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Commentary on the Intersection Between Health Information, Misinformation, and Generative AI Technologies

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Abstract

In recent years, the field of artificial intelligence has seen rapid advancements, with models, such as large-language models and generative AI, evolving at a rapid pace. While this progress offers tremendous opportunities, it also presents risks, particularly in the creation, consumption, and amplification of information and its impact on population health and health program delivery. Thoughtful approaches are necessary to navigate the consequences of advances in AI for different healthcare professionals, patient populations, and from a policy and governance perspective. Through a collaboration between the World Federation of Public Health Associations (WFPHA) Working Groups, this commentary article brings together perspectives, concerns, and aspirations from young adult professionals across five continents, each with diverse backgrounds, to explore the future of public health and AI in the context of the changing health information environment. Our discussion is divided into two parts specifically examining aspects of disinformation and AI and also the role of public health and medical professionals in a growing AI-driven health information ecosystem. The commentary concludes with five key recommendations on how to potentially address issues such as (Dis)Information overload, misinformation propagation, and resultant changes in health practices, research, ethics, and the need for robust policies that can dynamically address current and future challenges.

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Commentary on the Intersection Between Health Information, Misinformation, and Generative AI Technologies

Abstract

In recent years, the field of artificial intelligence has seen rapid advancements, with models, such as large-language models and generative AI, evolving at a rapid pace. While this progress offers tremendous opportunities, it also presents risks, particularly in the creation, consumption, and amplification of information and its impact on population health and health program delivery. Thoughtful approaches are necessary to navigate the consequences of advances in AI for different healthcare professionals, patient populations, and from a policy and governance perspective. Through a collaboration between the World Federation of Public Health Associations (WFPHA) Working Groups, this commentary article brings together perspectives, concerns, and aspirations from young adult professionals across five continents, each with diverse backgrounds, to explore the future of public health and AI in the context of the changing health information environment. Our discussion is divided into two parts specifically examining aspects of disinformation and AI and also the role of public health and medical professionals in a growing AI-driven health information ecosystem. The commentary concludes with five key recommendations on how to potentially address issues such as (Dis)Information overload, misinformation propagation, and resultant changes in health practices, research, ethics, and the need for robust policies that can dynamically address current and future challenges.

Keywords: Generative Artificial Intelligence, Infodemics, Public Health

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Introduction

Position Statement of Authors

The World Federation of Public Health Associations (WFPHA) serves as a crucial global network, uniting public health professionals and organizations committed to improving health outcomes and well-being worldwide. As a leading voice in global health, WFPHA promotes public health advocacy, influences policy, and advances professional education across diverse regions. Within WFPHA, the Young Professionals World Federation of Public Health Associations Working Group (Young WFPHA) acts as a collection of medical and health professionals focused on empowering the next generation of public health leaders. Dedicated to fostering leadership, expanding career opportunities, and driving innovation, Young WFPHA facilitates global collaboration among emerging professionals committed to advance health and well-being. The group's vision is to ensure that young professionals are integral to building equitable and high-performing public health systems. Young WFPHA, consistent with the mission of the WFPHA, is dedicated to equipping emerging public health professionals with the requisite skills and networks to address contemporary public health challenges, including in the context of new and emerging technologies. Young WFPHA is also active in collaboration with various stakeholders, and implements its mission through active engagement in prominent international health forums, including the World Health Assembly. In 2023, the Young WFPHA group conducted a detailed survey aimed at identifying the challenges encountered by early-career public health professionals. The findings identified major obstacles, and concern about the ability to navigate the expanding role of Generative Artificial Intelligence in public health and health care design, delivery and practice. This next generation of artificial intelligence tools present both opportunities and challenges, requiring professionals to adapt and innovate in response to this rapidly evolving landscape. In response, Young WFPHA partnered with the WFPHA Global Health Equity and Digital Technology Working Group that focuses on research, education, training, and capacity building to ensure that digital technologies include health equity principles in their design, validation, implementation and assessment. Together, in this commentary, the two working groups bring together and elevate the diverse perspectives, concerns, and aspirations from young adult public health and medical professionals across five continents to explore the future of public health and AI in the context of the changing health information environment.

"*Generative AI* is *artificial intelligence (AI)* that can create original content—such as text, images, video, audio or software code—in response to a user's prompt or request." [1]

Emerging Role of Generative AI

Artificial Intelligence (AI) area has seen significant advancements with the introduction of large-language models (LLMs) and Generative AI (GenAI) applications that are easily accessible worldwide. In 2024, genAI is aggressively being incorporated by Microsoft, Google and Apple across their products and services - concomitantly, Meta launched the largest open-source large language model, Llama 3.1. Subsequently, GenAI is being integrated in many aspects of daily life, from content creation (text, images, music), to productivity tools (automation of tasks, customer service, coding) and data analysis (insights, reports, trend predictions), transforming our daily lives. Furthermore, it has been shown to be promising in incorporating technically complex knowledge, as exemplified by OpenAI's ChatGPT's 98% score on a USMLE Step 3 mock exam [2].

On the other hand, GenAI are in essence modes that generate output based on the patterns of content and types of language in the datasets that were used for its training. Therefore, the quality and accuracy of the model's outputs depend on the format, strategy and language used in the prompting - when users use expert domain vocabulary, apply domain frameworks, and leverage domain context, they get better LLM outputs [3]. In specialized knowledge domains like medicine, the implementation of LLMs in workflows is still nascent and will require improved evaluation approaches, consideration of prompt engineering and understanding human-computer interaction with the systems that incorporate GenAI, among others [3-6].

On the regulatory front, the G7 AI Principles and Code of Conduct have been established to guide the responsible and safe global use of AI. The European Union (EU) led the way with its comprehensive AI Act, positioning itself between China's strict regulatory controls and the more innovation-friendly, self-regulatory approaches of the USA and UK. In the United States, the "Safe, Secure, and Trustworthy Artificial Intelligence" executive order sets the framework, complemented by state-level and industry-specific regulations [7-9]. Together, these emerging data and AI governance frameworks will be important to assess in the context of their implications for applications in medicine and public health.

The GenAI transformation will arguably impact all levels of society. McKinsey estimates that GenAI could add $4.4 trillion annually to the global economy, though there are concerns about potential loss of employment across multiple industrial sectors [10]. However, less understood is the question of how GenAI could impact health information systems and broader information ecosystems, already at significant risk from a trust and integrity standpoint following the COVID-19 global pandemic that was accompanied by an equally complex "infodemic". Tackling the challenges associated with infodemics in crises will be critical, particularly in the context of how infodemics in the age of polycrises can be mitigated or exacerbated by established or emerging technologies. We must also consider the broader challenge of the information ecosystems and how diverse types of information – unclear, outdated, conflicting, low quality health information, misinformation and disinformation – impact health information seeking, understanding and use, and health behaviors.

Infodemic refers to an overabundance of information, accurate or not, that occurs during a mass acute health event such as an outbreak, epidemic or an event of mass importance. It can lead to confusion, risky behaviors and mistrust in health authorities [11].

Outside of the health emergency context, the work and impact of public health systems and health professionals is influenced by the structures and dynamics of the information ecosystem. The *information environment* refers to the dynamic set of *ecosystems* of all the communication channels, platforms, actors, narratives and interactions that influence how individuals receive, process, and use information. With the digitization of information exchange, the ubiquitousness of consumer-centered and device-mediated information consumption, the rapidly changing information ecosystems are straining public health program's known ability to provide credible and accurate health information to clinicians, patients and the public.

LLMs, GenAI, and other emerging AI technologies and computational systems (e.g., quantum computing), present both challenges and opportunities for public health but are rarely designed or implemented with the priorities of public health outcomes, health and well-being in mind, or adequate governance of dual-use research [12]. Accordingly, a balanced approach to adopting the tools supported by AI advancements, ensuring these are both innovative and responsible, is necessary [13].

To address this complex topic, this commentary gathers perspectives from young health professionals who represent stakeholders who are crucial in shaping the future of how the public health community assesses, responds, and introduces into practice these technology changes. Specifically, this commentary will explore the specific opportunities and risks posed by GenAI in health and information sectors through a collaborative consensus making process, and then concludes with a discussion of essential steps in education, training, research, innovation, policy, and ethics to better ensure consideration of responsible AI advancements that benefit all public health.

Methods

An initial draft outline of the manuscript concept was developed, followed by an open call for contributors based on the outlined topics. This call was disseminated among members of the Youth World Federation of Public Health Associations (WFPHA), leading to the purposeful selection of authors to ensure diverse representation in terms of geography and professional backgrounds. The participating contributors and co-authors come from Portugal, United States of America, Nepal, Nigeria, New Zealand, Italy, Germany, and Brazil, representing diverse fields such as Medicine, Public Health, Medical Informatics, and Social Psychology.

A collaborative approach towards generating consensus on main findings was employed, with biweekly meetings where authors shared insights, proposed improvements, and agreed on new goals. For the five questions in Part 2, each participating respondent author independently drafted their responses, which were then submitted anonymously to the lead and first author, who synthesized these responses into unified answers, then reviewed and refined by all authors until consensus was reached.

For the remainder of the manuscript, while all authors were encouraged to contribute to each sub-section, each author was assigned the responsibility of compiling and integrating the content for their respective sections.

Part 1: *The Dynamics of Information Ecosystems in Health through the lens of AI Innovation*

In the first part of our Commentary we assess the threats and opportunities presented by GenAI tools and application, specifically concerning Disinformation overload, AI-generated misinformation, and societal impacts.

Disinformation

Disinformation is deliberately promoted false content and can include hoaxes, conspiracies, and propaganda. Spreading health disinformation often exploits people’s vulnerabilities for profit or political or ideological influence. This can be driven by harmful commercial industries, fraudsters, or profiteers in sectors like tobacco, alcohol, food, wellness, and health supplement industries. Some actors spread disinformation to gain influence and monetize their audiences, advancing political or ideological agendas. For example, anti-vaccination groups use strategies like donations, membership fees, advertising, and merchandise sales to fund their activities [14]. Additionally, geopolitical actors use disinformation to weaken political opponents. Attacks on health systems—through propaganda or cyberattacks—undermine both the quality of healthcare and public trust in institutions, eroding people’s sense of safety and social cohesion [15].

In today's digital age, people are bombarded with vast amounts of information daily through many channels, and devices, leading to *information overload*—a state where the sheer volume of information becomes overwhelming for people, making it difficult to process and make well-informed decisions. To manage this complexity, the brain uses *cognitive shortcuts* (or heuristics), quick mental strategies that allow individuals to make judgments without needing to analyze every detail [17-20]. Both information overload and cognitive shortcuts contribute to analysis paralysis—when people feel overwhelmed and avoid engaging with information critically. Political, economic or cultural agents can exploit this unbalanced information environment to advance their agendas, with limited transparency, taking advantage of trust erosion and belief confirmation bias, where individuals prioritize information that confirm pre-existing views and dismiss contradictory evidence, therefore making it harder to reach people with credible, accurate information [16-19].

In the *modern information environment***,** human attention is treated as a scarce and valuable resource, sometimes referred to as the *attention economy*. Platforms, content creators, and media outlets compete to capture this attention of their users, shaping how information is produced, distributed, and consumed in order to influence their user's behaviors and keep them on their platforms as long as possible to derive advertising revenues from their attention [20-27].

As public health strongly relies on the enactment of health behaviors by the broader population, this can be particularly harmful: these dynamics of the information ecosystems impact not only individuals' health behaviors and the interpersonal and community relationships, but also the health workforce, the health system, and the socio-political environment within which the public health systems operate [28]. Regarding the latter, politicization of health information also leads users to avoid critical thinking for selectively biased media content that can be amplified by platform algorithms [29-35].

AI generated misinformation

"*Misinformation* is when false information is shared, but no harm is meant" [36].

In the context of health-promoting behaviors and designed environments, understanding the continuum of elements in the information environment is essential to contextualize public health action that aims at preventing harms to health and wellbeing [37]. This continuum starts with *questions* and *concerns*—the natural inquiries people have during health crises. When these are not addressed, it can lead to *information voids*, where people search for answers but find none from credible sources. These information voids are situations where people are especially on the lookout for health information, and when they fail to find health information from credible, accurate sources, this creates fertile ground for exposure and susceptibility to *misinformation* (unintentional falsehoods) and *disinformation* (deliberate falsehoods), which can resonate with a person's values. People share information online because it is aligned with their beliefs and values, and experience, they want others to see and therefore it can snowball into narratives that can undermine trust in public health systems.

The rise of AI-generated media and information (deep fakes, news articles, statistics, photos, infographics, etc.) makes it increasingly difficult to understand health information, its relevance and accuracy, complicating communication of health guidance, health risks, and benefits of health products and programmes [38,39]. Additionally, the user- and AI-generated visually appealing mis- and disinformation spreads rapidly due to being easily digestible, triggering emotional appeal and being easily shareable. There has been a rise of low quality AI-generated content on the internet, which has been referred to as "digital sludge" or "the funkification of the internet", adding to concerns that low-quality AI-generated content will be further incorporated into general-use commercial LLMs, degrading the quality of LLM outputs over time [40]. Generating digital sludge is a strategy used by health-harming industries in marketing their products, alcohol industry being just one example [41].

Additionally to being used for easy content creation, genAI models are being built into many web portals, internet platforms, apps, and devices, therefore impacting the quality of information to which individuals are exposed. However, these applications often prioritize popular over accurate data sources, reinforcing imprecisions – that can be harmful, like promotion of ineffective treatments, amplifying health myths – of the algorithm or of the person since results are tailored by like minded individuals. A major example is the memory function of ChatGPT, which may skew a user's information knowledge base over time with little notice by the user [42]. This emotional manipulation makes people more likely to share disinformation and, over time, exposure to conflicting or false information can then erode trust in public health authorities and deepen societal divisions [38,39,43-45].

This emphasizes the need to understand how integrating AI technologies into our information environment can skew users' perceptions and source accuracy, demanding a more nuanced approach to address not only the explicit harms of inaccurate narratives but also how the built environment shapes people's understanding of health and wellbeing.

To mitigate the impact of GenAI-generated misinformation and in the interpretation of the built information environment, a comprehensive approach is needed:

- Technological Solutions: Development of advanced algorithms to detect and flag deep fakes and inaccurate information [43].
- Public Awareness: Promoting critical thinking and digital literacy to recognize misinformation.
- Regulatory Frameworks: Implementing regulations to hold accountable the full chain of dissemination of false information (e.g., the recently approved EU AI Act mandates disclosure when interacting with AI) [44].
- Collaboration: Engaging with tech companies, media, healthcare professionals, and governments to counter misinformation [46].

Societal impacts

Mis- and disinformation are estimated to compose 5-25% of the information environment and have wide-ranging impacts—psychological, physical, social, economic, and political [47-51]. Accordingly, these information ecosystems—where sensationalist reporting, conflicting expert opinions, and slow issuance of health guidance create confusion among the public—undermine trust and enable misinformation to flourish, making public health campaigns less effective [52,53,11]. For example, during a pandemic, this brings risks such as vaccine hesitancy and disregard for public health measures [53-55]. Additionally, the health information system can lead to other behavioral changes, with patients self-diagnosing more, requiring unnecessary and potentially harmful exams and treatments, and possibly forgoing preventive or care options [56,57]. Lastly, it is important that vulnerable communities are particularly susceptible to the deleterious impact of infodemics discussed consequences [58].

On the other hand, when combined with other measures, GenAI has the potential to be an ally in the detection and correction of misinformation (Health-related Misinformation Detection (HMD) framework; SimSearchNet, by Meta; and SynthID, from Google DeepMind) and in the spread of accessible and accurate information [59-64]. Additionally, GenAI may as well be useful to understand geographical patterns of information, analyze large data sets, identify trends and generate forecasts [65,66]. Furthermore, it may enhance health literacy, accelerate information dissemination, support treatment adherence, enable early diagnosis as well as be used for disease surveillance, risk assessment and mental health support [67-69]. A promising example is the 'digital health promoter prototype' S.A.R.A.H., which provides guidance on healthy habits, mental health, non-communicable diseases and misinformation handling through online 'face-to-face' conversations [70-77].

While technological innovation can help shape healthier information environments, it's crucial to address these challenges holistically, considering the broader, governance, regulatory, social and informational context [78].

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Part 2: *The Role of Public Health and Medical Professionals in LLMs and Information Ecosystem in Health*

As discussed, the impact of the information ecosystem and mis- and disinformation on health and wellbeing in the AI era is vast and ever-evolving with constantly new versions of LLM tools and systems that utilize them. Hence, it is crucial to take into account the views of young health professionals across various professional fields and regions to better understand current and future opportunities and challenges. We consulted Medical Doctors, Public Health Professionals, and other health experts (researchers, psychologists) from five continents. The following section presents their perspectives through a unified response developed from the intersection of their individual blind answers.

1. What roles do LLMs currently play in your professional area, and how can they enhance the propagation of safe and reliable health information?

LLMs are transforming healthcare by automating administrative tasks, enhancing clinical, public health, and administrative data management, and supporting health education and research. Examples of solutions under development that integrate LLMs include patient education, automated medical records writing, and providing suggestions for patient diagnosis and management [79]. In public health, LLMs can aid in data treatment, contributing to predictive analysis and response strategies during health emergencies, and generating rapid contextualized analysis of community sentiment and health behaviors to generate infodemic insights and inform adaptive delivery of public health responses, programmes and communications [66]. Despite these advancements, the integration of LLMs into health systems and public health practices faces significant regulatory and ethical challenges. For example, Health New Zealand - Te Whatu Ora has specifically advised against the use of GenAI in health due to concerns over privacy, accuracy, and ethics. To address these issues, WHO has called for stronger evidence around the design, training, and validation of AI-supported applications, yet global regulatory frameworks remain insufficient to oversee the full lifecycle of AI in healthcare and public health [80].

2. How is the integration of AI and LLMs transforming patient communication and overall health outcomes in your field?

AI and LLMs can transform patient-clinician communication not only in the consultation process but also by extending this communication beyond traditional consultation boundaries. These technologies can collect clinical information before appointments, handle administrative tasks such as record writing, and facilitate follow-up communications. If AI and LLMs can reduce the non-clinical workload of clinicians, this could allow healthcare providers to spend more time interacting with patients, thereby enhancing efficiency and quality of care. However, this productivity gain may only increase the number of patients seen, without necessarily improving the quality of care.

Additionally, if its current limitations and risks are overcome, AI and generative AI tools have the potential to contribute to health promotion, risk communication, health education, and social behavior change efforts in public health systems. These technologies can personalize messaging, analyze real-time health data, and automate responses, enabling more targeted health education and behavior change interventions. AI can enhance risk communication by providing tailored, timely health warnings and support behavior change through virtual counseling and interactive tools.

Furthermore, AI-powered tools are being tested to contribute to virtual counseling, adapted health information systems, and treatment adherence (e.g. medication reminders) [81-83]. This can improve the patient-clinician communication and the care continuum, ensuring that patients receive

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comprehensive and continuous care. To facilitate this integration, such technologies could be integrated in previously developed digital solutions developed to make healthcare more accessible in rural areas, for example through remote diagnostics and consultations in New Zealand and Brazil [84].

3. How do you plan to integrate LLMs into your practice, and what specific applications do you foresee?

LLMs' ability to process enormous amounts of data presents an opportunity to aid healthcare systems in managing patient outcomes. By utilizing previously unused data, LLMs can transform it into actionable insights, enabling more effective management of patient outcomes. They can support clinical decision-making by providing clinicians with insights about patients in similar situations or generating concise patient summaries. If we can eliminate biases and other current limitations, LLMs can potentially identify patterns in patient data that may indicate a risk of developing certain conditions (digital twins), enabling early diagnosis and interventions, and remind patients and health professionals about regular check-ups and screenings [85]. In this case, by analyzing and organizing large volumes of data, LLMs may facilitate regulated, accountable and auditable data interoperability, increasing clinicians' effectiveness and accelerate access to patient information when necessary.

Furthermore, LLMs can improve resource management. For example, in Germany, one of the authors is working on a project that is exploring the integration of LLMs into non-emergency urgent care to help with patient navigation: this system determines whether a patient needs an in-person urgent care appointment, a telemedical consultation, over-the-counter medication from a pharmacy, or can wait until normal business hours for their GP.

4. What policies and ethical guidelines do you think are necessary to responsibly integrate GenAI into health practices globally (& locally)?

The responsible integration of GenAI into healthcare requires robust global policies to avoid health risks, privacy issues, and biases (a study of a large US hospital database suggests that eliminating racial bias in triage algorithms would increase the percentage of black patients who receive additional help from 17.7 to 46.5%) [86]. Thus, formulation of relevant policies and guidelines are urgently needed. Adherence to existing standards such as the General Data Protection Regulation (GDPR - EU), Health Insurance Portability and Accountability Act (HIPAA - USA), and Lei Geral de Proteção de Dados (LGPD - Brazil) is foundational. However, people living in countries without consumer protections are disproportionately affected by how commercial actors use their communities to develop, test, and deploy AI-supported tools, which may further exacerbate health and wellbeing inequities worldwide. Given the international nature of AI data markets, regional and national strategies should seek to align with global guidelines, with international organizations such as the WHO, respecting the sovereignty of countries and the agency of individuals. Policies should balance innovation with patient safety and respect, ensuring practical implementation. The EU AI Act, for example, aims to create a comprehensive regulatory framework for AI, addressing risks and promoting ethical AI development and use within the EU.

Integration of these technologies must provide patients with easy options to opt out of data sharing without facing adverse consequences. Additionally, specific consumer protection against deceptive marketing to vulnerable populations (e.g. children), protection against hate speech and protections of freedom of expression are essential. Furthermore, addressing the risk of propagating biases from training data is crucial, as it impacts the fairness and accuracy of AI outputs. Ensuring inclusive and representative datasets is essential for equitable treatment of all patient groups. Additionally, GenAI systems must be continuously validated in a transparent manner to increase data reliability, avoid issues related to copyright and intellectual property rights, and maintain trust and efficacy. In line with the Global Digital Compact, AI governance must be anchored in human rights and international law, with ethical guidelines, regular compliance reviews and data security ensuring these technologies benefit all [87-89].

5. What future impacts of GenAI in healthcare and public health are currently underexplored or underestimated, and how should the health professionals community prepare for these changes?

The future impacts of GenAI in healthcare are promising but need to be further evaluated for key public health areas: disease surveillance, prediction of disease outbreaks, assessment of individual health risks, and suggestion of preventive measures. These advancements could lead to lower healthcare costs and better patient outcomes. Additionally, GenAI has the potential to aid medical education through personalized learning experiences, virtual simulations, and real-time feedback. It can also streamline administrative tasks such as scheduling, billing, and resource allocation. Furthermore, in direct patient care, the integration of information from different centers remains highly fragmented across the World. Patients often forget details about their medications, medical history, previous treatments, or surgeries. GenAI could help by securely integrating and condensing this data, reducing both missing and overlapping information, similar to what is being developed in the European Health Data Space.

While future health professionals will not need to be tech experts, they must effectively communicate with tech specialists. Therefore, every health degree should include GenAI training, including risks and limits, to prepare students for this integration. There will also be a growing need for professionals who can bridge management, technological, and health competencies to manage these complex systems, which can lead to work overload.

However, significant risks and challenges must be addressed. Public and ethical oversight, equity, and social participation are essential to prevent biases and ensure fair treatment for all patient groups and communities. Adequate resourcing of public communication, social participation, health promotion and health education capacities, and multilevel building of health, digital, information and media literacies in communities and in the workforce are crucial. Additionally, data sovereignty of peoples and nations (including Indigenous communities experiencing inequities) is a crucial but an underdeveloped area with important implications as AI progresses [90]. Policies must respect the data sovereignty of communities to ensure the ethical and equitable use of AI. These steps are necessary to foster acceptance and understanding of AI in healthcare.

Part 3: *Discussion and call to action*

In the third part of our commentary we focus on summarizing the potential impacts that GenAI is having in various areas of society: Education & Training, Research and Innovation and Policy and Ethics.

Education & Training

GenAI transformation is happening and, therefore, comprehensive training to future generations and the in service generation is necessary. This development of AI literacy is necessary not only to improve productivity but to ensure both users and consumers of GenAI generated content are aware of its potential risks and bias [81]. Additionally, health presents particular needs and threats and, therefore, specific continuous training for health and public health professionals should be prioritized.

Educational efforts must be comprehensive, addressing not only prompt engineering but also data privacy, policy implications, algorithmic bias while promoting transparent usage of AI systems. Beyond the healthcare and public health workforce, promoting digital literacy among the general population is crucial to ensure critical thinking and the ability to critically evaluate AI-generated content [49,91-93,25,94,95]. In this regard, infodemic management, a rising public health field, will be central in this transformation to build preparedness for future infodemics and training the health workforce to respond and mitigate misinformation during health emergencies [96].

Therefore, we call to action:

> *Increase Health Literacies (health, media, information, science) and specifically AI literacy starting as early as pre-university levels* to prepare future generations for the AI-driven healthcare landscape.

> *AI Education in All Health Degrees.* Courses on AI usage, risks, biases, and management of AI-generated information in all health degree programs. Similarly, we recommend integrating health topics into fields like computer science, ethics, and tech governance.

Research & Innovation

We believe AI research and innovation should focus on three key areas: ensuring universal and equitable access to health by proposing innovative strategies and empowering digital solutions to provide equitable access to healthcare; health preventive programmes; and non-polarized and non-biased health information for all populations. In general, while AI can significantly enhance research capabilities through advanced writing and data analysis, interdisciplinary collaboration is essential to prevent the spread of appealing yet inaccurate research.

Therefore, we call to action:

> *Incorporation of AI and ethics Experts within Public Health Organizations* to ensure accurate and ethical AI application.

Policy & Ethics

Effective AI adoption in healthcare and public health requires collaboration among patients, civil society, and policymakers to establish ethical frameworks, regulatory oversight, and effective data governance. The Global Digital Compact, annexed to the United Nations Pact for the Future, is the first global commitment to data governance – besides calling attention to the need to take local action by 2030, it incentivizes a global policy approach on AI governance and clarifies the need of this space to respect human rights and international law [89]. This urgent need for greater transparency and accountability is recognized by players from different backgrounds from non-governmental to corporate and philanthropies (as exemplified by the “Partnership on AI”) [97-101].

A responsible transition depends on comprehensive, yet flexible policy development (as the “EU AI Act”), robust ethical guidelines (as the “Ethics and governance of artificial intelligence for health: Guidance on large multi-modal models”) and a strong commitment to ensure Health Equity [102,44]. These are vital to avoid biases in AI models and ensure that AI benefits are distributed fairly.

Regarding ethics, the World Health Organization (WHO) has outlined six ethical principles to guide AI development in health: protecting autonomy, promoting well-being and safety, ensuring transparency, fostering accountability, ensuring inclusiveness and equity, and promoting sustainability [102]. WHO ethics guidance will soon extend to provide help to public health authorities to establish infodemic management practices, policies and strategies [103]. These guidelines emphasize the importance of fairness, transparency, and accountability, addressing critical concerns such as data privacy, algorithmic bias, and health equity to prevent AI from deepening existing health disparities.

Therefore, we call to action:

> *International Collaboration* to develop AI-related legislation that ensures global standards and practices, respecting regional and national autonomies, with clear definition of high-risk applications in medicine and public health.

> *Development of equitable Ethical and Regulatory Guidelines and Codes* to guide all sectors in the responsible use of AI in healthcare and public health that prioritizes health equity and human rights.

Conclusion

AI integration in healthcare and public health presents both significant opportunities and substantial risks, especially as it intersects with the complex dynamics of health information ecosystems. The main threats involve information overload, disinformation, and AI-generated misinformation, which can negatively impact individual and collective health behaviors. However, through responsible, participative, and evidence-based AI development, we can mitigate these risks and enhance the accuracy and accessibility of quality health information.

As emerging leaders in public health, drawing on the experiences of professionals from diverse backgrounds across five continents, we recognize this dual nature of AI technologies. To harness generative AI's potential responsibly, we must prioritize AI literacy among health professionals and the public, integrate AI education into health curricula, and establish robust ethical guidelines and regulatory frameworks that promote equity and protect patient privacy. By taking proactive steps in education, research, and policy, we can leverage generative AI to enhance global health while safeguarding against its risks.

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Contributions

AB and TM developed the Outline of the article. AB, LG, FH, JUS, MLG, RP, SP equally contributed to the writing of the commentary content, while AlB, TP and TM contributed with significant reviewing insights. All authors except for AB, AlB, TP and TM answered individually to the Questions at the beginning of part 2; AB collected all answers and wrote a joint answer for each questions that were later reviewed and approved by all authors. All authors reviewed and agreed with the final version of the article.

Conflicts of Interest

We disclose that Dr. Timothy Ken Mackey, the Editor-in-Chief of JMIR Infodemiology, is a co-author of this manuscript. We are committed to maintaining transparency and adhering to the journal's policies regarding conflicts of interest.

Abbreviations

AI: Artificial Intelligence

Preprint JMIR Publications

EU: European Union
GenAI: Generative Artificial Intelligence
GDPR: General Data Protection Regulation
GP: General Practitioner
HIPAA: Health Insurance Portability and Accountability Act
LGPD: *Lei Geral de Proteção de Dados*
LLMs: Large-Language Models
WHO: World Health Organization

Preprint JMIR Publications

References

1. Cole Stryker, Mark Scapicchio,. What is Generative AI? | IBM. https://www.ibm.com/topics/generative-ai 2024 -03-22; 2024(Oct 2).
2. Scott Gottlieb, Shani Benezra,. How Well Can AI Chatbots Mimic Doctors in a Treatment Setting? We Put 5 to the Test. American Enterprise Institute - AEI; 2024(Aug 6).
3. Zamfirescu-Pereira JD, Wong RY, Hartmann B, et al.,. Why Johnny Can't Prompt: How Non-AI Experts Try (and Fail) to Design LLM Prompts | Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems.
4. Sivarajkumar S, Kelley M, Samolyk-Mazzanti A, et al.,. An Empirical Evaluation of Prompting Strategies for Large Language Models in Zero-Shot Clinical Natural Language Processing: Algorithm Development and Validation Study. JMIR Medical Informatics 2024 -04-08; 12(1):e55318.
5. Mizrahi M, Kaplan G, Malkin D, et al.,. State of What Art? A Call for Multi-Prompt LLM Evaluation. Transactions of the Association for Computational Linguistics 2024 -08-01; 12:933–949.
6. Khurana A, Subramonyam H, Chilana PK,. Why and When LLM-Based Assistants Can Go Wrong: Investigating the Effectiveness of Prompt-Based Interactions for Software Help-Seeking | Proceedings of the 29th International Conference on Intelligent User Interfaces 2024 12 Fe.
7. European Parliament,. Regulation (EU) 2024/1689 of the European Parliament of 13 June 2024 (Artificial Intelligence Act) 2024 13 Jun.
8. The Economist,. AI needs regulation, but what kind, and how much?. The Economist 2024 August 24t.
9. Ernst & Young Global Ltd.,. G7 AI Principles and Code of Conduct | EY - Global 2023 01 De; 2024(Oct 22).
10. McKinsey,. What is the future of AI (Artificial Intelligence)? 2024 April 30.
11. World Health Organization,. Infodemic. https://www.who.int/health-topics/infodemic#tab=tab_1; 2024(September 12th).
12. WHO Chief Scientist and Science Division (SCI),. Global guidance framework for the responsible use of the life sciences: mitigating biorisks and governing dual-use research. World Health Organization 2022 13 Septembe.
13. Rasooly D, Khoury MJ,. Artificial Intelligence in Medicine and Public Health: Prospects and Challenges Beyond the Pandemic. https://blogs.cdc.gov/genomics/2022/03/01/artificial-intelligence-2/ 2022 March 1; 2024(September 30th).
14. Center for Countering Digital Hate,. The Anti-Vaxx Playbook. Center for Countering Digital Hate 2020 December 23.
15. United Nations High Commissioner for Refugees,. Using Social Media in Community Based Protection. United Nations High Commissioner for Refugees 2021 Januar:230–231.
16. Patent V,. Dysfunctional trusting and distrusting: Integrating trust and bias perspectives. Journal of Trust Research 2022 January 2; 12(1):66–93.
17. Ecker UKH, Lewandowsky S, Cook J, et al.,. The psychological drivers of misinformation belief and its resistance to correction. Nat Rev Psychol 2022 January 1; 1(1):13–29.
18. van Zoonen L,. I-Pistemology: Changing truth claims in popular and political culture. European Journal of Communication 2012 -03-01; 27(1):56–67.
19. Bing C, Schectman J,. Pentagon ran secret anti-vax campaign to incite fear of China vaccines. Reuters 2024 -08-28; 2024(Aug 28).
20. Pennycook G, McPhetres J, Zhang Y, et al.,. Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. Psychol Sci 2020 July 1; 31(7):770–780.
21. Cesarino L,. Pós-verdade e a crise do sistema de peritos: uma explicação cibernética. Ilha Revista

de Antropologia 2021 February 24; 23(1):73–96.
22. Goncalves LH, Furtado O,. The fake simple exchange between Facebook and its prosumers. Socioscapes. International Journal of Societies, Politics and Cultures 2020; 2(2):181–206.
23. Tim Wu. ,The Attention Merchants: The Epic Scramble to Get Inside Our Heads. 1st edition edition: Knopf; 2016.
24. Altay S, de Araujo E, Mercier H,. “If This account is True, It is Most Enormously Wonderful”: Interestingness-If-True and the Sharing of True and False News. Digital Journalism 2021 August 24; 10:1–22.
25. Lewandowsky S, Ecker UKH, Cook J,. Beyond misinformation: Understanding and coping with the “post-truth” era. Journal of Applied Research in Memory and Cognition 2017; 6(4):353–369.
26. Dantas M,. The Financial Logic of Internet Platforms: The Turnover Time of Money at the Limit of Zero. tripleC: Communication, Capitalism & Critique. Open Access Journal for a Global Sustainable Information Society 2019 May 18; 17(1):132–158.
27. Nick Srnicek. ,Platform Capitalism. 1st edition: Polity; 2016.
28. Laxa J,. The consumption of disinformation as a health crisis. Journal of Public Health 2023 -03-01; 45(1):e161.
29. Valenzuela S, Halpern D, Katz JE, et al.,. The Paradox of Participation Versus Misinformation: Social Media, Political Engagement, and the Spread of Misinformation. Digital Journalism 2019 -07-03; 7(6):802–823.
30. Pennycook G, Rand DG,. The Psychology of Fake News. Trends in Cognitive Sciences 2021 -05-01; 25(5):388–402.
31. Garrett C, Qiao S, Li X,. The Role of Social Media in Knowledge, Perceptions, and Self-Reported Adherence Toward COVID-19 Prevention Guidelines: Cross-Sectional Study. JMIR Infodemiology 2024 -02-16; 4(1):e44395.
32. Novaes CD,. The Role of Trust in Argumentation. Informal Logic 2020 July 6; 40(2):205–236.
33. Leonardo F. Nascimento, Tarssio Barreto, Letícia Cesarino, et al.,. Públicos refratados: grupos de extrema-direita brasileiros na plataforma Telegram 2023 -01-16T21:42:37+00:00.
34. Brady WJ, Jackson JC, Lindström B, et al.,. Algorithm-mediated social learning in online social networks. Trends in Cognitive Sciences 2023 -10-01; 27(10):947–960.
35. Amy Ross Arguedas &, Craig T. Robertson &, Richard Fletcher &, et al.,. Echo chambers, filter bubbles, and polarisation: a literature review | Reuters Institute for the Study of Journalism.
36. Claire Wardle P, Hossein Derakhsha,. INFORMATION DISORDER: Toward an interdisciplinary framework for research and policy making. Council of Europe 2017 September 27:5.
37. Briand S, Hess S, Nguyen T, et al., Infodemic Management in the Twenty-First Century. In: Purnat TD, Nguyen T, Briand S, editors., Managing Infodemics in the 21st Century : Addressing New Public Health Challenges in the Information Ecosystem Cham: Springer International Publishing; 2023. p. 1–16.
38. Tina D Purnat,. Information ecosystem disrupting health, Ex #3: misdirection and misleading in health information search results 2024 April 15.
39. Ashraf AR, Mackey TK, Fittler A,. Search Engines and Generative Artificial Intelligence Integration: Public Health Risks and Recommendations to Safeguard Consumers Online. JMIR Public Health and Surveillance 2024 -03-21; 10(1):e53086.
40. Lubin N,. What to Do About the Junkification of the Internet 2024 -03-12.
41. Roy-Highley E, Körner K, Mulrenan C, et al.,. Dark patterns, dark nudges, sludge and misinformation: alcohol industry apps and digital tools. Health Promotion International 2024 -10-01; 39(5):daae037.
42. Barbara Lampl,. Memory Function of ChatGPT – Think Twice Before You Use It! 2024 Octobe.
43. Citron D, Chesney R,. Deepfakes and the New Disinformation War. Foreign Affairs 2019 -01-01.
44. European Parliament,. EU AI Act: first regulation on artificial intelligence. https://www.europarl.europa.eu/topics/en/article/20230601STO93804/eu-ai-act-first-regulation-on-

artificial-intelligence 2024 June 18th; 2024(Aug 6).
45. Hughes BL, Zaki J,. The neuroscience of motivated cognition. Trends in Cognitive Sciences 2015 -02-01; 19(2):62–64.
46. Shao C, Ciampaglia GL, Varol O, et al.,. The spread of low-credibility content by social bots. Nat Commun 2018 November 20; 9(1):4787.
47. Stewart R, Madonsela A, Tshabalala N, et al.,. The importance of social media users' responses in tackling digital COVID-19 misinformation in Africa. DIGITAL HEALTH 2022 January 1; 8:20552076221085070.
48. Nascimento IJBd, Pizarro AB, Almeida JM, et al.,. Infodemics and health misinformation: a systematic review of reviews. Bulletin of the World Health Organization 2022 Jun 30; 100(9):544.
49. Vosoughi S, Roy D, Aral S,. The spread of true and false news online. Science 2018 -03-09; 359(6380):1146–1151. PMID: 29590045.
50. Purnat T, Dunn AG, Ishizumi A, et al.,. A research platform for measuring information exposure, trust, and behaviour – burden of infodemics. European Journal of Public Health 2023 -10-01; 33(Supplement_2):ckad160.1678.
51. Wilhelm E, Ballalai I, Belanger M, et al.,. Measuring the Burden of Infodemics: Summary of the Methods and Results of the Fifth WHO Infodemic Management Conference. JMIR Infodemiology 2023 -02-20; 3(1):e44207.
52. Sora Aiko,. The Ethics of Reporting: Balancing Truth and Sensationalism in Global Media. Global Media Journal 2024 June 30th.
53. Singh K, Lima G, Cha M, et al.,. Misinformation, believability, and vaccine acceptance over 40 countries: Takeaways from the initial phase of the COVID-19 infodemic. PLOS ONE 2022 09/02; 17(2):e0263381.
54. Gaysynsky A, Everson NS, Heley K, et al.,. Perceptions of Health Misinformation on Social Media: Cross-Sectional Survey Study. JMIR Infodemiology 2024 -04-30; 4(1):e51127.
55. Jon Roozenbeek, , Claudia R. Schneider, et al.,. Susceptibility to misinformation about COVID-19 around the world | Royal Society Open Science.
56. Yıldırım S., The Challenge of Self-diagnosis on Mental Health Through Social Media: A Qualitative Study. In: Battineni G, Mittal M, Chintalapudi N, editors., Computational Methods in Psychiatry Singapore: Springer Nature; 2023. p. 197–213.
57. Farnood A, Johnston B, Mair FS,. A mixed methods systematic review of the effects of patient online self-diagnosing in the 'smart-phone society' on the healthcare professional-patient relationship and medical authority. BMC Medical Informatics and Decision Making 2020 October 6; 20(1):253.
58. Melki J, Tamim H, Hadid D, et al.,. Mitigating infodemics: The relationship between news exposure and trust and belief in COVID-19 fake news and social media spreading. PLOS ONE 2021 04/06; 16(6):e0252830.
59. Liu Y, Yu K, Wu X, et al.,. Analysis and Detection of Health-Related Misinformation on Chinese Social Media. IEEE Access 2019 October 11; 7:1–1.
60. Walter N, Brooks JJ, Saucier CJ, et al.,. Evaluating the Impact of Attempts to Correct Health Misinformation on Social Media: A Meta-Analysis. Health Commun 2021 -11; 36(13):1776–1784. PMID: 32762260.
61. Pandey S, Prabhakaran S, Reddy NVS, et al.,. Fake News Detection from Online media using Machine learning Classifiers. J Phys : Conf Ser 2022 January 1; 2161(1):012027.
62. Sundelson AE, Jamison AM, Huhn N, et al.,. Fighting the infodemic: the 4 i Framework for Advancing Communication and Trust. BMC Public Health 2023 August 30; 23(1):1662.
63. . Usando inteligência artificial para detectar desinformação e conteúdo abusivo sobre COVID-19 2020 -05-12T18:53:52+00:00.
64. Google Deepmind,. SynthID. https://deepmind.google/technologies/synthid/; 2024(Oct 1).
65. Olawade DB, Wada OJ, David-Olawade AC, et al.,. Using artificial intelligence to improve public health: a narrative review. Front Public Health 2023; 11:1196397. PMID: 37954052.

66. Bandeira A, Lianjie &, Anthony, et al.,. The Role of AI in Sentiment Analysis of Health News: A Case Study of Newspaper Coverage on ER Misdiagnosis 2024 November 13.
67. Chaix B, Guillemassé A, Nectoux P, et al.,. Vik: A Chatbot to Support Patients with Chronic Diseases. Health 2020 July 2; 12(7):804–810.
68. Jungwirth D, Haluza D,. Artificial Intelligence and Public Health: An Exploratory Study. International Journal of Environmental Research and Public Health 2023 /1; 20(5):4541.
69. Tina D Purnat,. What are some ways that generative AI could be used for public health and infodemic management? 2023 March 18.
70. Fisher S, Rosella LC,. Priorities for successful use of artificial intelligence by public health organizations: a literature review. BMC Public Health 2022 November 22; 22(1):2146.
71. WHO,. Meet Florence, WHO's digital health worker who can help you quit tobacco. https://www.who.int/europe/news/item/14-02-2021-meet-florence-who-s- 2021 14 Februar; 2024(August 6th).
72. WHO,. S.A.R.A.H, a Smart AI Resource Assistant for Health; 2024(August 6th).
73. Stein N, Brooks K,. A Fully Automated Conversational Artificial Intelligence for Weight Loss: Longitudinal Observational Study Among Overweight and Obese Adults. JMIR Diabetes 2017 -11-01; 2(2):e28. PMID: 30291087.
74. Neuhauser L, Kreps GL, Morrison K, et al.,. Using design science and artificial intelligence to improve health communication: ChronologyMD case example. Patient Educ Couns 2013 -08; 92(2):211–217. PMID: 23726219.
75. Grolleman J, van Dijk B, Nijholt A, et al. ,Break the Habit! Designing an e-Therapy Intervention Using a Virtual Coach in Aid of Smoking Cessation. Berlin, Heidelberg: Springer; 2006.
76. Soul Machines,. Soul Machines Joins Forces with the World Health Organization to Combat COVID-19 Misinformation and Help More Than 1 Billion Tobacco Users Quit 2020 7/10/ 3:54:34 P; 2024(Aug 6).
77. Johnson NF, Velásquez N, Restrepo NJ, et al.,. The online competition between pro- and anti-vaccination views. Nature 2020 June 1; 582(7811):230–233.
78. Robert A. Kaufman, Michael Robert Haupt, Steven P. Dow. ,Who's in the Crowd Matters: Cognitive Factors and Beliefs Predict Misinformation Assessment Accuracy | Proceedings of the ACM on Human-Computer Interaction. ACM on Human-Computer Interaction; 11 November 2022.
79. Nazi ZA, Peng W,. Large Language Models in Healthcare and Medical Domain: A Review. Informatics 2024 /9; 11(3):57.
80. Digital Health and Innovation (DHI), Medical Devices and Diagnostics (MDD), WHO; . Generating Evidence for Artificial Intelligence Based Medical Devices: A Framework for Training Validation and Evaluation. World Health Organization 2021 17 November.
81. Gutierrez G, Stephenson C, Eadie J, et al.,. Examining the role of AI technology in online mental healthcare: opportunities, challenges, and implications, a mixed-methods review. Front Psychiatry 2024 May 7; 15.
82. Samy Helmy Hanna B, Samy Helmy Hanna A,. Role of Artificial Intelligence in Mental Wellbeing: Opportunities and Challenges. Journal of Artificial Intelligence 2021 /12/15; 15(1):1–8.
83. Fadhil A,. A Conversational Interface to Improve Medication Adherence: Towards AI Support in Patient's Treatment 2018 -03-03.
84. Ministério da Saúde Brazil,. Programa do SUS investirá de R$ 133,6 milhões em redes de telessaúde. https://agenciagov.ebc.com.br/noticias/202404/proadi-sus-fortalece-estrategia-em-telessaude-com-investimento-de-r-133-6-milhoes; 2024(Aug 6).
85. Hager P, Jungmann F, Holland R, et al.,. Evaluation and mitigation of the limitations of large language models in clinical decision-making. Nat Med 2024 July 4:1–10.
86. Obermeyer Z, Powers B, Vogeli C, et al.,. Dissecting racial bias in an algorithm used to manage the health of populations. Science 2019 -10-25; 366(6464):447–453.

87. Alessandra Lemos, Gabriela Buarque, Ingrid Soares, et al.,. Avaliação de Impacto Algorítmico para Proteção dos Direitos Fundamentais 2023 April.
88. OECD., Public policy considerations Artificial Intelligence in Society: OECD; 2019. p. 81–120.
89. Francyne Harrigan, Stefania Piffanelli, Jackquelyn Kay Topacio,. Press Release | United Nations adopts ground-breaking Pact for the Future to transform global governance 2024 -09-22.
90. Mackey TK, Calac AJ, Chenna Keshava BS, et al.,. Establishing a blockchain-enabled Indigenous data sovereignty framework for genomic data. Cell 2022 -07-21; 185(15):2626–2631.
91. Nutbeam D,. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International 2000 -09-01; 15(3):259–267.
92. Friedman CP, Wong AK, Blumenthal D,. Achieving a nationwide learning health system. Sci Transl Med 2010 -11-10; 2(57):57cm29. PMID: 21068440.
93. Chou WS, Oh A, Klein WMP,. Addressing Health-Related Misinformation on Social Media. JAMA 2018 -12-18; 320(23):2417–2418. PMID: 30428002.
94. Esteva A, Robicquet A, Ramsundar B, et al.,. A guide to deep learning in healthcare. Nat Med 2019 January 1; 25(1):24–29.
95. Morley J, Machado CCV, Burr C, et al.,. The ethics of AI in health care: A mapping review. Soc Sci Med 2020 -09; 260:113172. PMID: 32702587.
96. Community Readiness and Resilience (, Country Readiness Strengthening (, Epidemic and Pandemic Preparedness and Prevention, (EPP),. Mainstreaming infodemic management in learning and teaching programmes: a report from a WHO technical consultation, 21–23 March 2023, Belgrade, Serbia. World Health Organization 2024 16 Februar.
97. ParternshiponAI,. Our Funding | ParternshiponAI. https://partnershiponai.org/; 2024(Oct 1).
98. Oremus W,. Zuckerberg expresses regrets over covid misinformation crackdown. Washington Post 2024 -08-27.
99. UNESCO,. Addressing hate speech on social media: contemporary challenges 2021; 2024(Oct 1).
100. AccessNow,. Transparency Reporting Index 2021 Jul.
101. Canela G, Claesson A, Pollack R., Addressing Mis- and Disinformation on Social Media. In: Purnat TD, Nguyen T, Briand S, editors., Managing Infodemics in the 21st Century : Addressing New Public Health Challenges in the Information Ecosystem Cham: Springer International Publishing; 2023. p. 113–26.
102. WHO,. Ethics and governance of artificial intelligence for health, WHO guidance. WHO 2021 28 Jun.
103. Machiri S, Purnat T, Nguyen T, et al.,. An ethics framework for social listening and infodemic management. European Journal of Public Health 2023 -10-01; 33(Supplement_2):ckad160.661.