



Advocating for population health: The role of public health practitioners in the age of artificial intelligence

Alireza Kamyabi¹ · Ihoghosa Iyamu^{2,3} · Manik Saini¹ · Curtis May³ · Geoffrey McKee^{2,3} · Alex Choi¹

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Abstract

Over the past decade, artificial intelligence (AI) has begun to transform Canadian organizations, driven by the promise of improved efficiency, better decision-making, and enhanced client experience. While AI holds great opportunities, there are also near-term impacts on the determinants of health and population health equity that are already emerging. If adoption is unregulated, there is a substantial risk that health inequities could be exacerbated through intended or unintended biases embedded in AI systems. New economic opportunities could be disproportionately leveraged by already privileged workers and owners of AI systems, reinforcing prevailing power dynamics. AI could also detrimentally affect population well-being by replacing human interactions rather than fostering social connectedness. Furthermore, AI-powered health misinformation could undermine effective public health communication. To respond to these challenges, public health must assess and report on the health equity impacts of AI, inform implementation to reduce health inequities, and facilitate intersectoral partnerships to foster development of policies and regulatory frameworks to mitigate risks. This commentary highlights AI's near-term risks for population health to inform a public health response.

Résumé

Au cours de la dernière décennie, l'intelligence artificielle (IA) a commencé à transformer les organismes canadiens en leur promettant une plus grande efficacité, de meilleurs processus décisionnels et une expérience client enrichie. Bien qu'elle recèle d'immenses possibilités, l'IA aura des effets à court terme – qui se font d'ailleurs déjà sentir – sur les déterminants de la santé et sur l'équité en santé des populations. Si son adoption n'est pas réglementée, il se peut très bien que les iniquités en santé continuent d'être exacerbées par les préjugés, intentionnels ou non, ancrés dans les systèmes d'IA. Les nouvelles possibilités économiques pourraient être démesurément exploitées par les travailleurs et les travailleuses déjà privilégiés et par les propriétaires des systèmes d'IA, renforçant ainsi la dynamique de pouvoir existante. L'IA pourrait aussi nuire au bien-être des populations en remplaçant les interactions humaines au lieu de favoriser la connexité sociale. De plus, la mésinformation sur la santé alimentée par l'IA pourrait réduire l'efficacité des messages de santé publique. Pour relever ces défis, la santé publique devra évaluer et communiquer les effets de l'IA sur l'équité en santé, en modérer la mise en œuvre pour réduire les iniquités en santé, et faciliter des partenariats intersectoriels pour éclairer l'élaboration de politiques et de cadres réglementaires d'atténuation des risques. Le présent commentaire fait ressortir les risques à court terme de l'IA pour la santé des populations afin d'éclairer la riposte de la santé publique.

Keywords Digital technologies · Artificial intelligence · Public health · Health equity · Determinants of health

Mots-clés Technologie numérique · intelligence artificielle · santé publique · équité en santé · déterminants de la santé

✉ Alex Choi
alexandra.choi1@vch.ca

¹ Vancouver Coastal Health, Vancouver, BC, Canada

² British Columbia Centre for Disease Control, Vancouver, BC, Canada

³ School of Population and Public Health, University of British Columbia, Vancouver, BC, Canada

Introduction

While artificial intelligence (AI) systems have been improving for over a decade, the introduction of novel, popular systems like ChatGPT has captured public attention and reignited debates about what AI could mean for our communities. Like the internet and social media, AI can be a

double-edged sword, presenting both benefits and risks for public health.

Health organizations increasingly recognize AI's potential, though discourse to date has been dominated by clinical applications. Nonetheless, improvements in digital tools are increasingly integrated into public health activities. Surveillance teams have long used supervised machine learning, but increasingly other public health practitioners have recognized the promise of generative AI to conduct near-instantaneous literature reviews, aid in statistical analyses, and draft documents. Implemented appropriately, AI could augment the efficiency of the public health workforce through automation, extend our reach among underserved populations, deepen our insights into population health, and drive innovation. These advancements could boost healthcare capacity and increase accessibility while elevating standards of care, particularly in the face of growing population health needs and limited resources.

However, the impacts of novel AI tools extend beyond utilization within the healthcare environment. Although only a small number of public health departments are currently utilizing AI tools, the use of AI in various sectors of society, including education and employment, is quickly advancing, bringing both positive and negative impacts on the social determinants of health. Understanding the true extent of AI's impact on society is challenging and predicting its consequences even more so. Regardless, Canada is moving forward, championing the adoption of AI through the Pan-Canadian Artificial Intelligence Strategy. Canada's proposed *Artificial Intelligence and Data Act* (AIDA) aims to establish oversight for "high-impact" AI systems, but may not come into force before 2025. While new applications of AI routinely emerge with promises of benefit, a thoughtful approach to harm mitigation is necessary. Consequently, this commentary focuses on outlining the potential threats AI poses to population health to facilitate the development of strategies that might preserve the benefits of AI while effectively managing associated risks.

Exploring risks and benefits of AI to population health

Embedding systemic bias

While practitioners routinely encounter and manage human or other sources of bias when using data for public health activities like surveillance or research, AI introduces new challenges owing to increased complexity and generally lower "explainability". Our lack of complete understanding of AI algorithms reduces the interpretability of the data. This lack of full understanding of AI algorithms makes it harder to decipher its outputs and examine its logic for sources of biases.

Without mitigation, AI systems can mask unchecked systemic biases that have the potential to skew outputs and exacerbate existing inequities. Bias in AI systems can stem from unrepresentative data samples during training (data-driven bias), human bias introduced during implementation (human bias), or inappropriate algorithmic weighting of different features within training datasets (algorithmic bias) (Norori et al., 2021).

Data-driven bias typically stems from the use of unrepresentative data samples during the initial stages of training. The exclusion of historically marginalized populations from data samples can result in AI systems demonstrating preferential accuracy towards privileged groups, reinforcing existing health disparities. For instance, AI-driven skin cancer detection algorithms, when trained on datasets that are disproportionately comprised of patients with lighter skin tones, demonstrate reduced accuracy for individuals with darker skin (Guo et al., 2022). Data-driven bias can also intensify societal prejudices if coupled with human biases when healthcare workers, influenced by conscious or unconscious racial biases, preferentially act on the algorithm's outputs (European Union Agency for Fundamental Rights, 2022). As we confront racism within health systems, we must acknowledge the risk of new biased tools acting within already inequitable structures.

When an algorithm is trained on biased data, it tends to perpetuate patterns from the dominant class in that data, often in a way that eludes detection. AI systems are especially vulnerable to this form of algorithmic bias due to their reliance on large, multi-faceted datasets for training, which often include demographic attributes such as gender, age, ethnicity, and location of residence. A well-known instance of algorithmic bias occurred when Amazon trained a system for evaluating job candidates. Trained on a predominantly male applicant pool, it identified female gender as a non-desirable trait, disproportionately rejecting applications from women (Dastin, 2018). Consequently, the explainability of AI systems is a critical factor that should be considered when assessing the risks associated with their use.

Exacerbating socioeconomic inequities

Income is a pivotal determinant of health, with poverty increasing risks for mental illness, chronic disease, and lower life expectancy. AI's adoption is already showing worrying signs of exacerbating existing socioeconomic inequities by failing to compensate content creators whose work has been used to train AI systems. Many current AI systems have been developed using the unpaid, unrecognized contributions of artists, authors, and labourers, transferring wealth to large corporate owners of AI systems (Klein, 2023). Moreover, as AI is adopted in workplaces, privileged workers with the resources and training to rapidly adapt to and leverage AI

have unfair advantages over those experiencing systemic barriers to adoption. This potential divide can further widen existing digital and socioeconomic disparities across various dimensions including age, education, and geographical location (e.g. rural and remote).

As such, AI-driven economic growth may disproportionately benefit privileged populations, thus exacerbating existing socioeconomic inequities and deepening wealth-driven health disparities. AI's environmental impacts (e.g. training a large language model can result in emissions of up to 300,000 kg of CO² (Strubell et al., 2019)) can further amplify inequities, given climate change disproportionately impacts lower-income populations.

Eroding human-to-human interactions

Social connections are an important determinant of health as they influence physical, mental, and emotional well-being (Hold-Lunstad, 2022). Technology has enabled us to transition communication from in-person to voice-based (telephones), then text-based (texting), and asynchronous (social media) methods. While this has enabled more effective communication over time and space, the transition has frequently impacted the quality of social connections. As social media platforms like Snapchat, Instagram, and Facebook progress further with introducing functions that substitute human-to-human interactions with human-to-AI contact, social isolation could become more pervasive.

Again, AI could bring both risks and benefits. New AI chatbots and technologies offer 24/7 service and extended reach. By automating routine tasks, AI could free up time for more human interactions, thereby enhancing connectedness. However, as with the adoption of social media tools, we must be cognizant of potential negative mental health impacts, particularly among susceptible groups such as children and youth (Greenfield & Bhavnani, 2023). With the increasing digitization of human interactions, we risk losing the richness, diversity, and depth inherent in interpersonal relationships. This erosion of human-to-human interactions could increase social isolation and polarization, inadvertently contributing to a decline in community health.

Perpetuating misinformation

Technological advancements have allowed public health practitioners to reach communities in innovative ways, for instance using targeted social media ads to disseminate information to underserved populations. However, while AI-powered tools offer the potential for improved communication, they also risk facilitating and amplifying misinformation (World Health Organization, 2023). The emergence of AI-driven deepfakes now permits the creation and manipulation of media content, introducing doubt about authenticity

when applied to trusted health figures and organizations (Angelis et al., 2023). At present, social media companies can curate and prioritize content, and their advertisement-based business models can neglect accuracy in favour of sensationalism. The COVID-19 pandemic demonstrated how social media could facilitate the spread of misinformation, leading to more transmission, vaccine hesitancy, and loss of trust in public health (Suarez-Lledo & Alvarez-Galvez, 2021). Without adequate regulatory intervention, incentive alignment, and digital literacy, the commercial factors that shape content curation in social media could fuel further misinformation with the assistance of AI.

The role of public health

Ongoing government initiatives are seeking to position health to effectively and ethically incorporate AI into health functions. The Canadian Institute for Advanced Research's AI for Health Task Force Report (Artificial Intelligence for Health Task Force, 2020) highlights data governance, infrastructure investments, and transparent public communication as examples of strategies to mitigate risks associated with using AI in health settings. These recommendations, however, focus on the narrow view of AI as a tool for advancing healthcare functions. Public health has a broader role considering the plethora of disruptions on social determinants of health and associated public health impacts of widespread adoption of AI.

To respond to the impacts of AI outside of clinical settings, public health practitioners must advocate for effective regulation and oversight, develop strategies that are founded on principles of health equity and social justice, and take action to draw public attention to the negative impacts of AI on social determinants of health (Canadian Public Health Association, 2017). The National Collaborating Centre for Determinants of Health framework for equity-related public health functions can guide this response (National Collaborating Centre for Determinants of Health, 2013).

Authorities in Canada must act to establish robust structures and guidelines for effectively assessing and reporting the health equity impacts of AI use. This may involve crafting population-level indicators that monitor social connectedness, exposure to health misinformation, digital literacy, and equitable access to AI technologies. In order to facilitate this, it is critical that public health practitioners understand, develop, and maintain key digital competencies (e.g. digital literacy). Furthermore, it is paramount that public health practitioners actively participate in the formulation of impact assessment and regulatory frameworks for AI systems (e.g. AIDA). Such frameworks could set standards for reporting AI-involved trials, requiring health equity impact assessments in AI deployments, and mandating systematic

tracking and reporting of AI systems' effects on population health.

Considering AI's broad societal impact, interdisciplinary and intersectoral partnerships are likely to be a key element of the public health strategy for shaping AI regulatory frameworks and mitigating associated risks. As such, public health must quickly position itself to play a role in policy development and advocacy, mindful of the rapid speed of AI development. History provides many examples of technological innovations leading to population health impacts for which we were not prepared, including relatively recent experiences with social media. We must learn from these examples and mobilize public health practitioners to respond to maximize the benefits of AI while mitigating the risks of harm.

Data availability Not applicable

Code availability Not applicable

Declarations

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