



Health Promotion and Disease Prevention through Digital Health Initiative: A Scoping Review

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ABSTRACT

Digital health technologies, initially developed for digitizing medical records, have evolved into essential components of healthcare due to their accessibility at any time and from any location. By 2040, global healthcare spending is projected to reach US\$25 trillion, driven by digital health and IoT. This scoping review aims to connect existing digital health technologies to the public health perspective, including health promotion and disease prevention concepts, their prevalence, usage effectiveness, and challenges faced by youth and elderly populations. Following the Arksey and O'Malley (2005) framework and adhering to the PRISMA ScR guidelines, a comprehensive search was conducted across databases such as Google Scholar, Elsevier, PubMed, and ScienceDirect, using keywords related to digital health, health promotion, and prevention. An initial total of 415 articles were identified, with 11 qualifying based on the inclusion criteria. The studies focused on mHealth, telehealth, wearables, and AI tools, primarily targeting youth and elderly populations. Digital health tools like mHealth apps, telehealth, wearables, and AI technologies effectively promote health behaviors and manage chronic diseases among adults and older adults. Programs such as Lark have demonstrated significant weight loss in the elderly, while social media and community-driven interventions prove effective for younger populations. However, adoption faces barriers such as digital literacy gaps, privacy concerns, and limited access, especially for the elderly. Digital health technologies are valuable tools for health promotion and disease prevention; nonetheless, challenges persist, mainly in increasing adoption among older adults. Further research is required to address these issues, especially in low-resource settings, to ensure equitable access to digital health interventions.

Keywords: Disease prevention, Digital health; Elderly, Health promotion, mHealth, Telehealth, Youth.

BACKGROUND

Digital Health initiatives began in the 1960s with electronic medical records and telemedicine. Advances in imaging (the 1970s), wearables (2009), and mobile apps (2010s) transformed care. By 2020, COVID-19 accelerated telehealth, solidifying its role in modern healthcare (1). Today, it has advanced to a stage called “health on a cloud,” where healthcare can be accessed anytime, anywhere (2). This journey shows how digital technologies have been integrated into healthcare, creating new ways to organize and improve healthcare services (3).

Digital health tools promote health and prevent disease by enabling individuals to track their health, access personalized care, and adopt healthier lifestyles. These technologies facilitate early detection, continuous monitoring, and timely interventions, helping reduce risks and prevent disease progression. AI diagnostics and telemedicine enhance care, while secure data systems improve accessibility, leading to better health management and outcomes (4–6). Digital health innovations in Africa, like telehealth and mobile apps, improve access and outcomes for marginalized groups (7). These tools also enhance equity, reduce

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costs, and address the digital divide in diabetes care (8). Still, digital health tools face numerous challenges in health promotion and disease prevention, such as societal resistance, low digital literacy, and ethical concerns like data privacy and consent. Infrastructure limitations, AI explainability, and safety and security issues hinder progress. Additionally, socioeconomic disparities, regulatory uncertainties, and difficulties in ensuring accessibility for people with disabilities further restrict their potential. The growing demand for telehealth raises scalability and sustainability concerns (9–11).

This review aims to overview of current digital health tools, evaluate their effectiveness in health promotion and disease prevention, and identify challenges to inform future research. It will also include strategies to improve the adoption of digital health interventions among youth and the elderly.

METHODS

This scoping review followed a five-stage methodological framework developed by Arksey and O'Malley and reported by Preferred Reporting Items for Systematic Review and Meta-Analyses extension for scoping review (PRISMA-ScR) guidelines (12).

Identifying relevant studies

The search strategy involved searches in different databases as PubMed, Google Scholar, Science Direct, and Elsevier. Boolean operators were applied, such as (“digital health” OR eHealth OR mHealth OR “mobile health” OR “telehealth” OR “telemedicine” OR “health technology” OR “digital intervention*” OR “technology-enabled care” OR “wearable device*” OR “mobile application*” OR app*) AND (“health promotion” OR “disease prevention” OR “health education” OR “health behavior*” OR “behavior change” OR “self-care” OR “patient engagement” OR “lifestyle modification” OR “chronic disease management” OR “public health” OR “preventive health”). Two independent reviewers (S.A. and Ro.P.) screened titles and abstracts in the first stage, followed by full-text review by two additional reviewers (N.S., R.P., S.K.). Disagreements were resolved through discussion and consensus. The search period covered 18th August 2024 to 25th August 2024.

Selection of study

The eligibility criteria of the study were defined based on the research theme. The articles that met our theme were only included in the studies. The articles related to digital health initiatives such as mobile health, telehealth programs, social media campaigns, and wearable devices were involved in the study. The articles published before 2018 and articles without full text were excluded as well. The English text articles from different regions were selected for the study. The grey literature, unpublished documents, theses, letters, and conference papers were excluded.

Data charting, processing, and reporting

The process followed a systematic approach using the PRISMA framework to ensure that the final articles included were rigorously selected. The PRISMA provided the finalization of articles with well-defined inclusion and exclusion criteria that ensured the relevance and quality of the studies. All five authors were involved in the data extraction process.

The review focused on the themes: Digital health initiatives for health promotion and prevention, effectiveness of digital health initiatives for youth and elderly, strategies to promote behavior change, measurement of health outcomes, and challenges in implementing digital health initiatives. Information under these themes was extracted from the selected articles, ensuring consistency and relevance to the research focus. Lastly, synthesis of the results was done, which included integration of findings from the extracted data on a comprehensive overview of the subject matter.

RESULTS

The initial search from different databases included 415 articles, of which 63 duplicate articles were detected and removed. After removing the duplication, 352 articles were screened, and 314 articles were excluded that didn't meet our inclusion criteria. Out of 38 articles, 3 were eliminated, leading us to 35 eligible articles. We obtained and reviewed the full text, and finally, 11 articles were selected for the study. The PRISMA flow diagram of the selection process is represented in figure 1.

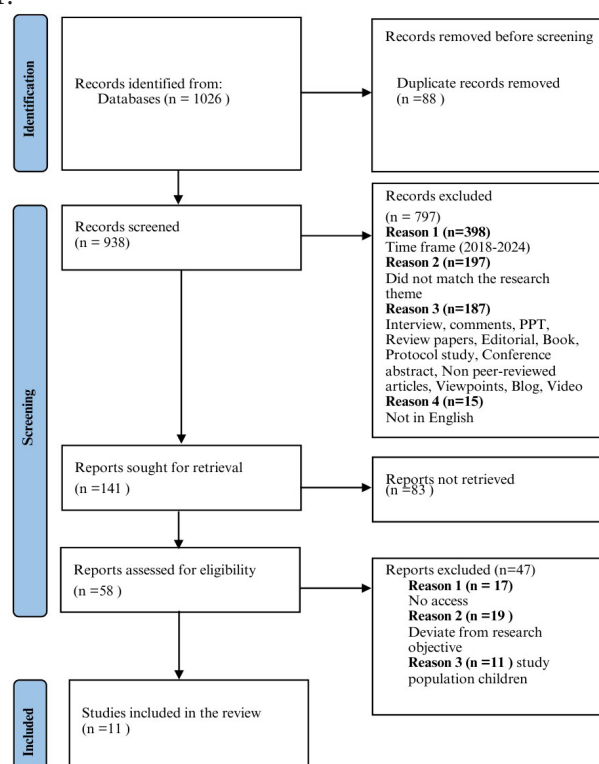


Figure 1. PRISMA Flow Diagram

Table 1. Detailed information about the selected articles

Article Title	Country	Study Design	Author, Year of publication	Health Promotion & Prevention	Effectiveness (Youth/Elderly)	Behavior Change Strategies	Health Outcome Measures	Challenges
Exploring the potential of mobile health interventions to address behavioral risk factors for the prevention of non-communicable diseases in Asian populations: a qualitative study	Asia	Qualitative study Focus group discussion Sample (n) = 34	(Mair et al., 2023)	Mobile health app (Lark)	Effective for the elderly (weight loss)	Engagement with AI coaches	Weight loss over 9 weeks	Engagement, accessibility issues
Engagement in digital health app-based prevention programs is associated with weight loss among adults age 65+	United states	Longitudinal observational study Sample(n) = 538	(Auster-Gussman et al., 2022)	Mobile health app (Lark)	Effective for elderly (weight loss)	Engagement with AI coaches	Weight loss over 9 weeks	Engagement, accessibility issues
The role of human -centered design in healthcare innovation: a digital health equity case study	United states	Qualitative research methods Focus group discussion and survey	(Levander et al., 2024)	Telehealth services	Lower adoption rates for elderly	Community engagement, user-centered design	Improved patient care in virtual visits	Digital divide, tech skill gaps
Digital health integration for non-communicable diseases: Comprehensive process mapping for full-life cycle management	China	Triphasic qualitative approach (literature review, stakeholder focus group discussions and expert consultations) Sample(n) = 21	(He et al., 2024)	Digital platform for screening	Not specified	Systematic, person-centered approach	Improved coordination and long-term impact	Data inconsistency, fragmented practices
Healthcare professionals' digital health competence profiles and associated factors: A cross-sectional study	Finland	Cross-sectional study Sample(n) = 23,100	(Jarva et al., 2024)	Mobile health, wearables	Not specified	Organizational support for digital tools	Competence development, digital care outcomes	Competence gaps, privacy, tech concerns
Digital health literacy: empowering the patients in the era of electronic medical records	United states	Longitudinal observational study Sample(n) = 538	(Mulukuntla, 2020)	Mobile health, telehealth	Not specified	Social media, community support	User feedback, parental health outcomes	Privacy concerns, digital literacy gaps
The need for green and responsible medical informatics and digital health:looking forward with one digital health	Israel and Italy	Perspective study	(Benis & Tamburis, 2023)	Wearables, telehealth	Not specified	Public education, ecofriendly practices	Long-term healthcare and environmental impact	Privacy, infrastructure, ethical challenges
Digital health integration for noncommunicable diseases: Comprehensive process mapping for full-life-cycle management	China	Triphasic qualitative approach including desk research, focus group discussions, and Delphi consensus.	He et al. (2024)	Digital platform for screening	Not specified	Systematic, person-centered approach	Improved coordination and long-term impact	Data inconsistency, fragmented practices
Accelerating implementation of adolescent digital health prevention programs: analysis of insights from Australian stakeholders	Australia	Qualitative interviews using the RE-AIM framework	Raeside, R. et al. (2024)	Mobile health, social media campaigns	Effective for youth	Preventive health education, community engagement	User feedback, long-term outcomes	Privacy, technology barriers, ethics
An investigation of mHealth and digital health literacy among new parents during COVID-19	Canada	non-experimental, cross-sectional design	Donelle, L., Hiebert, B., & Hall, J. (2024).	Mobile health, telehealth	Not specified	Social media, community support	User feedback, parental health outcomes	Privacy concerns, digital literacy gaps
Deploying digital health tools within large, complex health systems: key considerations for adoption and implementation	USA	perspective approach	Marwaha, J. S., et al (2022).	Telehealth, digital screening tools	Not specified	Stakeholder engagement, internal training	Operational outcomes, user efficiency	Infrastructure integration, long-term support

The reviewed articles examined a wide range of digital health initiatives aimed at health promotion and disease prevention, yielding mixed but generally positive outcomes. Commonly used tools included mobile health apps, chatbots, and telehealth services, which proved effective for both younger and older adults, especially when combined with strategies such as incentives, social collaboration, and community engagement. For example, the Lark app helped older adults lose weight through interactions with AI coaches. Meanwhile, initiatives targeting adolescents often used social media campaigns and preventive health education to encourage healthier behaviors. Participatory approaches involving wearables and online communities also showed promise in improving patient outcomes; however, challenges like digital literacy gaps, privacy concerns, and an over-reliance on social media limited their effectiveness.

Human-centered telehealth services improved virtual care experiences but faced barriers, including low adoption among the elderly and ongoing digital divides. Additionally, integrating digital tools into managing non-communicable diseases highlighted the potential for more systematic and patient-centered care, though issues such as fragmented practices and inconsistent data remained significant obstacles. For new parents, mobile health and telehealth programs supported parental health through community networks and feedback loops, but privacy and accessibility concerns persisted.

At the organizational level, the successful implementation of digital tools often depended on strong stakeholder engagement, staff training, and reliable infrastructure. Furthermore, the digital skills of healthcare professionals were considered vital for achieving better outcomes. Lastly, some studies highlighted the environmental aspect of digital health, noting that eco-friendly practices using wearables and telehealth could provide long-term benefits. Still, questions about ethics, infrastructure, and sustainability need to be addressed.

DISCUSSION

Digital health initiatives demonstrate significant potential for promoting health and preventing diseases through tools like mobile apps, telehealth services, and wearables (6,13,14). These programs have shown effectiveness for youth by leveraging gamified approaches, social media campaigns, and community-driven engagement strategies (15–17), while telehealth and remote monitoring have improved access to care and chronic disease management for elderly populations (16,18). Strategies such as community engagement, preventive health education, and user-centered designs foster behavior change and sustained use. Success is measured through user engagement metrics, such

as app usage and interaction with AI coaches, which correlate with improved health outcomes like weight loss and increased physical activity. However, challenges like technological barriers, digital literacy gaps, privacy concerns, and equity issues remain, emphasizing the need for robust infrastructure, regulatory clarity, and inclusive strategies to ensure long-term effectiveness (17–20).

The primary challenges behind the usage of digital health initiatives, especially among the elderly, include technological anxiety, navigating complex systems, low digital maturity, trust issues related to data security, personal privacy, and skepticism about the accuracy of digital diagnoses, and a general disinterest in digitalization, as many elderly individuals are hesitant to learn or adopt new technologies (21–23). Other significant challenges faced by youth include the digital divide, low digital literacy, limited access to devices or the internet in low-resource areas, integration with existing systems, and addressing privacy concerns and stigma around sensitive health topics such as sexual and reproductive health (24–27). Concerns about depersonalization of care, faulty technology, and increased administrative burdens on doctors further hinder adoption (23). To sustain the effectiveness of digital health initiatives for youth and the elderly, it is essential to focus on digital health literacy interventions tailored to their specific needs, educational campaigns and awareness, user-friendly design, step-by-step guidance, trust-building, personalized support, and affordability (21,22,24–26). Apart from these key strategies, the content of the digital tool that is not age-appropriate or culturally irrelevant should be carefully looked at (27).

This scoping review is subject to certain limitations. The search was restricted to articles published in English, which may have excluded relevant studies in other languages. Only peer-reviewed articles were included, excluding grey literature and unpublished studies, which could contribute to publication bias. The databases searched were limited to PubMed, Google Scholar, ScienceDirect, and Elsevier, and relevant studies in other databases might have been missed. Additionally, due to the nature of scoping reviews, no meta-analysis was conducted, which limits the ability to quantify effect sizes.

CONCLUSION

Although significant progress has been made in the development of digital health technologies, addressing challenges such as technological literacy, addressing disparities, and privacy concerns is essential for their long-term success. Many individuals, particularly older adults and underserved communities, lack the skills to



use these tools, while socioeconomic and geographic barriers limit access. Future research should aim to fill existing gaps in the literature, particularly regarding the integration of digital health tools in low-resource settings and among vulnerable population.

Conflict of Interest

The authors declare no conflict of interest.

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