# Editorial

## Role of Artificial Intelligence in Public Health

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Artificial intelligence (AI) uses data-driven algorithms to recognize patterns and make decisions. In public health, it can not only improve interventions but also reproduce social inequities, thereby creating better solutions.[1] AI shows promise in improving health education. Machine-learning models can analyze large datasets to personalize messages delivered through mobile apps, chatbots, and social media. These tools can support vaccine reminders, encourage physical activity, or provide nutrition advice tailored to individual risk factors. However, they are only as unbiased as their training data. Furthermore, the collection of personal information raises privacy concerns.[2]

The use of AI is also transforming clinical care. Algorithms built from electronic health records and genomic data can predict disease risk, support early diagnosis, and help select treatments.[3] AI helps classify tumors, match therapies to patients, and interpret radiology images, sometimes matching or exceeding clinician accuracy. By automating routine diagnostic tasks, AI can free clinicians to focus on complex cases and patient communication. While these innovations promise earlier disease detection and more efficient resource use, they require representative datasets and transparent methods to ensure that all populations benefit.

Epidemiological surveillance demonstrates AI's ability to speed discovery. Instead of waiting for manual reports, machine-learning systems can scan electronic records, social media, and news feeds to detect unusual patterns.[4] Contact-tracing and outbreak-prediction tools used during COVID-19 provided early warnings and informed allocation of resources. Combining geolocation, symptom reporting, and natural-language processing enabled authorities to track disease spread in near-real time. Nevertheless, false positives and negatives, privacy breaches, and the risk of surveillance over reach, demand careful regulation and ethical oversight.

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AI can also reveal social determinants of health. Natural-language processing can extract information about housing or food insecurity from clinical notes, while chatbots help patients navigate social services.[5] Large language models could support multilingual communication and reduce administrative burdens. Yet these tools face barriers: they depend on standardized data and digital infrastructure, digital literacy varies, and algorithmic bias can entrench inequity. Designers of AI tools must address these challenges and consider the environmental costs of large models.

Bias is a recurring issue that threatens to undermine AI's benefits. Many AI models are trained on datasets from a few high-income countries, limiting generalisability.[6] Mitigation requires collaboration among clinicians, data scientists, patient advocates, and regulators. Strategies include diversifying training datasets, testing models across subgroups, and continuously monitoring performance. Open data initiatives, coupled with privacy safeguards, could increase diversity and transparency, but must involve communities to prevent exploitation.

Opaque "black-box" models present another challenge. During the pandemic, algorithms forecasted disease trends, but policymakers struggled to interpret their outputs. Explainable AI techniques are needed so clinicians and public health experts understand how models arrive at decisions. Tools, such as feature importance scores and rule-based models, can enhance trust without sacrificing accuracy.

Ethical and equity considerations are central to any AI deployment.[5] AI-enabled diagnostics and predictive analytics can improve outcomes, but poorly designed systems risk worsening disparities. Engaging affected communities in tool design, ensuring inclusive data practices, and emphasizing transparency are critical. Policymakers should create guidelines for algorithmic accountability and auditing. Achieving health equity willrequire addressing structural determinants alongside technological innovation and ensuring that AI supports rather than replaces human judgment.

Governance frameworks are needed to balance innovation and risk.[6] Drawing on harm-reduction principles, social

determinants of health, public health ethics, and One Health perspectives can help shape policies. Public health agencies, technologists, ethicists, and communities must collaborate to set standards for data use, ensure equitable access to benefits, and prevent misuse. Because diseases and digital technologies cross borders, global cooperation is essential.

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