehensive knowledge about how policies could affect their health and by simulating policy scenarios

and solutions, AI can assist people and communities in making well-informed decisions.

Public Health Fraud and Abuse Prevention

Artificial intelligence (AI) chatbots can guarantee the swift and precise screening of vast volumes of data to detect any anomalous or dubious conduct, so aiding in the identification and prevention of public health fraud and abuse (9).

Challenges

Indirect consequences are possible when it comes to artificial intelligence and public health. With enhanced productivity and health system performance, artificial intelligence (AI) is likely to boost the effectiveness of personnel and logistics (10).

Additionally, social inequality may increase, and focus on individual action may be diverted by artificial intelligence, so ignoring the lessons learned from decades of innovation in public health. There is also little data available about how well AI models produce high-caliber research (8).

Using AI for healthcare has many restrictions and problems, such as structural issues with data sharing, a lack of sophisticated infrastructure, and a staff lacking in AI training for public health. One primary challenge of AI is the potential for data breaches and violation of privacy Also, various concerns regarding the usage of AI in datasets have also been expressed such as timely reporting, validation, poor data integration, and data surveillance (8,12, 13).

Future of AI

AI breakthroughs have an opportunity to revolutionize several healthcare-related areas and make healthcare more precise, predictable, and portable in the years to come (12). In addition, AI technologies can offer readily available individual risk assessments and risk reduction recommendations through a variety of interactive applications that are more interesting and inspiring than conventional methods, such as those for the management and prevention of chronic illnesses or to promote behavioral changes.

During COVID-19 pandemic World Health Organization"" released digital health worker 'Florence', as part of their AI for Quitting Tobacco initiative". Florence is designed to have several short voice or text chats with various users to assist them in quitting smoking and to counteract false information on COVID-19 (14).

AI is anticipated to have enormous potential and a significant influence on:

- The prediction, preparedness and timely prevention of disease onset in the individuals as well as in communities.
- Disease transmission trends and the effects on psychological and biological variables
- The provision of personalized healthcare and assistance in better health outcomes.
- The planning of different healthcare treatments and diagnostic procedures as well as the processes for making choices

In the long run, passive detectors combined with artificial intelligence may be used to connect patients, caregivers, social care providers, and healthcare services to a unified digital network.

Conclusion

The Artificial Intelligence techniques and their inception in public health are still in early stages. However, AI is rapidly and positively transforming the field of public health by improving individual as well as community health. Despite various challenges, AI has the potential to transform public health as well as healthcare systems to improve the health of populations across the globe AI techniques undoubtedly can bring novel efficiencies and quality to healthcare outcomes.

Universal health coverage (UHC) and the health-related goals in SDGs may surely be achieved with the effective and efficient use of AI technologies in the healthcare systems.

Authors Contribution

All authors have contributed equally.

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CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Samoili, S., Lopez Cobo, M., Gomez Gutierrez, E., De Prato, G., Martinez-Plumed, F. and Delipetrev, B., AI WATCH. Defining Artificial Intelligence, EUR 30117 EN, Publications Office of the European Union, Luxembourg, 2020.
2. Davenport T, Kalakota R. The potential for artificial intelligence in healthcare. Future Healthc J. 2019 Jun;6(2):94-98.
3. Pennachin, C., & Goertzel, B. Contemporary Approaches to Artificial General Intelligence. Artificial General Intelligence: Springer 2007:1–30
4. WHO issues first global report on Artificial Intelligence (AI) in health and six guiding principles for its design and use Available from: https://www.who.int/news/item/28-06-2021-who-issues-first-global-report-on-ai-in-health-and-six-guiding-principles-for-its-design-and-use. Accessed 30 Dec2023.
5. Giansanti D. Artificial Intelligence in Public Health: Current Trends and Future Possibilities. Int J Environ Res Public Health. 2022 Sep 21;19(19):11907.
6. Artificial intelligence in Medicine and Public Health Artificial: Prospects and challenges beyond the pandemic CDC Blogs. Center for disease control and Prevention. Available from https://blogs.cdc.gov/genomics/2022/03/01/artificial-intelligence-2/. Accessed 30 Dec 2023
7. Artificial intelligence in public health Digital transformative toolkit: Pan American Health Organization Available from https://www.paho.org/en/documents/artificial-intelligence-public-health. Accessed 30 Dec 2023
8. Fisher S, Rosella LC. Priorities for successful use of artificial intelligence by public health organizations: a literature review. BMC Public Health. 2022 Nov 22;22(1):2146.
9. Jungwirth D, Haluza D. Artificial Intelligence and Public Health: An Exploratory Study. Int J Environ Res Public Health. 2023 Mar 3;20(5):4541.
10. Panch T, Pearson-Stuttard J, Greaves F, Atun R. Artificial intelligence: opportunities and risks for public health. Lancet Digit Health. 2019 May;1(1):e13-e14. doi: 10.1016/S2589-7500(19)30002-0.
11. Sunarti S, Fadzlul Rahman F, Naufal M, Risky M, Febriyanto K, Masnina R. Artificial intelligence in healthcare: opportunities and risk for future. Gac Sanit. 2021;35 Suppl 1:S67-S70.
12. Bajwa J, Munir U, Nori A, Williams B. Artificial intelligence in healthcare: transforming the practice of medicine. Future Healthc J. 2021 Jul;8(2):e188-e194.
13. Dolley S. Big Data's Role in Precision Public Health. Front Public Health. 2018 Mar 7;6:68.
14. Using AI to lead healthier lifestyle. World Health Organization Available from https://www.who.int/campaigns/Florence. Accessed 30 Dec 2023