

Understanding Digital Health Literacy: A Narrative Review of Determinants, Barriers, and Health Outcomes

Emadoddin Hosseinjani¹, Negar Hassanzadeh^{2*}, Fatemeh Haji Ali Asgari³, Ali Alizadeh⁴, Ardalan Shariat⁵, Alireza Atashi⁶, Tahmineh Mokhtari⁷, Seyed Yasin Yazdi Amirkhiz⁸

¹Department of Cardiology, Faculty of Medicine, Labbafinejad Medical Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

²Department of Cardiology, School of Medicine, Shariati Medical Center, Tehran University of Medical Sciences, Tehran, Iran.

³Department of Geriatric Medicine, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

⁴Department of Medical Physics and Biomedical Engineering, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

⁵Electronic Health Specialist, Tehran, Iran.

⁶Department of Medical Informatics, Breast Cancer Research Center, Iranian National Cancer Institute, ACECR, Tehran, Iran.

⁷Department of Surgery, University of California Davis Medical Center, Sacramento, CA 95817, USA.

⁸Department of Foreign Languages, International College, Tehran University of Medical Sciences, Tehran, Iran.

*Correspondence to: Negar Hassanzadeh (E-mail: hz91_negar@yahoo.com)

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Abstract

Digital health literacy refers to the ability to access, understand, evaluate, and apply health information from digital sources, and it is increasingly recognized as a determinant of health behaviors, outcomes, and equity. This narrative review synthesizes current evidence on digital health literacy within an integrative framework linking its determinants, core competencies, and health outcomes. Multiple sociodemographic and structural factors, including age, education, income, and marital status, shape an individual's digital health literacy, producing disparities in access to and use of digital health resources. Vulnerable groups, such as rural and low-income populations and older adults, face particular barriers, while the spread of online misinformation and the digital divide further heighten the need for these skills. The review also considers instruments used to measure digital health literacy and emerging technologies, including artificial intelligence and digital therapeutics, that are reshaping how individuals engage with health information. Strategies such as community-based education, user-centered tool design, and multi-stakeholder collaboration can strengthen digital health literacy, but their success depends on equitable access, sustained community engagement, and rigorous, measurable evaluation. Strengthening digital health literacy holds promise for improving health outcomes and reducing health disparities across populations.

Keywords: e-Health, digital health literacy, health literacy, telehealth, artificial intelligence

Introduction

Digital health literacy refers to the ability to locate, understand, evaluate, and apply health information obtained from digital sources. It is increasingly recognized as a critical determinant of health behaviors and outcomes in the context of rapidly evolving digital health ecosystems. As healthcare systems become more digitized, the capacity to effectively access and use health-related information and services has become essential for individuals engaging with these technologies.¹ Digital health literacy encompasses a range of competencies, including the ability to assess the credibility of online health information, navigate telehealth platforms, and appropriately use mobile health applications and other digital tools.² Higher levels of digital health literacy are associated with more active patient engagement in health management, particularly among individuals with chronic conditions who frequently rely on continuous self-monitoring and digital resources.³ In this regard, the ability to critically appraise and effectively utilize online health information supports informed decision-making and promotes greater autonomy in personal health and care.⁴

Importantly, digital health literacy plays a central role in addressing health disparities and promoting equitable access to healthcare services. Inequities in access to digital health resources may arise from socioeconomic status, age-related barriers, limited educational attainment, and language differences.⁵ These disparities can limit the effective use of digital health technologies among vulnerable populations.

To mitigate these challenges, healthcare systems and providers must consider strategies that enhance digital health literacy and ensure that digital tools are accessible, understandable, and usable across diverse population groups.⁶ User-centered design approaches that incorporate demographic and cultural considerations have been shown to improve usability and reduce barriers to engagement with digital health platforms, thereby supporting more equitable healthcare delivery.⁵

Despite its growing importance, gaps remain in understanding how digital health literacy is distributed across populations and how it interacts with specific health outcomes and patterns of healthcare utilization. Further research is needed to clarify the mechanisms through which digital health literacy influences patient engagement and to identify effective interventions that can enhance these skills in underserved groups. Addressing these gaps is essential for optimizing the implementation of digital health technologies and ensuring that their benefits are equitably shared across all segments of the population.

Although digital health literacy is increasingly recognized as a determinant of health outcomes and equity, the existing literature remains fragmented, with its determinants, measurement, interventions, and barriers frequently addressed in isolation and with limited attention to rapidly emerging technologies. The aim of this narrative review is to synthesize current evidence on digital health literacy within an integrative framework linking its determinants, core competencies, and health outcomes, as illustrated in [Figure 1](#). To this end, the review examines the sociodemographic and structural

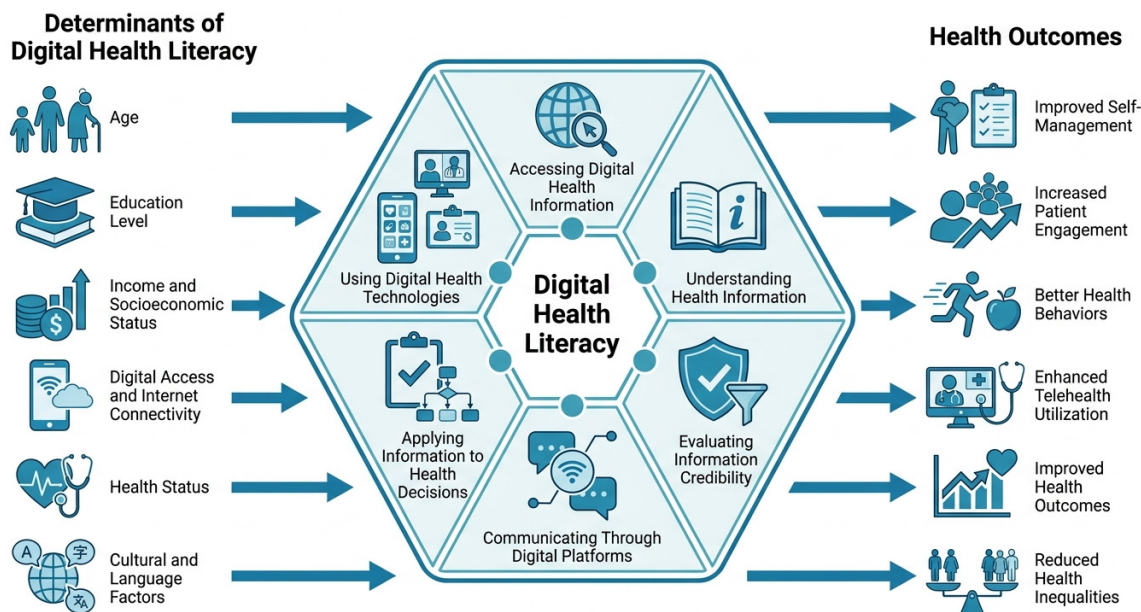


Fig. 1 Conceptual framework of digital health literacy: determinants, core competencies, and health outcomes. Individual-level determinants, including age, education level, income and socioeconomic status, digital access and internet connectivity, health status, and cultural and language factors, influence the development of digital health literacy competencies. These competencies encompass accessing, understanding, evaluating, communicating, and applying digital health information, as well as using digital health technologies. Enhanced digital health literacy contributes to improved self-management, increased patient engagement, better health behaviors, enhanced telehealth utilization, and ultimately improved health outcomes and reduced health inequalities. The figure was generated by the author using FigureLabs (Nano Banana Pro); <https://chat.figurelabs.ai/chat>.

factors that shape digital health literacy, the validated instruments used to measure it, the barriers and facilitators influencing its development across diverse populations, and the emerging technologies, including artificial intelligence and digital therapeutics, that are reshaping the field. By integrating international and regional evidence, this review seeks to identify key knowledge gaps and inform strategies to promote equitable digital health literacy and reduce health disparities. Throughout this review, *health literacy* refers to the general ability to obtain and understand health information; *digital literacy* refers to the skills needed to use digital devices and platforms; and *digital health literacy* (used interchangeably with *e-health literacy*) is the convergence of these domains. “Digital health literacy” is used as the umbrella term, with “e-health literacy” reserved for instances tied to instruments that use that label.

Methods

This narrative review was conducted through a non-systematic search of PubMed, Scopus, Web of Science, and Google Scholar, supplemented by the Persian-language databases SID and Magiran. Search terms included combinations of “digital health literacy,” “eHealth literacy,” “e-health literacy,” “telehealth,” “digital divide,” “health literacy,” and “digital health” using Boolean operators. Articles published between 2018 and 2026 in English or Persian were considered. Studies were included if they addressed the definition, determinants, measurement, populations, interventions, or challenges of digital health literacy; non-peer-reviewed sources were excluded except for authoritative guidance from organizations such as

the World Health Organization. Reference lists of retrieved articles were screened for additional sources. Given the narrative design, no formal quality appraisal or quantitative synthesis was performed; findings were organized thematically.

Factors Affecting Digital Health Literacy

Digital health literacy is shaped by a range of sociodemographic and structural factors, including education level, income, age, and marital status. These determinants may act as either barriers or facilitators depending on context and the support available to the individual (Figure 2). Understanding how they operate is essential for designing targeted strategies to promote digital health literacy across different populations.⁷

Education Level

Higher levels of education are consistently associated with greater digital health literacy. Individuals with more education tend to have better access to digital resources and stronger critical-thinking skills, enabling them to more effectively evaluate the credibility of online health information.⁵ Education is necessary but not sufficient, however: some studies report high formal education alongside low digital health literacy,⁸ suggesting that domain-specific digital skills, rather than general educational attainment, are the proximal driver.

Income

Income also plays an important role in digital health literacy. Most participants in the higher-income group scored higher

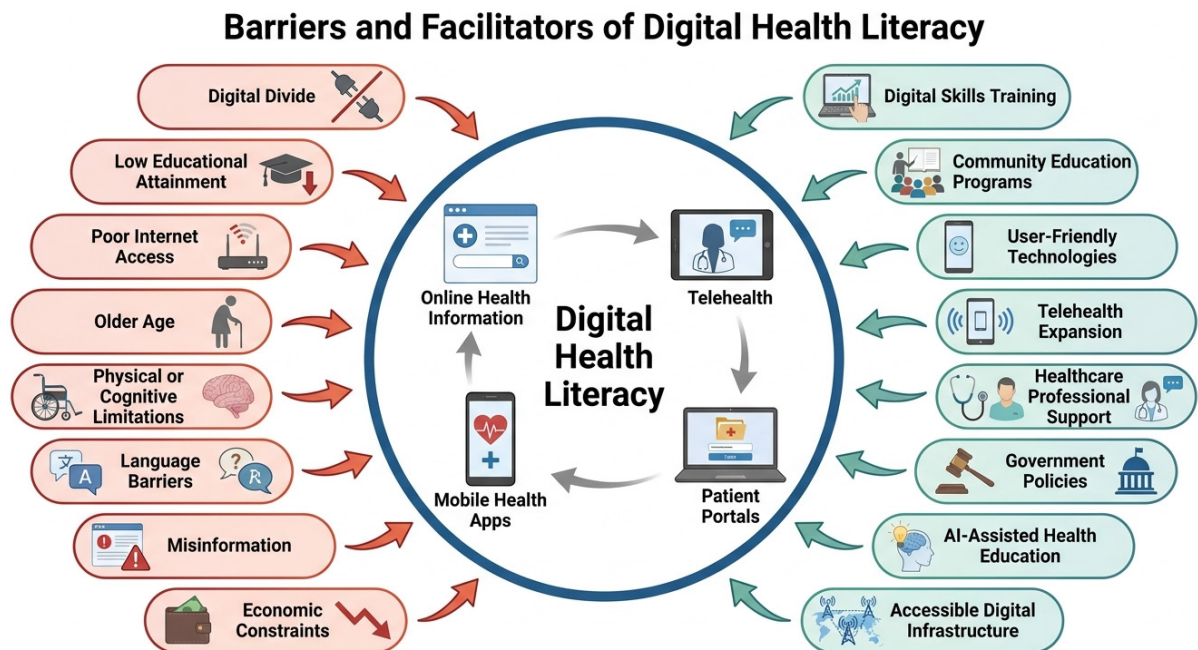


Fig. 2 **Barriers and facilitators of digital health literacy.** Barriers (left) include the digital divide, low educational attainment, poor internet access, older age, physical or cognitive limitations, language barriers, misinformation, and economic constraints. Facilitators (right) include digital skills training, community education programs, user-friendly technologies, telehealth expansion, healthcare professional support, government policies, AI-assisted health education, and accessible digital infrastructure. These factors collectively shape an individual's ability to engage with core digital health resources, including online health information, telehealth, mobile health applications, and patient portals, acting as either obstacles or enablers depending on context and available support. The figure was generated by the author using FigureLabs (Nano Banana Pro); <https://chat.figurelabs.ai/chat>.

on digital health literacy than participants from lower socioeconomic groups. This difference is often attributed to higher-income participants having greater access to digital health technology and health information resources that support their navigation through the digital health system.⁹ Economic status remains an important factor, particularly because health literacy is unevenly distributed across the socioeconomic spectrum.¹⁰

Age

Age is another influential factor, and research shows that digital health literacy varies across age groups.¹¹ Younger individuals, particularly Generation Z, typically have higher levels of digital health literacy than older adults,¹² although some studies have shown lower levels of digital health literacy in middle-aged adults compared to younger generations, possibly related to their exposure to digital technology during childhood. This difference suggests a need for interventions aimed at improving digital health literacy in older populations.¹³ These age-related findings are not fully consistent across studies, and most are cross-sectional, limiting causal interpretation; exposure to and engagement with technology, rather than age itself, may drive the association.

Marital Status

Marital status has also been associated with digital health, with married individuals generally reporting higher digital health literacy than single individuals.¹⁴ This may be related to the

demand for health information by married individuals, particularly Generation Y, as an additional responsibility related to their family's health.¹⁵ Taken together, these sociodemographic factors rarely act in isolation; their combined and interacting effects shape an individual's overall digital health literacy.

Measuring Digital Health Literacy

Accurate measurement underpins research and intervention design, yet no single instrument is universally adopted. The eHealth Literacy Scale (eHEALS) is the earliest and most widely used, an eight-item self-report measure of perceived ability.¹⁶ The Digital Health Literacy Instrument (DHLI) assesses operational, navigational, and information-evaluation skills;¹⁷ the eHealth Literacy Questionnaire (eHLQ) provides a seven-dimension profile spanning skills, engagement, trust, and service fit;¹⁸ and the Transactional eHealth Literacy Instrument (TeHLI) frames e-health literacy as a transaction between the individual and the digital environment (Table 1).¹⁹ The diversity of instruments limits cross-study comparability and partly explains inconsistent findings across the literature, underscoring the need for validated, context-appropriate tools.

Interactions Between Variables

Interactions between these variables reveal the subtleties of digital health literacy. For example, while education level and/or income are typically positively associated with digital health

Table 1. Common instruments for measuring digital health literacy

Instrument	Structure	Construct	Key limitation	Ref.
eHEALS	8 items	Perceived e-health literacy	Predates mobile/social/telehealth	(16)
DHLI	Multi-scale	Operational/navigation/evaluation skills	Longer; partly self-report	(17)
eHLQ	7 dimensions	Skills, engagement, trust, service fit	More respondent time	(18)
TeHLI	4 dimensions	Functional, communicative, critical, translational	Newer; less validated	(19)

literacy, they may also interact uniquely with age and marital status.^{14,20} Digital health literacy is inherently multifactorial, requiring a comprehensive approach in examining subsequent research and interventions to understand how variables collectively influence individuals' ability to access and effectively use digital health resources.²¹

Digital Health Literacy in Diverse Populations

Research shows that sociodemographic characteristics, such as age, education level, and socioeconomic level, can influence digital health literacy.¹ However, these characteristics do not determine digital health literacy in all settings. Digital health literacy has been associated with better health behaviors and treatment outcomes, particularly for people with chronic conditions.³ Understanding how digital health literacy operates within specific population groups is therefore essential for designing equitable and effective interventions.

Rural Populations

Digital health literacy plays a major role in health behaviors in rural populations.¹ Rural residents often face barriers to obtaining accurate health information that exacerbate health inequalities. Limited digital skills in this population make people more likely to seek out and rely on inaccurate sources of health information, underscoring the need for targeted educational interventions that meet the needs of these populations. Much of this evidence derives from single-region surveys with limited generalizability, and few interventions have been rigorously evaluated in rural settings, representing a clear research gap. Closing it requires not only improved infrastructure but also locally relevant educational programs tailored to rural contexts.

Youth and Seniors

Young people constitute an important population in digital health literacy.²² Digital interventions for substance use disorders, tobacco use, and high-risk behaviors have been shown to be effective with young people, whereas other strategies may be difficult to implement due to other barriers. These digital strategies can reduce barriers to youth accessing help and are promising interventions for educating young people about health information. Youth and young adults are critical ages for the initiation of substance use and tobacco use. Therefore, promoting digital health literacy could be an important part of prevention and treatment.²³ A similar digital health literacy context is true for the elderly, and it is essential for the elderly

to become familiar with self-care approaches and the prevention of physical and mental harm.¹³

Effects of Digital Health Literacy on Health Behaviors

People living with chronic conditions and high digital health literacy are more likely to engage in health-promoting behaviors.²⁴ The skills gap between those who can appropriately use online health information and those who cannot, known as the digital divide, may contribute to health-related disparities in treatment.⁶ This issue requires ongoing study to identify effective strategies for promoting digital health literacy, especially among disadvantaged groups; in short, ongoing research could promote equity in access to health information and health resources through digital health literacy.

Technologies and Tools to Promote Digital Health Literacy

Mobile Apps

Mobile apps are a valuable tool for developing digital health literacy across many health domains. In addition to treatment, for example, apps such as Sober Grid, I Am Sober, and Daylio offer daily check-ins, motivational reminders, and sobriety-tracking tools that can increase accountability and engagement in recovery.²⁵ Prescription digital therapeutics, such as reSET and reSET-O, may also serve as adjuncts to traditional treatment.²⁶

Online Social Support

Social support also occurs online and involves interacting with others and sharing perspectives, experiences, and challenges. Online environments not only increase social support, but also provide opportunities to learn and engage in the application of digital health literacy.²⁷

Telehealth Services

Telehealth has become a key aspect of healthcare.²⁸ The COVID-19 pandemic led to an increase in telemedicine, meaning that patients could participate in virtual treatment sessions from the comfort of their own homes. The greater ease of access reduced barriers such as geographic location, mobility, and/or time, and expanded the scope of health advice.^{29,30} Through the lens of digital health literacy, telehealth platforms are creating tools for patients to effectively manage their health, including electronic record reviews, graphical

patient portals, and digital delivery of health information.^{28,29} In this way, telehealth both depends on and reinforces digital health literacy, making the two mutually reinforcing components of modern care.

Emerging Technologies and Digital Health Literacy

Several rapidly evolving technologies are reshaping the literacy demands placed on users, as summarized in Figure 3. Artificial intelligence (AI), particularly generative AI and large language models such as conversational chatbots, is increasingly used by the public to seek health information; users must now judge the reliability of AI-generated responses, recognize fabricated (“hallucinated”) content, and understand the limits of automated advice, prompting calls to embed AI literacy within digital health literacy education.³¹ Digital therapeutics extend digital tools from information provision to active treatment, requiring users to engage with them safely and adhere appropriately.³² Wearable devices and remote patient monitoring generate continuous personal health data, shifting part of the interpretive burden onto patients,³³ while personalized digital healthcare promises tailored support but risks widening inequalities if literacy and access gaps are not addressed.³⁴ Incorporating these developments into digital health literacy frameworks, curricula, and measurement tools is an urgent direction for research and practice.

Developing Educational Resources and Empowerment Programs

To increase digital health literacy at the population level, service providers are developing educational resources and programs. The World Health Organization has highlighted the role of digital health literacy as a key element of the global digital health strategy and emphasized its competency framework for navigating the digital health landscape.^{2,35} Other countries, including the United States, have developed evidence-based resources such as Healthwise, a structured platform for producing concise, understandable digital health information. These educational programs are even more aware of vulnerable populations who tend to exhibit different characteristics in accessing digital health resources.^{36,37} When appropriate training is provided to healthcare professionals, it is likely that digital health literacy will be incorporated into patient-centered care and its comprehensive implications for health management will be fully explored.³⁸

Challenges of Digital Health Literacy

Digital health literacy requires a set of skills to use health information technologies, and the relevant challenges, especially among vulnerable populations, hinder the development of this type of literacy.

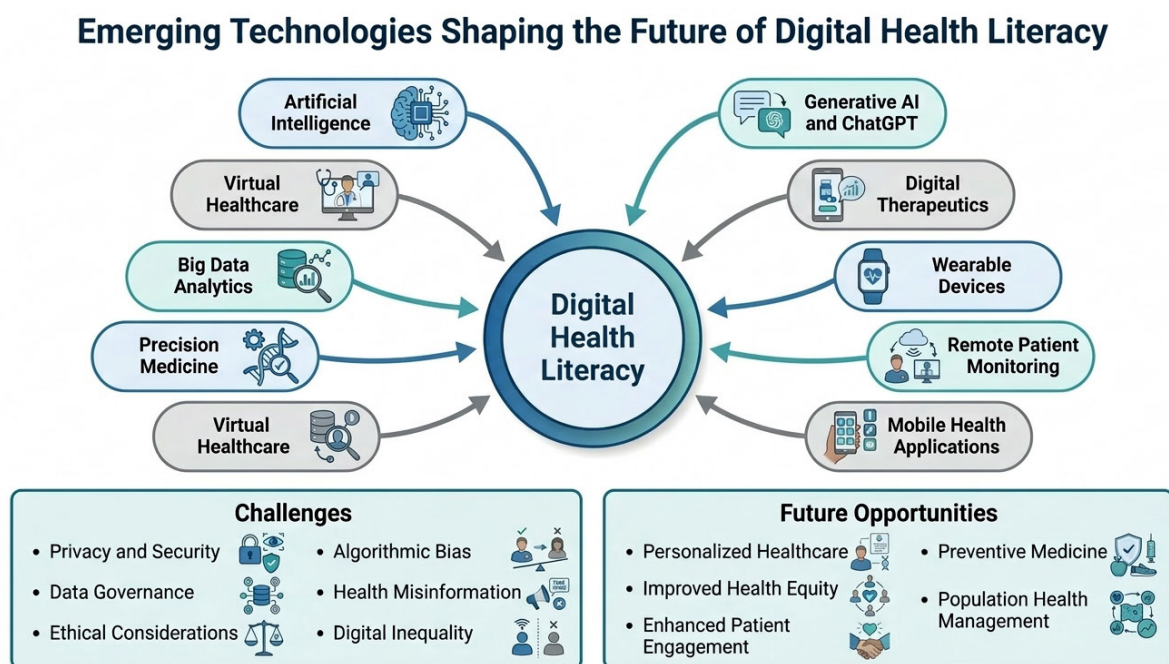


Fig. 3 **Emerging technologies shaping the future of digital health literacy.** Advances including artificial intelligence and generative AI (e.g., large language models such as ChatGPT), digital therapeutics, wearable devices, remote patient monitoring, big data analytics, precision medicine, and mobile health applications are expanding both the opportunities and the literacy demands placed on users. These developments raise challenges, privacy and security, algorithmic bias, health misinformation, digital inequality, ethical considerations, and data governance, while offering opportunities for personalized healthcare, improved health equity, enhanced patient engagement, preventive medicine, and population health management. The figure was generated by the author using FigureLabs (Nano Banana Pro); <https://chat.figurelabs.ai/chat>.

Digital Divide

A major challenge is the digital divide, the inequality in access to and use of digital technologies.⁶ This inequality is most evident among low-income populations and rural areas, where individuals face barriers such as inadequate internet access, lack of appropriate devices, and minimal exposure to new technologies. As a result, many individuals are unable to engage in digital health behaviors, further fueling health inequalities.⁴

Low Digital Literacy

Low digital literacy is another important barrier to effective use of digital health resources.³⁹ Digital literacy requires cognitive skills to evaluate and use information and technical skills to work with different digital platforms.^{40,41} The inability to perform these skills makes it challenging for individuals to find, evaluate, and use health information and leads to adverse health outcomes.⁴² This is particularly problematic for non-digital users, such as older adults, who have already demonstrated feelings of being overwhelmed by the pace of change in the digital landscape.²⁶

Misinformation

The spread of misinformation online is another challenging element of digital health literacy.²⁷ Many people may have access to misinformation about health that is based on commercialism or ideology and can contribute to poor health decisions. As social media and digital platforms are increasingly used by people to obtain health information, the need for critical appraisal skills is becoming increasingly apparent.⁴³

Socioeconomic Inequalities

Socioeconomic factors also play an important role in shaping digital health literacy.^{1,44} Populations that are perceived as disadvantaged are known to face multiple barriers, such as financial barriers to acquiring or accessing technologies, lack of education about digital tools, and low health literacy.⁴⁵ This multifaceted challenge requires targeted interventions to bridge gaps and provide equitable access to health resources. Without such measures, digital health risks widening, rather than narrowing, existing health inequalities.

Strategies to Improve Digital Health Literacy

Improving digital health literacy requires coordinated efforts among multiple stakeholders operating at individual, community, healthcare, technological, and policy levels. **Figure 4** illustrates a multi-level ecosystem model highlighting the interconnected actors that contribute to digital health literacy development and sustainable implementation.

Holistic Framework for Digital Health Literacy

Comprehensive scope in digital health literacy is important for improving health outcomes, particularly in vulnerable populations.^{22,42} Approaches need to be multi-level, at the individual level, and across organizational and policy levels.⁴⁶ Also

understanding the interaction of digital health literacy and social determinants of health, such as education and economic status, is essential for effective design of interventions. Health literacy and digital health literacy can be integrated into public health policies to create an environment that engages with and uses digital health resources across the lifespan.⁴⁷

Community-based Approaches

Community engagement can play a role in reducing the digital health gap. Collaborations with community institutions such as public libraries and community colleges can leverage public and private support resources to deliver educational programs to underserved populations.³ Community educators can provide field skills training on low- or no-cost digital health solutions and help people connect to needed resources such as low-cost devices and Internet access.⁵

Stakeholder Collaboration

A successful digital health literacy initiative requires broad collaboration between multiple stakeholders. The “quadruple helix” model integrates public policy, industry, academia, and civil society to develop sustainable digital health and equity solutions.³⁵ Participatory workshops that engage diverse individuals and community stakeholders can develop strategies that are rooted in the real needs of communities.⁴⁸

Monitoring and Evaluation

To assess the effectiveness of digital health literacy programs, monitoring and evaluation procedures were developed and presented in capacity assessments.⁷ There are comprehensive developments with indicators and practical recommendations for assessing digital health literacy and identifying geographical and socio-economic gaps. For example, the Global Atlas of Health Literacy (GALH) is a tool that allows for comparisons between countries and provides information for policymakers.³⁵

Educational Initiatives

Implementing educational programs focused on digital health skills can improve health among older adults and other populations.¹³ These programs should identify existing digital health readiness and develop educational interventions targeting the specific needs of subpopulations.³⁶ Targeted educational supports for digital health literacy not only help reduce health system costs, but can also support and improve health outcomes.^{49,50}

Discussion and Conclusion

Digital health literacy is a multifaceted and interdisciplinary concept shaped by technological, social, cultural, educational, and economic determinants. The effectiveness of e-health systems in storing, transferring, and retrieving health information for clinical care, education, research, and public health depends on the integration of human capacity, technological infrastructure, and financial resources.⁵¹ In this context, social and cultural structures such as media systems,

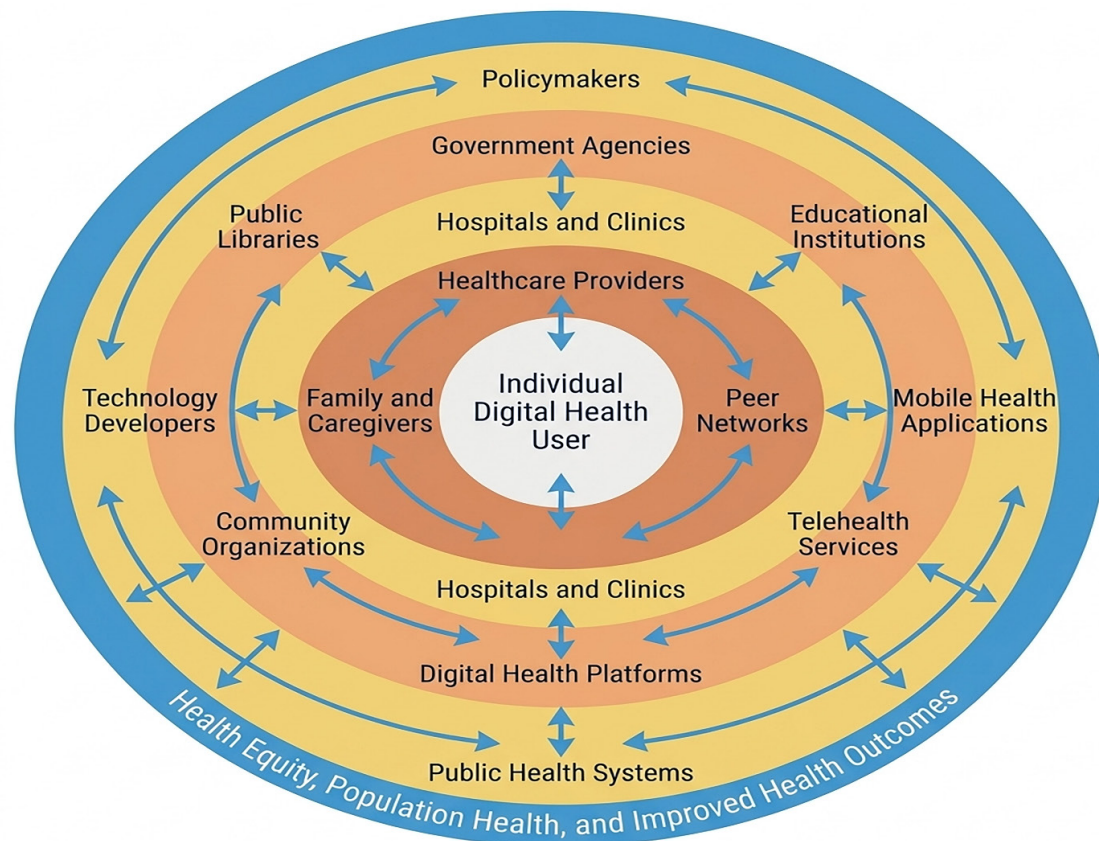


Fig. 4 Multi-level ecosystem supporting digital health literacy. At the center is the individual digital health user, whose digital health literacy is shaped by interactions with family members and caregivers, peer networks, healthcare providers, educational institutions, community organizations, public libraries, technology developers, policymakers, government agencies, and public health systems. These interconnected stakeholders collectively contribute to health equity, population health, and improved health outcomes, illustrating that digital health literacy extends beyond individual skills and requires coordinated support across healthcare, educational, technological, and policy environments. The figure was generated by the author using FigureLabs (Nano Banana Pro); <https://chat.figurelabs.ai/chat>.

educational institutions, and non-governmental organizations play a key role in shaping and strengthening digital health literacy within populations.³⁴ Despite this importance, significant gaps remain in the development and implementation of structured digital health literacy programs, particularly for vulnerable populations including children, adolescents, older adults, women, and individuals in underserved communities. The absence of standardized implementation frameworks, operational tools, and unified evaluation models limits the scalability and effectiveness of current initiatives. Addressing these limitations requires systematic field-based assessments of digital health literacy, particularly in rural and disadvantaged regions where access disparities are more pronounced, to inform equitable health policy and planning strategies.³⁷ Further advancement depends on the development of targeted educational models tailored to specific population needs, such as older adults, adolescents, and patients with chronic diseases, to ensure intervention effectiveness across diverse groups. In parallel, establishing standardized indicators for digital health literacy is essential for evaluating intervention outcomes, monitoring progress,

and supporting evidence-based decision-making. Sustainable improvement in this field also requires strengthened collaboration among healthcare authorities, academic institutions, non-governmental organizations, and the private sector to ensure coordinated development and implementation of digital health literacy initiatives. However, the implementation of digital health solutions may be constrained by barriers including social stigma, digital inequities, privacy concerns, limited digital skills, and resistance to technology adoption. Overcoming these challenges necessitates inclusive, evidence-informed strategies that prioritize stakeholder engagement, community participation, equitable access to digital resources, and continuous evaluation through measurable indicators. Strengthening digital health literacy in this way can ultimately enhance healthcare utilization, improve health outcomes, empower informed decision-making, and reduce health disparities across populations.

Conflict of Interest

The authors declare no conflict of interest. ■

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