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SYNOPSIS

Review of "Integrating Health Equity in Artificial Intelligence for Public Health in Canada: A Rapid Narrative Review"

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One-Minute Summary

- The use of artificial intelligence (AI) in the context of public health is rapidly evolving, with many Canadian organizations publishing frameworks, toolkits, and priorities aimed at ensuring responsible use[1-5]. While AI has the potential to strengthen public health initiatives, there is also the potential of exacerbation of existing inequities – this necessitates considerations of health equity.[6]
- This rapid review summarized the evidence on how health equity is considered in relation to AI application in public health. 54 peer-reviewed articles and grey literature sources were included. Several health equity considerations were identified, including:
  - Gaps in AI epistemology
  - Algorithmic bias
  - Accessibility of AI technologies
  - Ethical and privacy concerns
  - Unrepresentative training datasets
  - Lack of transparency and interpretability of AI models
  - Challenges in scaling technical skills
- The authors conclude with recommendations on how future work can address equity when using AI in public health spaces. Specifically, this includes: "implementing diverse AI frameworks, ensuring human oversight, using advanced modelling techniques to mitigate biases, fostering intersectoral collaboration for equitable AI development, and standardizing ethical and privacy guidelines to enhance AI governance."[6]

Additional Information

This rapid review aimed to identify and synthesize existing literature addressing the integration of health equity considerations into AI in the public health sphere. This rapid review consisted of scoping, searching, screening, data extraction and analysis. This approach was informed by Arksey and O'Malley's methodological framework and Peters et al.'s guidelines.[7,8] Databases Medline and Embase were searched for studies published between January 1, 2014 and June 20, 2024. Following this, a search of the grey literature was conducted between May 21, 2024 and July 24, 2024 through targeted website searches, browser keyword searches, and identification of literature from cited results. Two main inclusion criteria were used to guide screening: 1) AI is used in a public health setting and 2) health equity considerations are either explicitly or implicitly integrated. only English language articles published in Canada between 2014 and 2024 were included.

The authors included 54 studies for analysis. From these studies they extracted information about health equity, based on the Government of Canada's Health Portfolio Sex- and Gender-Based Analysis Plus (SGBA Plus).[9] This framework emphasizes an intersectional approach, acknowledging the ways in which individual, group, social, and systemic factors intersect to create distinct experiences of power and privilege. Results of the rapid review were organized along these dimensions.

Challenges in Integrating Health Equity in AI use for Public Health

Systems of Oppression

Three distinct themes of systematic oppression emerged in the results of this search. First, epistemologically, AI was found to be grounded in Western frameworks and datasets, restricting the diversity of views and values represented. This poses a risk to systemically marginalized groups including Indigenous communities, racialized communities, 2SLGBTQI+ communities, and women. Second, biases arising from limited datasets, developer bias, or intentional programming are perpetuated throughout the AI lifecycle, as biases emerge in the development of AI and its algorithms. These biases often reflect systems of oppression – a number of studies in this review found that AI biases exacerbate racial and gender stereotypes, and can exacerbate health inequities in public health provision if unaddressed. Third, this review identified that inequitable access to AI technology deepens the "digital divide", exacerbating inequities and disproportionately disadvantaging groups including rural and remote communities, older adults, those with lower socioeconomic status, Indigenous peoples, and racialized communities.

Social Context

Three distinct themes were identified in terms of the impact of social context on health equity incorporation in AI. First, the development of ethical and privacy guidelines has lagged behind the rapid implementation of AI in public health spaces. The resulting use of technologies that raise ethical and privacy concerns deepens health inequities and mistrust. Second, the training of AI technology with unrepresentative data sets that exclude priority populations results in inaccurate outcomes and potential bias. Third, in the absence of robust data sets, AI outputs are difficult to interpret, with inadequate data posing the risk for AI "hallucinations" – fabricated data that can deepen mistrust.

Group Membership

Factors such as limited funding, inadequate training, and insufficient resources can prevent public health professionals from developing the technical skills required to engage with AI. This can cause practitioners to rely on AI developers who may not have the same public health and health equity expertise, potentially exacerbating implicit biases and delaying equitable AI advancements.

Opportunities to Strengthen Health Equity Integration in AI use for Public Health

This review identified a number of potential avenues by which health equity can be better integrated into AI development in the public health space. First, the maintenance of human oversight throughout the AI lifecycle can reduce biases, with particular emphasis on the representation of diverse perspectives through the development and validations phases. Second, mitigating bias when possible and acknowledging bias when it cannot be mitigated can ensure accountability and foster discussion on the appropriateness of AI in a variety of public health settings. Third, the adoption of the FASTER principles (fair, accountable, secure, transparent, educated, and relevant) through governance structures can centre privacy, security, and human well-being in AI governance. Finally, AI models should be interpretable – inter-sectoral collaboration can promote data transparency, knowledge exchange, and capacity building between public health practitioners and AI developers.

PHO Reviewer's Comments

This literature review was conducted by a group of four employees of the Public Health Agency of Canada (PHAC). The authors followed Arksey and O'Malley's often-cited approach to rapid reviews and Peters et al. updated guidance, following the steps of scoping, searching, screening, data extraction and analysis.[7,8] Inclusion criteria were studies that explored the use of AI in public health settings, and also discussed the integration of health equity considerations in AI (e.g. considered bias, privacy, discrimination). The search was limited to English articles published in Canada between 2014 and 2024.

The authors distinguish this rapid review from a systematic review, with the goal to "accelerate the process of conducting a traditional review to produce evidence in a resource-efficient manner".[6] Using the 2020 Preferred Reporting Items for Systematic Reviews and Met-Analyses (PRISMA) checklist the authors of this rapid review followed standard systematic review methods with the following key exceptions: 1) risk of bias assessment for included studies; 2) certainty assessment; and, 3) full description of included study characteristics and results. [10,11]. The quality of this rapid review was assessed to be moderate quality (rated: 6) using the Health Evidence Tool.[12]

The timing of this review is critical, as recent years have seen a significant surge in the discussion of AI usage in public health. There have been frameworks and toolkits put forth by various international, national, and provincial/territorial organizations to support the development and use of AI in public health.[1-5,13] For instance, the Pan-Canadian AI for Health (AI4H) Guiding Principles were published in January 2025, a result of collaborative effort of Health Ministers across the country.[1] This document puts forth nine values and principles to support the ethical adoption of AI across the country, including: 1) Person-centricity; 2) Equity, diversity and inclusion; 3) Privacy and security; 4) Safety and oversight; 5) Accountability and responsibility; 6) Transparency and understandability; 7) AI literacy; 8) Robust data and data practices, and; 9) Indigenous-led governance and data sovereignty.[1] Ultimately, responsibility falls on provinces and territories to ensure alignment of their approach with these standards.[1]

Studies included in this review identified ways in which AI technology can deepen inequity in public health spaces. For instance, Luccioni and Bengio found that when compared to lighter-skinned males, facial recognition technologies demonstrate a 34.4% error rate in recognizing darker-skinned females.[14] Data that is used to train AI predominately excludes racialized groups, focusing instead on white populations.[15] Another study found that facial recognition technology used during the COVID-19 pandemic compromised privacy, equity, and human rights which eroded public trust and undermined other public health efforts.[16] The authors acknowledge the concept of the "digital divide"[17,18] wherein systematically oppressed groups also have inequitable access to AI technology. This divide is deepened by the use of biased data in AI training, and by the reliance on inequitable and colonial labour practices to rapidly upscale AI technologies.

Turning to a real-world local case example, we can further examine the inherent challenges to incorporating equity into public health AI technologies. The COVID-19 pandemic was declared in March 2020, necessitating a global wave of public health measures.[19] As cases of COVID-19 began to spread, countries around the world implemented digital technologies to aid in contact tracing while optimizing resource utilization.[20] In Canada, the federal government implemented CovidAlert, a digital contact tracing (DCT) mobile application, which was designed to alert users if they had been in close contact with another user who self-reported a positive COVID-19 test.[21] Analysis of the application after its decommissioning in June 2022 demonstrated that it had over 3 million active users, with almost 500,000 notifications sent.[21,22] Since the use of DCT apps during the COVID-19 pandemic, there has been a growing body of literature pertaining to the ethics of these public health tools. Concerns have been raised about the potential impact of AI public health tools on racial disparities, socio-economic disparities, existing health disparities, and the widening of digital divides.[23]

This rapid review addresses a crucial gap in a rapidly evolving field of literature, examining how health equity is considered in AI public health development in the Canadian context. The authors of this review extracted evidence from both academic and grey literature sources, offering important perspectives that can often be overlooked in academic papers. AI is being adopted in various settings at the federal, provincial/territorial, and local public health level and its adoption in these spaces will likely continue to grow. While this review offers a crucial overview of health equity considerations, it is the responsibility of public health organizations, researchers, and practitioners to adopt these lessons to their own context.

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