HSJ Health Sciences Journal
HCI HOSPITAL DE CLÍNICAS DE ITAJUBÁ-MG ENSINO E PESQUISA

EDITORIAL

Artificial intelligence in epidemic management: transforming public health in Brazil and beyond

Inteligência artificial na gestão de epidemias: transformando a saúde pública no Brasil e além

Luciano Magalhães Vitorino[1*], Gerson Hiroshi Yoshinari Júnior[1]
[1]Faculdade de Medicina de Itajubá – FMIT, Itajubá, MG, Brasil.

Artificial Intelligence (AI) is revolutionizing our approach to epidemic preparedness and response, particularly in developing countries like Brazil, where geographical and socioeconomic diversity presents unique public health challenges. The emergence of AI as a crucial player in the global health arena underscores its potential to significantly improve epidemic management[1,2]. Recent global health crises, including the COVID-19 pandemic, dengue, and Zika outbreaks, have highlighted the urgent need for innovative strategies in public health systems.

AI-driven technologies have proved indispensable in enhancing disease surveillance systems, traditionally hampered by manual data collection and processing[3]. These systems struggle to keep pace with the rapid scale and speed of outbreaks. AI offers a robust solution by integrating diverse data sources such as healthcare records, mobile phones, and social media, providing real-time analytics that predict disease transmission dynamics and identify hotspots[1,3]. This capability allows health authorities in Brazil to optimize resource allocation and effectively target interventions. For instance, COVID-Net can diagnose COVID-19 with 92.4% accuracy using chest radiographs[4]. Moreover, algorithms can predict which patients will need intensive care, streamlining patient triage during pandemics. Faster diagnosis leads to quicker decisions about quarantines and protection for healthcare workers, which is crucial in managing fast-spreading viruses.

Companies like BlueDot have successfully predicted areas at risk for outbreaks of COVID-19 and other viruses, such as H1N1, Ebola, and Zika[5]. HealthMap even alerted the world about the coronavirus before the World Health Organization[3]. These predictive capabilities enable more efficient and effective public health responses, allowing authorities to implement timely interventions. Additionally, AI accelerates the discovery of drugs and vaccines[6]. For example, BenevolentAI identified baricitinib as a potential treatment for COVID-19, illustrating the speed and precision AI brings to medical research and development[7].

AI improves diagnostic efficiency, reducing the time needed for diagnosis and improving hospital resource allocation, which is critical during pandemic peaks. Accurate outbreak predictions allow faster and more efficient responses, potentially saving many lives[2-5]. Continuous monitoring of global data helps in preparing for and mitigating future outbreaks. Global scientific collaboration is essential for effective AI use in pandemic response. Data-sharing initiatives at various levels, including genetic sequences, clinical data, medical images, and epidemiological data, enhance the ability to respond quickly and effectively to emerging health threats[1-3].

AI applications range from molecular (e.g., protein structure prediction, nucleic acid testing) to clinical (e.g., imaging diagnostics, patient monitoring) to societal (e.g., early warning systems, empirical data modeling, combating misinformation). These applications improve the ability to detect and respond to health threats in real-time[2-4]. However, significant challenges remain in implementing AI in public health, particularly concerning data privacy. AI systems need access to sensitive personal data to function optimally, so adherence to stringent data protection laws is crucial for maintaining public trust[5]. The risk of algorithmic bias, where AI performs differently across diverse populations, necessitates rigorous testing and calibration to ensure accuracy and fairness.

In Brazil, customizing AI technologies to meet local needs is essential due to the varied epidemiological and socio-cultural landscapes. Effective AI solutions necessitate collaborative development involving AI experts, public health professionals, and local communities to ensure they

*Correspondent author:
Faculdade de Medicina de Itajubá – FMIT
Addr.: Av. Renó Júnior, 368, São Vicente. Itajubá, MG, Brasil. CEP: 37502-138.
Phone: +55 (35) 3621-4555
E-mail: lucianoenf@yahoo.com.br (Vitorino LM)

This study was conducted at the Institution - Faculty of Medicine of Itajubá – FMIT.
Conflicts of interest: No conflicts of interest declared concerning the publication of this article.
Funding information: nothing to declare
Submitted 1 Oct. 2024, revised: 1 Oct. 2024, accepted 1 Oct. 2024, published 5 Nov. 2024

How to cite this article: Vitorino LM, Yoshinari Júnior GH. Artificial intelligence in epidemic management: transforming public health in Brazil and beyond. HSJ. 2024;14:e1579. https://doi.org/10.21876/hsjhci.v14.2024.e1579

are appropriate and effective. International collaboration in AI development and deployment is crucial given the global nature of pandemics. Brazil's participation in global AI initiatives enhances its epidemic management capabilities, fostering partnerships essential for developing accessible, innovative solutions worldwide, especially in resource-constrained settings.

The integration of AI in public health does not replace human judgment and clinical expertise[2,3]. It is crucial to incorporate AI training within healthcare education to prepare professionals for future challenges, ensuring they can work alongside AI tools effectively[8]. AI has the potential to significantly enhance Brazil's public health responses to epidemics like COVID-19 and dengue. With appropriate investments and a robust ethical framework for deployment, AI can improve health outcomes and position Brazil as a leader in integrating cutting-edge technology to protect public health. The role of AI in managing health crises is increasingly evident as the world continues to grapple with COVID-19[2]. Adopting AI can propel Brazil to the forefront of global efforts to enhance epidemic preparedness, ensuring technological benefits reach all segments of society. This approach represents not merely an investment in technology but a commitment to a future where public health challenges are met with the best available scientific and innovative tools.

Closer collaboration between technologists, healthcare professionals, and governments is needed to develop strategies that effectively integrate AI into public health. Policies promoting the ethical use of AI will ensure that technological advances benefit all population segments, upholding a commitment to responsible and inclusive innovation. Embracing AI as part of the arsenal to combat epidemics is crucial, but it requires maintaining a critical and ethical perspective. This editorial calls for a renewed commitment to responsible innovation in the field of global health, aiming to protect countless lives and livelihoods while sending a strong message of Brazilian and international cooperation in solving global problems.

REFERENCES

1. MacIntyre CR, Lim S, Quigley A. Preventing the next pandemic: use of artificial intelligence for epidemic monitoring and alerts. Cell Rep Med 2022;3(12):100867. http://doi.org/10.1016/j.xcrm.2022.100867. PMid:36543103.
2. Luengo-Oroz M, Hoffmann Pham K, Bullock J, Kirkpatrick R, Luccioni A, Rubel S, et al. Artificial intelligence cooperation to support the global response to COVID-19. Nat Mach Intell 2020;2(6):295-7. http://doi.org/10.1038/s42256-020-0184-3.
3. Syrowatka A, Kuznetsova M, Alsubai A, Beckman AL, Bain PA, Craig KJT, et al. Leveraging artificial intelligence for pandemic preparedness and response: a scoping review to identify key use cases. NPJ Digit Med 2021;4(1):96. http://doi.org/10.1038/s41746-021-00459-8. PMid:34112939.
4. Wang L, Lin ZQ, Wong A. COVID-Net: a tailored deep convolutional neural network design for detection of COVID-19 cases from chest X-ray images. Sci Rep 2020;10(1):19549. http://doi.org/10.1038/s41598-020-76550-z. PMid:33177550.
5. Williams CM, Chaturvedi R, Urman RD, Waterman RS, Gabriel RA. Artificial Intelligence and a pandemic: an analysis of the potential uses and drawbacks. J Med Syst 2021;45(3):26. http://doi.org/10.1007/s10916-021-01705-y. PMid:33459840.
6. Subbiah V. The next generation of evidence-based medicine. Nat Med 2023;29(1):49-58. http://doi.org/10.1038/s41591-022-02160-z. PMid:36646803.
7. Bragazzi NL, Dai H, Damiani G, Behzadifar M, Martini M, Wu J. How big data and artificial intelligence can help better manage the covid-19 pandemic. Int J Environ Res Public Health 2020;17(9):3176. http://doi.org/10.3390/ijerph17093176. PMid:32370204.
8. Yoshinari GH Jr, Vitorino LM. How may ChatGPT impact medical teaching? Rev Assoc Med Bras 2023;69(4):e20230282. https://doi.org/10.1590/1806-9282.20230282. PMid:37194805.

Individual contribution of the authors:
Study conception and design: LMV, GHYJ
Manuscript writing: LMV, GHYJ
Critical review of the text: LMV, GHYJ
Final approval of the manuscript*: LMV, GHYJ
Overall responsibility for the study: LMV, GHYJ
*All authors read and approved the final version of the manuscript submitted for publication in HSJ.