The Era of Generalist Conversational AI to Support Public Health Communications

Emre Sezgin, A. Baki Kocaballi

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Abstract

The integration of artificial intelligence (AI) into health communication systems has introduced a transformative approach to public health management, particularly during health emergencies. This paper explores the utility and implications of generalist Conversational AI (CAI)- advanced AI systems trained on extensive datasets to handle a wide range of conversational tasks across various domains with human-like responsiveness. Specific focus is on using generalist CAI within messaging services, emphasizing its potential to enhance public health communication. We highlight the evolution and current applications of AI-driven messaging services, including their ability to provide personalized, scalable, and accessible health interventions. Specifically, we discuss the integration of large language models (LLMs) and generative AI in mainstream messaging platforms, which may potentially outperform traditional online information retrieval systems in public health contexts. We report a critical examination of the advantages of generalist CAI in delivering health information, with a case of its operationalization during the COVID-19 pandemic, and the strategic deployment of these technologies in collaboration with public health agencies. Additionally, we address significant challenges and ethical considerations, such as AI biases, misinformation, privacy concerns, and the required regulatory oversight. We envision a future with leveraging generalist CAI in messaging apps, proposing a multi-agent approach to enhance the reliability and specificity of health communications. We hope this commentary initiates the necessary conversations and research towards building evaluation approaches, adaptive strategies, and robust legal and technical frameworks to fully realize the benefits of AI-enhanced communications in public health, aiming to ensure equitable and effective health outcomes across diverse populations.

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Abstract

The integration of artificial intelligence (AI) into health communication systems has introduced a transformative approach to public health management, particularly during health emergencies. This paper explores the utility and implications of generalist Conversational AI (CAI)- advanced AI systems trained on extensive datasets to handle a wide range of conversational tasks across various domains with human-like responsiveness. Specific focus is on using generalist CAI within messaging services, emphasizing its potential to enhance public health communication. We highlight the evolution and current applications of AI-driven messaging services, including their ability to provide personalized, scalable, and accessible health interventions. Specifically, we discuss the integration of large language models (LLMs) and generative AI in mainstream messaging platforms, which may potentially outperform traditional online information retrieval systems in public health contexts. We report a critical examination of the advantages of generalist CAI in delivering health information, with a case of its operationalization during the COVID-19 pandemic, and the strategic deployment of these technologies in collaboration with public health agencies. Additionally, we address significant challenges and ethical considerations, such as AI biases, misinformation, privacy concerns, and the required regulatory oversight. We envision a future with leveraging generalist CAI in messaging apps, proposing a multi-agent approach to enhance the reliability and specificity of health communications. We hope this commentary initiates the necessary conversations and research towards building evaluation approaches, adaptive strategies, and robust legal and technical frameworks to fully realize the benefits of AI-enhanced communications in public health, aiming to ensure equitable and effective health outcomes across diverse populations.

Keywords: Conversational AI; Messaging Apps; Public Health Communication; Language models; Generative AI

Introduction

Health communication and information dissemination are essential for global risk mitigation during public health emergencies. The pandemic highlighted the necessity for effective worldwide communication networks in support of the public health agencies (Center for World Health Organization (WHO) and Global Public Health Intelligence Network), and furthermore, the need for more integrated and global systems for timely warnings and responses to health crises. For this

purpose, messaging services have been vital tools in disseminating information, monitoring disease spread, and promoting informed health decisions.[1] Historically, SMS and app-based text messaging platforms have long been recognized for their potential in scalable health interventions for diverse populations, exemplified by RCTs on substance abuse intervention and promoting COVID-19 vaccination.[2,3] These examples illustrate the established value of messaging services in engaging populations and promoting health behaviors.

The emergence of artificial intelligence (AI) has brought innovative and personalized methods in health communications, with chatbots and AI-driven messaging services presenting personalized, timely, and interactive health interventions.[4] Conversational AI (CAI) interventions have exhibited significant positive effect on behavior change, such as smoking cessation, healthy eating, sleep quality and physical activity.[5,6] As CAI has been widely used for personalized health intervention, public health perspective has yet to be studied.

During the pandemic, the emerging value of CAI has been observed as being scalable, easy to use and accessible dissemination tools.[7–9] In addition, the long term value of CAI via chatbot tools and voice assistants in public health management has been emphasized.[10,11] However, none of the intelligent systems covered earlier has envisioned the impact of generative AI at scale where it can lead highly accessible, decentralized, and scalable implementations. Recent applications of large language models (LLM) and generative AI presented evidence towards the effectiveness of generated responses to answer public health questions,[12] contributing to the trend of utilizing AI to augment the impact of public health interventions. Envisioning the future, its impact could exponentially grow by wide-scale adoption and implementation across the population by its integration to our daily communication tools (i.e, messaging apps). We hypothesize that such generative AI and LLM based CAI services (Generalist CAI) via messaging apps, the most commonly used tools on a daily basis, may overtake other means of online information seeking and public information dissemination and sharing mechanisms, towards improving public health communications.

Generalist CAI models represent foundation models that are trained on extensive and diverse datasets to perform a myriad of conversational tasks. These models transcend the limitations of their predecessors, which were constrained to specific tasks, by exhibiting proficiency in varied domains, from casual dialogue to expert-level engagements in sectors like healthcare and finance. These models' broad applicability is underpinned by their capacity to comprehend and respond in a human-like manner across different conversational contexts. As such, generalist CAI models are not only poised to enhance user interactions but are also likely to supplant multiple task-specific agents (multi-agents), heralding a shift towards more unified and contextually aware conversational AI systems in diverse applications.

The Advantage of Generalist CAI in Messaging Services

AI has already transformed the ways in which individuals seek health information. Today, we observe that the generalist CAI or LLM applications (e.g., chatGPT) simplify access to health advice,[13] breaking down barriers associated with traditional web searches.

The next step appears to be messaging tools with generalist CAI assistance, like WhatsApp, Signal, iMessage and Telegram, would offer a 'familiar' platform to billions of people, having potential to improve access to health information and services. Messaging apps' simplicity in terms of user interface and the use of natural language do inherently reduce digital literacy and accessibility barriers. Therefore, messaging services with generalist CAI can surpass prior implementations of task-specific CAI services regarding capabilities, user access and adoption, lower barriers to use and

provide personalization via self-learning and conversation adaptation (Table 1 for key features). Furthermore, mobile device-based dialogue services (e.g., automatic speech recognition, text-to-speech) further improve usability of the service via natural language conversations. This means, in a public health emergency, the widespread use of apps like iMessages and WhatsApp (billions of active users daily) can facilitate immediate access to personalized health advice, circumventing the barriers to access urgent public health information. The integration with generalist CAI, as seen in Meta AI's LLM powered generalist CAI or personal assistant, positions these providers in a favorable spot to be a convenient tool for information seeking and health communication, potentially offering equitable access to personalized health information across diverse populations.

Table 1. Key features and descriptions of Generalist CAI

Key Features	Descriptions
Natural Language Understanding and Generation	They can understand a broad range of user prompts that can be expressed in various different ways, allowing a higher level of flexibility and ease-of-use.
Generalist	They can converse about a large range of topics and transition between them smoothly.
Dialog management	They can excel in multi-turn conversations more effectively than their rule-based alternatives with the ability of responding to follow-up questions.
Emotional Intelligence	They can detect subtle cues in language that indicate a user's emotional state, allowing the chatbot to provide empathetic responses.
Personalization	Generalist CAI can extract user profile information and use them to generate tailored responses effectively.
Multilingual Support	They can support multiple languages, making them accessible to a wider audience.
Scalability	They can handle an unlimited number of queries simultaneously, providing instant information on a wide range of public health issues.

Envisioning generalist CAI use in public health emergencies

As the AI tools and applications are rapidly growing and immersing in our daily lives, it is necessary to plan and strategize for the use of generalist CAI services in public health emergencies. Given the fact that current generative AI tools, LLMs and CAI are trained on publicly available data and general-knowledge oriented with less attention to information quality or specific domains like health care, we need to approach cautiously to promote safe and reliable information pipelines over these messaging platforms for public health information sharing, communication and dissemination. To improve CAI accuracy and reliability in public health communications, a multi-agent approach could be considered.[14,15] This includes specialized AI agents collaborating—some provide general health information, while others ensure compliance with health guidelines. We envision the integration of

generalist CAI assistants into public health messaging services via such a multi-agent approach to streamline future interventions. Figure 1 illustrates a two-agent arrangement where a CAI agent in a messaging app uses the public health information provided by the CDC to compose its response.

Public health emergency case: Pandemic

During the COVID-19, we observed that dissemination of comprehensive and accurate information is crucial for educating the public and combating the pandemic.[9] This period highlighted the potential of basic chatbot applications in enhancing public health communications, especially in diverse and low-resource settings. For instance, WHO released a chatbot over WhatsApp providing up-to-date COVID-19 information in multiple local languages across several low- and middle-income countries (LMICs).[16] In Nigeria, an SMS-based chatbot, offered by Nigeria Centre for Disease Control (NCDC), with support from UNICEF, provided localized guidance and timely information about pandemic.[17] Similarly, India released an app with chatbot features to engage rural and urban Indian residents for COVID-19 safety practices and checking symptoms, updates and access helplines.[18] These implementations demonstrate the scalability and potential of digital conversational intervention in public health emergencies. With generalist CAI, personalized public health intervention can be achieved, bridging communication gaps and supporting public health agencies during emergencies.

A strategic plan for effective communication during health crises is required leveraging a multi-agent approach. In partnership between the public health agencies (e.g, WHO and CDC) and technology providers, we may create an information dissemination pipeline during a public health crisis (Figure 1). For instance, by adhering to CDC's guidelines for communication and dissemination and utilizing only vetted information sources,[19] generalist CAI agents can be designed to deliver messages accurately, empathetic and action-oriented. CDC-defined key elements for developing outbreak-related messages include expressing empathy, outlining clear actions, delineating what is known and unknown, explaining public health actions and their rationale, committing to ongoing communication, and guiding the public on where to find reliable information.[19] This framework may be used to prompt the agents and ensure that generated messaging are fine tuned to deliver intended messages towards not only inform and educate but also to build trust and encourages compliance with health advisories. Furthermore, aligning with WHO's Early Action Review guidelines that are designed to optimize early detection of public health emergencies, such agents could be deployed to intervene timely and tailored to the audience in compliance with the guidelines across the globe.[20] Ideally, a trained generalist CAI as a public health support agent, can be simultaneously activated across the populations following global and local guidelines in low resource countries, rural and urban areas served in any preferred languages via text or speech. In the long term, such agents can contribute to the knowledge of public health agencies and the data they provide can help learn more about the effectiveness of communications with real-time feedback from the public. Future research should focus on developing frameworks that facilitate the integration of multi-agent CAI systems into existing public health infrastructures. Some of the viable approaches could be through interoperability with Electronic Health Records, collaboration with public health databases and registries, using standardized communication protocols like FHIR,[21] embedding CAI agents into communication platforms preferred by health professionals, and establishing governance mechanisms to ensure ethical and efficient operation.
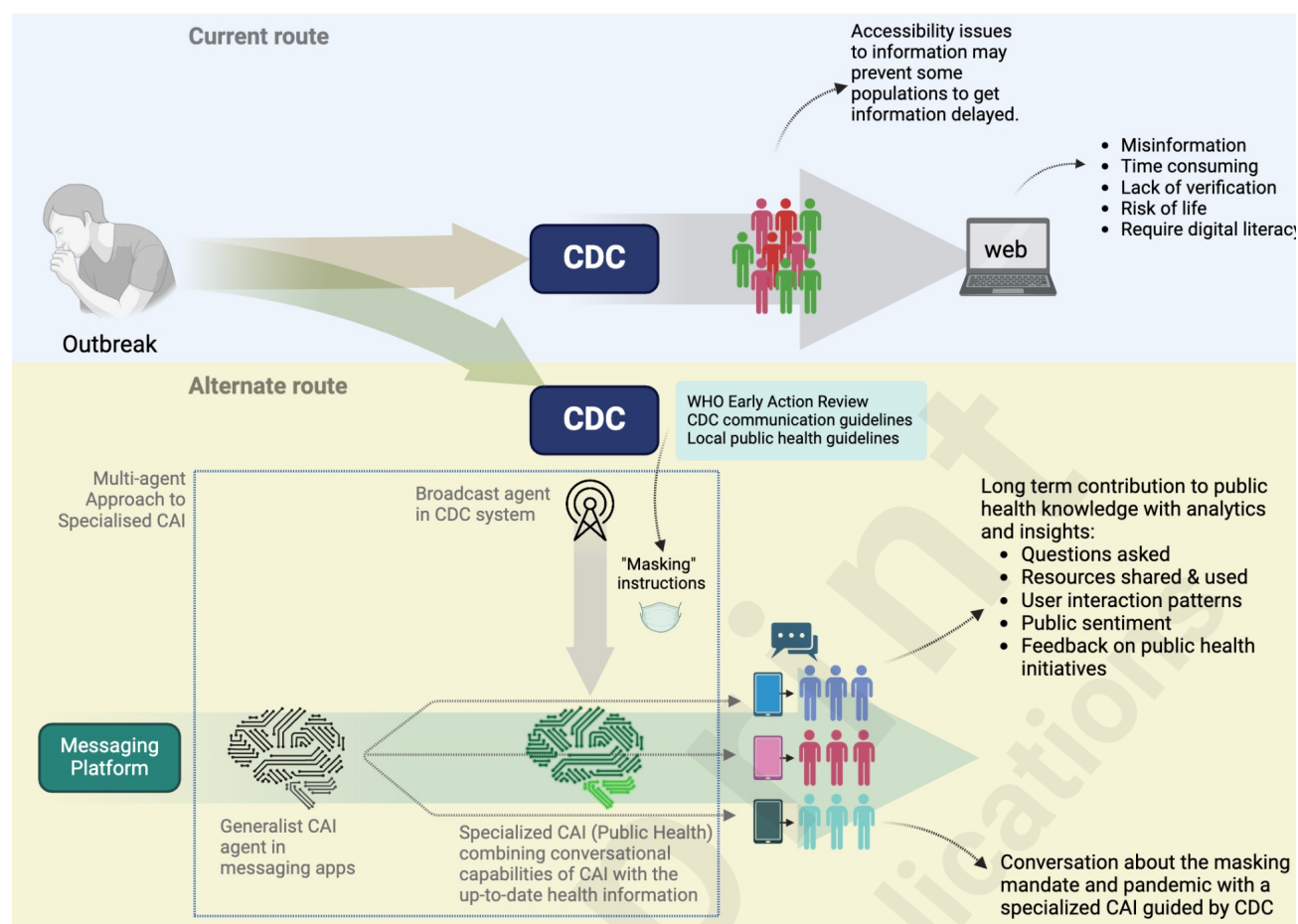
Figure 1. Current and alternative routes for public health communications during an outbreak

Challenges, Risks and Ethical Considerations

The deployment of generalist CAI assistants in messaging apps presents multifaceted challenges, including risks of bias, misinformation, hallucinations, and ethical pitfalls, which has been observed in earlier with Snapchat's personal assistant.[22] To illustrate, biases in AI algorithms can replicate social prejudices in decision-making processes, and unchecked interactions might spread false information. Please see Supplementary Materials 1 for our brief experiments and observations towards the opportunities and limitations with current generalist CAI applications in response to some of the emerging public health problems including pandemic response, unmet social needs, mental health support and vaccinations.

In addition, a culturally-sensitive and inclusive design is also important to mitigate the risk of inherent-biases that may exist in the training data of generalist CAI. These issues underscore the importance of accountability, fairness, equity and regulatory oversight.[23] Moreover, ethical concerns extend beyond privacy to include user autonomy and the transparent use of data, necessitating clear guidelines and user consent. To support user autonomy, implementing verification mechanisms and ensuring the source data originating from authoritative health organizations can help maintain the trustworthiness of the AI-generated information. One step further, a multi-agent approach can help control the CAI behavior, regarding user location and profile, ensuring that advice and data handling procedures comply with local rules and regulations. Even though messaging services are one of the most accessible and used communication technologies, FCC Affordable Connectivity Program or

similar global programs can be utilized to address digital divide and affordability issues.[24] While some messaging apps offer end-to-end encryption, overall, the lack of governance or medicolegal compliance (e.g., HIPAA, HITECH or GDPR rule on processing sensitive data requirements for public health information)—unless integrated with telehealth services— raises significant privacy concerns, similar to the standard text messaging services. Technical standards and ethical frameworks should be developed to ensure AI systems are transparent and fair.[25] Further considerations are outlined in the supplementary materials 2.

The contentious nature of AI governance and accreditation of service providers for multi-agent AI services might require legal infrastructure as much as technical, to reduce perceived legal risks and liabilities with government agencies accrediting private sector tools. However, the recent initiative by the Biden Administration to form task forces aimed at shaping policies for AI in healthcare signals a promising direction for overcoming these hurdles in U.S.,[26] suggesting that improvements in the medicolegal landscape could pave the way for safer AI implementations in public health communication.[27] Internationally, regulatory bodies are also beginning to take similar steps, aiming for a cohesive global response to AI challenges. It is crucial to address how these technologies might disproportionately affect marginalized groups, ensuring inclusive and equitable AI development. The long-term societal impacts, such as the erosion of public trust through AI missteps, must also be considered in developing sustainable AI strategies. Engaging a broad spectrum of stakeholders in AI discussions can enhance the legitimacy and effectiveness of governance structures. This evolving scenario highlights the critical need for a balanced approach to harnessing AI's potential while addressing its ethical, legal, and social challenges.

Conclusions

AI-enhanced messaging apps hold significant promise for advancing public health goals by facilitating effective communication, improving access to health information, and supporting health behavior change in collaboration with public health agencies. However, realizing their full potential requires navigating the number of challenges. As the field evolves, ongoing evaluation and adaptive strategies will be essential in leveraging these technologies to enhance public health outcomes meaningfully. We need to ensure that AI messaging services are developed and continually updated with an emphasis on fairness, accountability, and transparency is essential to mitigate these risks and uphold the principles of equity and justice in public health. Further research should focus on these highly capable generalist CAI services as they are immersing into our daily lives. Observational studies and experiments are necessary on how individuals engage with CAI in messaging apps and how to leverage these platforms for public health communications and how to inform technology providers to improve AI models for public health communications.

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Supplementary Files

Multimedia Appendixes

Examples of Generalist CAI responses to public health issues.
URL: http://asset.jmir.pub/assets/2fbd9e4adc7088327b77f9c1d8b8cd59.docx

Technical Challenges and Potential Solutions in Deploying Generalist CAI.
URL: http://asset.jmir.pub/assets/5498d466fff78958476bd08e4c69d9e8.docx