

**EFFECTIVE USE OF AI IN PUBLIC HEALTH; A SOCIAL INNOVATION  
IN SCIENCE AND TECHNOLOGY**

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**Abstract**

There is an urgent need to involve communities in how artificial intelligence (AI) is adopted and used in public health. Although public health has led major innovations such as immunization and sanitation, it has been cautious in adopting newer technologies like generative AI. Today's complex health challenges require the field to be more flexible and responsive. Community engagement is already a core strength of public health and can be used to guide the responsible use of AI. Without community involvement, AI tools may overlook underserved populations and worsen existing health inequalities. Including community perspectives helps address concerns about privacy, bias, and unfair outcomes, making AI systems more ethical and inclusive. To support responsible AI use in public health, key actions like teaching basic AI concepts in public health education and professional training, Co-designing AI tools with communities, Creating clear governance and ethical guidelines. Together, these steps can promote transparent, fair, and trustworthy use of AI, helping improve health outcomes while minimizing harm.

**Keywords:** Artificial Intelligence (AI), Public Health, Community Engagement, Health Equity, Ethical AI.

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**Introduction**

Public health has long been recognized for transformative achievements in areas such as immunization, sanitation infrastructure, and the development of epidemiological methods [1]. Despite this strong legacy of innovation, the field has historically adopted a more cautious stance toward emerging technologies, including generative artificial intelligence (GenAI). As health systems in the United States and globally continue to evolve, there have been increasing calls to reconsider how public health is funded, structured, and studied [2,15]. In this context, the discipline stands at a critical juncture, facing growing pressure to adopt innovative approaches that enhance flexibility and enable more timely and effective responses to emerging health challenges.

GenAI applications are expected to influence nearly all sectors of society, including public health. Many practitioners and researchers remain understandably cautious about how these tools may affect both the discipline and the communities it serves. A notable exception has been in bioinformatics and biostatistics, where machine learning techniques have long been used to analyze biomedical and health data [4]. However, given the rapid pace of technological change, there is concern that GenAI could marginalize populations with limited resources. Similar

challenges have already been observed with the increasing reliance on digital health tools—such as patient portals, telehealth platforms, and pharmacy applications—which disproportionately exclude low-income and older populations [16,17]. Without careful implementation, the integration of AI into public health risks exacerbating existing health disparities through both novel generative tools and the broader application of traditional AI and informatics methods [18]. To uphold the mission of promoting and protecting population health, public health professionals must actively educate themselves and engage communities in understanding AI and its potential impact on daily life.

Although adopting technological innovations presents challenges, community engagement has long been a defining strength of contemporary public health practice. The field has increasingly embraced participatory approaches as a standard, offering an opportunity to ensure that AI technologies are developed in ways that benefit society and advance health equity [3,5]. Because community-engaged design methods are already embedded in many public health initiatives [5], the field is well positioned to collaborate with communities to improve understanding of both the benefits and risks of AI in public health. Involving communities in AI design and implementation is particularly important for ensuring that these technologies are person-centered and responsive to the priorities of underrepresented and marginalized populations, who often experience disproportionate health burdens [6].

Beyond clinical applications—where AI tools have primarily been used for decision support, outcome prediction, and medical record summarization—AI has a wide range of applications in public health practice. Infectious disease surveillance and risk assessment have been among the most prominent areas of AI use [7,8]. In global health contexts, AI has been applied to improve vaccine delivery systems and enhance the efficiency of community health services [9]. As public health systems become increasingly digital, AI-based tools for monitoring and evaluation are also becoming more common [10,11]. GenAI-powered chatbots are being used to deliver health education and support behavior change interventions [12], while large language models are increasingly applied to question-answering tasks across large health datasets, supporting more informed decision-making [13]. At the same time, there is an urgent need to address health-related misinformation and disinformation, particularly as projections suggest that GenAI could generate a substantial proportion of online content in the coming years [14].

Significant ethical concerns arise when AI technologies are implemented in public health without a clear understanding of how these systems operate—both among professionals and among the individuals whose data are used to train them. For AI to be applied safely and responsibly, public health researchers, practitioners, and community partners must develop a foundational understanding of how AI tools function and where they are deployed [6,19]. Without this knowledge, it becomes difficult to identify risks, prevent harm, or fully realize AI's potential as a force for social good. Ethical and responsible AI use requires sustained commitments to education, transparency, and openness. Although AI is often perceived as the domain of technical experts, meaningful community participation in its design and development is essential [19–21]. Ethical AI in public health depends on transparency, accountability, and fairness—principles that can only be upheld through active collaboration among researchers, practitioners, and individuals with lived experience.

In addition to concerns surrounding data privacy, AI applications in health carry the risk of reinforcing or amplifying existing biases. Such biases can worsen health inequities and, in some cases, contribute to discriminatory outcomes, including unequal access to health services or insurance coverage [18]. Because AI models rely on historical data and embedded assumptions,

they may inadvertently reproduce systemic inequities. A strong understanding of community contexts, social determinants of health, and equity-focused strategies is therefore essential to prevent bias from being embedded in AI systems [15]. A widely cited example from the United States demonstrated that a commonly used health care algorithm exhibited substantial racial bias, resulting in White patients being more likely than Black patients with similar health needs to be enrolled in care management programs [18]. Integrating expertise in health equity and structural determinants into AI development is critical to ensure that emerging technologies promote fairness rather than deepen disparities.

### **Effective Use of AI; Action Needs to be taken by Public Health Community**

To ensure the safe and effective use of AI in public health, a comprehensive strategy is required. This strategy should include integrating foundational AI education into public health training and workforce development actively involving communities in the co-design of AI tools and establishing governance frameworks and best-practice guidelines to oversee AI use and reduce potential risks [6, 15].

First, public health training programs and organizations should incorporate instruction on core AI principles into academic curricula and professional development initiatives. This education should equip professionals with the skills needed to critically evaluate and responsibly apply AI technologies in population health practice. Training must extend beyond technical concepts to include ethical considerations, algorithmic bias, and the broader social and cultural implications of AI-driven decision-making [6, 18]. Several schools of public health have begun developing specialized centers and training initiatives to address these needs. In parallel, ongoing reviews of literature across public health and computer science can help identify effective educational resources [13]. Importantly, education efforts must also extend to communities, ensuring that individuals understand how AI is used in public health and how it may affect their lives.

Second, collaboration among technologists, public health professionals, and community members is essential for developing AI technologies that are responsive to population needs. Engaging community stakeholders from the earliest stages of development helps ensure that AI systems reflect the values, priorities, and lived experiences of those they are intended to serve [19–21]. Participatory and co-design approaches can enhance transparency and build trust by allowing affected individuals to contribute directly to decision-making processes.

One illustrative example involves partnerships between labor organizations and academic institutions to engage workers in shaping AI-based tools [22]. In the hospitality sector, workers and researchers jointly examined AI-driven management systems designed to optimize workflow. While these systems aimed to improve efficiency, they unintentionally increased workloads, reduced worker autonomy, and introduced potential health and safety risks. Through collaboration among workers, labor leaders, and academic experts, these challenges were identified and addressed, reducing occupational harms associated with AI implementation [22]. This participatory approach, which aligns closely with contemporary public health practice, improves the relevance, acceptability, and equity of AI-based interventions while enabling early identification of potential biases.

Finally, public health organizations must establish robust governance frameworks and best-practice guidelines to guide the ethical use of AI technologies. These frameworks should aim to prevent or mitigate risks such as privacy violations, biased outcomes, and the widening of health inequities. Effective governance requires clear standards for data management, algorithmic transparency, accountability, and continuous monitoring throughout the AI lifecycle [15, 23].

The establishment of interdisciplinary oversight bodies—including ethicists, data scientists, public health professionals, and community representatives—can further support responsible AI implementation. One example is a national initiative that developed ethics and equity principles, shared terminology, and engagement tools to guide collaboration with historically underrepresented communities [23]. Such efforts promote transparency, accountability, and fairness, strengthening the use of AI across diverse public health settings. When guided appropriately, AI can enhance the work of public health practitioners and researchers, improving health outcomes while minimizing unintended harms. Without these safeguards, however, AI implementation risks being driven primarily by technical perspectives that lack grounding in biomedical ethics, human rights, health equity, and the social determinants central to improving population health.

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