Adaptation of Coastal Adolescents to Digital Technology in Improving Health Behavior

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Abstract

Digital technology increasingly shapes adolescent health behavior; however, little is known about how adolescents in remote coastal communities adapt to digital health information environments. This study aims to explore how digital technology influences adolescent health behaviors and how environmental and social factors shape adolescents' adaptation to digital technology in a coastal community. This qualitative study employed a phenomenological approach. Data were collected through in-depth interviews with 27 adolescents aged 15–19 years and two focus group discussions conducted in Mandangin Island, Madura, Indonesia. Participants were selected using purposive sampling based on their access to digital devices and internet connectivity. Data were analyzed using thematic analysis supported by NVivo 12 software. Digital technology, particularly social media platforms such as TikTok, Instagram, and YouTube, emerged as the primary source of health information for adolescents. Participants reported increased awareness of healthy behaviors, including diet, physical activity, and mental well-being. However, significant challenges were identified, including limited internet access, unequal device ownership, and difficulties in distinguishing credible information from misinformation. Peer influence played a central role in shaping how adolescents adopt and interpret online health information. Digital technology has the potential to support positive health behavior among adolescents in coastal communities. Nevertheless, digital inequality and limited digital health literacy restrict its effectiveness. Strengthening digital literacy and improving equitable access to technology are essential to optimize digital health interventions for adolescents in underserved coastal areas

Keywords: Adolescent Health, Digital Health Literacy, Health Behavior, Digital Divide, Coastal Community, Qualitative Research

INTRODUCTION

Adolescents represent nearly 1.3 billion people globally, accounting for approximately one-sixth of the world's population (UNICEF, 2022). The rapid expansion of digital technology has transformed how adolescents access information, communicate, and shape their health behaviors. Recent global estimates indicate that more than 70% of young people aged 15–24 use the internet, making digital platforms a dominant source of health-related information (Ferretti et al., 2023). While digital technologies offer opportunities to improve health literacy and promote healthy behaviors, they also expose adolescents to misinformation, particularly on social media platforms where content is not always scientifically verified.

The rapid evolution of digital technology is transforming various aspects of daily life, including health behaviors, especially among adolescents. (Martina et al., 2023; Rose et al., 2022; Stavropoulos et al., 2021). Adolescents are increasingly using the internet, social media, and health applications to access information about fitness, nutrition, and mental well-being. However, most existing studies focus on urban or well-connected populations, leaving a gap in understanding how youth in geographically and socio-economically marginalized areas, such as coastal communities, experience this digital shift.

Mandangin Island, located off the coast of Madura, Indonesia, represents a unique case with distinct socio-economic and environmental characteristics. The community relies heavily on traditional livelihoods such as fishing, and its remote location presents structural challenges to digital access and infrastructure development. These conditions limit adolescents' exposure to digital tools that are otherwise transforming youth health behavior in urban settings. Yet, some adolescents in this region are beginning to engage with digital platforms through shared devices or intermittent connectivity, offering a window into how digital adaptation unfolds in underserved communities. The digital divide is particularly evident among adolescents from low-income families, further hindering their ability to fully benefit from the advantages that digital technology can offer. (Kormos et al., 2021; Lythreatis et al., 2022).

Despite these challenges, the potential of digital technology to improve adolescent health behavior in coastal areas is significant. Digital platforms, especially social media and health applications, offer new pathways for accessing health information, promoting physical activity, and raising awareness about the risks associated with unhealthy behaviors. (Chatterjee et al., 2021; Holmberg et al., 2019; O'Neil, 2019; Robinson et al., 2020). Adolescents often rely on platforms such as Instagram, TikTok, and YouTube to learn about fitness, nutrition, and mental health. (Blanchard et al., 2023; Lim et al., 2022; Lupton, 2021; McCashin et al., 2023; Younis, 2024). Additionally, health applications that track physical activity, sleep patterns, or nutritional intake have the potential to guide adolescents towards healthier lifestyles. However, this potential remains untapped for many adolescents in remote regions due to limited digital literacy and infrastructure. (Rui et al., 2022; World Health Organization, 2020).

Previous research on adolescent digital health behavior has primarily focused on urban or technologically advanced populations, with limited attention to geographically isolated communities where cultural norms, limited infrastructure, and developing digital access intersect. Understanding this sociocultural context is important for designing effective interventions in marginalized settings. This study draws on three complementary theoretical

perspectives. First, the Digital Divide theory explains how inequalities in digital access and use are shaped by socioeconomic status, geographic location, and education, influencing both infrastructure access and digital skills. (Dijk, 2020). Second, Health Literacy frameworks**,** particularly those proposed by Nutbeam, emphasize individuals' abilities to obtain, understand, evaluate, and apply health information in ways that support informed health decisions. (Nutbeam, 2023). In digital environments, these competencies extend to the critical appraisal of online health information, often referred to as digital health literacy. (Norman & Skinner, 2006). Third, the Technology Acceptance Model (TAM) developed by Davis highlights how perceived usefulness and perceived ease of use influence individuals' willingness to adopt and utilize digital technologies. (Davis, 1989). Together, these perspectives provide a conceptual foundation for understanding how structural inequalities, digital competencies, and perceptions of technology shape adolescents' engagement with digital health information in marginalized coastal communities.

This study contributes novel insights by using a phenomenological approach to explore adolescents' lived experiences of digital health adaptation in a geographically and economically marginalized Indonesian island community. Unlike previous studies in low- and middle-income countries that mainly focus on access, infrastructure, or general digital literacy, this research examines how adolescents in a remote coastal area actively use digital technologies to support their health behaviors. It specifically explores how environmental, social, and economic factors influence the use of digital platforms, such as social media and mobile applications, for health-related purposes. By focusing on adolescents in Mandangin Island, this study provides a deeper understanding of how digital health practices are shaped within resource-limited and socioculturally strong contexts. The findings offer important implications for developing context-sensitive digital health interventions to improve health equity among marginalized adolescents.

METHODS

This qualitative study used a phenomenological approach to explore the lived experiences of coastal adolescents in adapting to digital technology for health-related purposes. The study was conducted on Mandangin Island, Sampang Regency, Indonesia, from March 2023 to February 2024. Participants were recruited in collaboration with local schools and community health workers using purposive sampling. The study involved 27 adolescents aged 15–19 years, comprising 14 females and 13 males. Participants were selected based on their access to smartphones and internet connectivity, including those who accessed technology

through shared devices. Diversity in gender, educational background, and digital access experience was considered during recruitment.

Data were collected through semi-structured in-depth interviews with 15 participants, two focus group discussions involving 12 participants, and participant observations. Each FGD consisted of six participants. Interviews lasted approximately 45–60 minutes, while FGDs lasted approximately 90 minutes. The discussions explored patterns of digital technology use, sources and perceived credibility of online health information, social and peer influences, and barriers to digital health literacy. All sessions were conducted in Madurese or Bahasa Indonesia, audio-recorded with participants' consent, transcribed verbatim, and translated into Indonesian and English. Field notes from participant observations were used to describe adolescents' daily digital practices and environmental conditions. Data collection continued until no new information or themes emerged.

Data were analyzed thematically with the support of NVivo 12. The analysis included familiarization with the data, initial coding, grouping codes into potential themes, reviewing and defining themes, and selecting representative participant quotations. Two researchers independently coded the data, and discrepancies were resolved through discussion. A third researcher conducted peer debriefing to strengthen analytical rigor and reduce researcher bias.

Trustworthiness was established through credibility, transferability, dependability, and confirmability. Credibility was supported through triangulation of interviews, FGDs, and observations. Transferability was enhanced by providing detailed descriptions of the research setting and participant characteristics. Dependability was maintained through an audit trail documenting data collection and analytical decisions, while confirmability was supported through reflexive discussions among the researchers. Ethical approval was obtained from the Health Research Ethics Committee of STIKES Yayasan Rumah Sakit Dr. Soetomo (Approval No. KEPK/YRSDS/011/II/2023). Written informed consent was obtained from all participants and from parents or guardians of participants under 18 years of age. Participant confidentiality and anonymity were maintained throughout the study.

RESULT

The findings reveal that digital technology significantly influences health behavior among coastal adolescents. Social media platforms, particularly TikTok and YouTube, have become primary informal channels of health information for adolescents, often replacing traditional sources in areas such as diet, physical activity, and skin care. However, this information is frequently accepted without critical evaluation.

However, challenges persist. Many adolescents expressed difficulty in distinguishing credible health information from misinformation on social media. There was also a digital divide within the community; adolescents from higher-income families had better access to technology, while those from low-income households struggled with device ownership and internet connectivity.

Table 1. Results of in-depth interview and FGD analysis

Theme	Category	Coding	Quotation
Digital Technology	Access to technology	Limited access to devices and the internet	“I sometimes have to share a cellphone with my brother, because our family only has one. Internet is also difficult here” (P1. In-depth interview)
	Type of platform used	Social media as a primary source	"I often see information about health on TikTok, usually tips like that, healthy food, to take care of the skin" (P2, FGD)
	Use health applications	Health apps are less known	"I have heard of health apps, but I haven't tried them. I have heard of sports apps like those for counting steps, but I have never used them" (P3, in-depth interview)
Health Behavior Change	Influence of social media on behavior	Positive change in physical activity	“Look at TikTok, lots of people post health tips, so sometimes my friends and I try what is suggested on TikTok” (P4, FGD)
	Health awareness	Increase awareness of health risks	“I didn’t know that there were foods that were not good for my heart before, I had seen information about it on TikTok and YouTube” (P5, In-depth interview)
Challenges in Technology Adoption	Digital literacy	Difficulty distinguishing valid information	"I'm confused, sometimes the information is different. I don't know which one is correct" (P6, FGD) "Someone gave me tips on dieting using drugs, but I don't know if it's hard drugs or not." (P7, FGD)
	Peer influence on technology adoption	Peer and motivator for health behavior change	“I follow my friends. If they try a new sport or there is an application like that, I want to join in” (P7, in-depth interview)
	Digital devide	Socioeconomic status limits access	“Rich friends find it easier to use the internet, they have their own cellphones and more quota” (P8, FGD)

The social environment, especially peer influence, was found to play a critical role in shaping health behaviors. Adolescents tended to adopt behaviors that were endorsed or practiced by their peer groups, with digital platforms amplifying the reach of these influences. Despite the challenges, the study found that digital technology, when accessible, encouraged increased participation in physical activities, heightened awareness of health risks (such as foods that are not good for the body), and improved mental health awareness.

The study found that most adolescents on the Mandangin coast have limited access to the internet and digital devices, primarily through shared mobile phones. Access to the internet is

inconsistent, with many adolescents relying on communal Wi-Fi hotspots or data packages shared within their families. Inadequate technological infrastructure and economic constraints significantly limit the availability and quality of digital access. Adolescents from low-income families face additional barriers, such as the inability to afford personal devices or regular internet subscriptions, further contributing to a digital divide in the community.

One adolescent shared that the limited access affects not only their ability to stay connected but also their opportunities to use digital technology for educational and health-related purposes. Despite limited access, adolescents use digital technology primarily for entertainment and communication, with platforms like Instagram, WhatsApp, and TikTok being the most popular. Social media is the primary tool for staying connected with friends, consuming content, and following trends. Adolescents often spend hours browsing social media content related to entertainment, fashion, and pop culture, reflecting a global trend among youth in their age group.

Social media platforms have become primary sources of health information for adolescents in Mandangin Island. Platforms such as TikTok, Instagram, and YouTube provide easily accessible content related to diet, exercise, and mental well-being. However, this information is often consumed without critical evaluation.

"I often see information about health on TikTok, usually tips about healthy food or skin care." (P2, FGD)

This finding suggests that digital platforms function as informal health education channels, although their reliability remains uncertain. However, the use of digital technology for health purposes is still minimal. While some adolescents have started to familiarize themselves with health applications such as fitness trackers or apps providing health information, this is not yet a widespread behavior. A few adolescents mentioned using social media as a source of health-related information, although the information is often consumed passively and not critically evaluated for credibility. Health apps, such as those that track steps or monitor nutrition, are sometimes used, but often as an afterthought rather than a primary focus of digital engagement. Participants reported using these platforms to learn about reproductive health, mental well-being, and physical fitness. Their engagement with digital content, however, was often shaped by superficial markers such as view counts, likes, and the popularity of influencers rather than by the credibility or scientific accuracy of the information presented. The lack of digital literacy was evident, as many adolescents expressed difficulty in distinguishing credible health information from misinformation. Some rely on social media influencers for health advice, which can lead to misleading or inaccurate information. This

illustrates the potential risks of relying on social media for health information without the ability to critically assess its validity.

Many adolescents reported being aware of the importance of maintaining healthy lifestyles, particularly regarding physical activity and diet. This awareness was expressed by several participants during interviews and FGDs. For example, one participant stated:

> *"We know exercise is important, but usually we only do it sometimes. Sometimes we just watch videos about workouts on TikTok."* (P4, FGD)

Similar perspectives were shared by nine participants across the interviews and focus group discussions, indicating that although adolescents possess basic health awareness, this knowledge does not always translate into consistent health-related digital practices. Adolescents in the Mandangin coastal area are generally aware of the importance of health, particularly regarding physical activity and diet. However, this awareness has not yet translated into consistent utilization of digital technology to improve health behaviors. While some adolescents have recognized the benefits of tracking physical activity through apps or learning about healthy habits online, there is a tendency to prefer traditional methods of obtaining health information, such as through family members, peers, or local healthcare providers.

Peer influence also surfaced as a significant factor in adolescents' decision-making processes regarding health content. Many adolescents described feeling encouraged to try new health practices or seek information online after seeing peers or admired social media figures doing the same. This motivation was closely tied to the need for social validation and a desire to conform to peer trends, especially those related to body image and lifestyle. Peer relationships strongly influence how adolescents interpret and adopt online health information. Many participants reported trying health practices after seeing their friends engage in similar activities.

> *"If my friends try a new sport or application, I usually want to try it too."* (P7, in-depth interview)

Peer influence acts as both a motivator and a mechanism for spreading digital health information within adolescent networks. Despite their curiosity and enthusiasm toward digital sources, adolescents also encountered multiple barriers to accessing valid health information. These included unstable internet connections, limited access to personal digital devices, and a lack of understanding of how to verify the credibility of health-related content online. Some participants admitted to feeling confused or overwhelmed when encountering contradictory information, and many lacked the digital literacy skills required to filter and critically assess the content they consumed. A significant barrier identified in the study is unequal access to digital technology.

"I sometimes have to share a cellphone with my brother because our family only has one." (P1, P8, FGD)

Limited internet connectivity and economic constraints create disparities in access to digital health resources, reinforcing the digital divide within the community. Importantly, the findings point to a broader issue of digital inequality. While some adolescents were able to engage meaningfully with online health information, others, particularly those from low-income families or with limited connectivity, were at greater risk of exposure to misinformation. This digital divide highlights a layered vulnerability where adolescents not only struggle with access but also with the quality and reliability of the health information they receive.

DISCUSSION

This study highlights the complex ways in which digital technology shapes adolescent health behavior in marginalized coastal communities. The findings demonstrate that while digital platforms offer new opportunities for accessing health information, their impact is constrained by structural inequalities, limited digital literacy, and strong peer-mediated information flows. One of the most significant findings of this study is the central role of social media platforms as informal sources of health information. Adolescents frequently rely on platforms such as TikTok and YouTube to learn about health behaviors, reflecting broader global trends in youth digital engagement. Similar patterns have been observed in studies conducted in other contexts, where social media has emerged as a dominant channel for health communication among young populations. However, the widespread reliance on social media also exposes adolescents to health misinformation. Algorithm-driven content prioritizes popularity and engagement rather than scientific credibility, which can lead to the circulation of misleading or potentially harmful health advice.

The results of this study highlight several significant barriers to the adoption of digital technology for health purposes among adolescents in coastal areas like Mandangin Island. One of the primary obstacles is limited internet access, which restricts the frequency and quality of digital engagement. Due to inadequate technological infrastructure and intermittent connectivity, adolescents often cannot access reliable health information online. The lack of technological knowledge, or digital literacy, also hampers their ability to use digital tools effectively. (Dudi et al., 2023; Radovanović et al., 2020).

Although digital platforms offer unprecedented access to health-related content, they simultaneously introduce new risks, particularly in environments where digital literacy is low and infrastructure is limited. Adolescents in Mandangin exemplify this dual reality, being

simultaneously empowered and endangered by the digital information ecosystem. Many participants expressed difficulties in verifying the credibility of health information found on social media platforms and other digital sources, underscoring a gap in digital health literacy.

Additionally, economic and geographic factors play a crucial role in limiting access to technology.(G., Reddick Christopher Enriquez et al., 2020). Adolescents from lower-income families struggle to afford personal devices and consistent internet access.(Boerkamp et al., 2024; G., Reddick Christopher Enriquez et al., 2020; Gonzales et al., 2020; Notley & Aziz, 2024), creating a digital divide that prevents many from fully benefiting from digital health tools. Geographic isolation further compounds these challenges, as infrastructure development in remote coastal areas like Mandangin often lags behind more urbanized regions, exacerbating the disparity in technological access.

Cultural factors also influence the rate and extent of digital technology adoption for health purposes among coastal adolescents. The findings indicate that Mandangin adolescents tend to prefer traditional and community-based approaches to health, such as seeking advice from family members, community health workers, or peers. These traditional health-seeking behaviors are deeply ingrained in the social fabric of the community, where trust in local sources of knowledge often outweighs the appeal of unfamiliar digital platforms.

Despite an emerging interest in digital technology, the adaptation to technology for health purposes remains limited. Adolescents may experiment with digital tools, such as fitness apps or social media health influencers, but this usage is often casual and lacks consistency. Educational interventions that increase both digital literacy and health literacy (El Benny et al., 2021; Patil et al., 2021) are essential for empowering these adolescents to engage with digital health tools in a meaningful way. Programs that focus on building trust in reliable digital health sources and improving access to technology would help bridge the gap between traditional health practices and modern digital health solutions.

Although current usage of digital health tools is limited, there is significant potential for improvement if access and education are enhanced. With increased access to reliable internet connections and technological devices, coastal adolescents can more effectively use digital technologies to improve health behaviors. Furthermore, digital health programs that are tailored to the local needs and contexts of communities like Mandangin have the potential to bring about substantial changes in health outcomes. These programs can incorporate culturally relevant content, such as integrating local health practices with modern health technologies, which would likely resonate more with the target audience and encourage greater participation.

Investments in digital infrastructure and targeted health education programs can help overcome the barriers of digital literacy and access. By focusing on local engagement and building trust in digital platforms, adolescents can be better equipped to leverage the power of digital technology for improving physical activity, nutrition, and overall health awareness.

One of the concerning findings of this study is the prevalence of social media, particularly TikTok, as a primary source of health information among adolescents. (Song et al., 2021). While social media can provide valuable platforms for sharing health tips and promoting healthy lifestyles, it also carries inherent risks. Adolescents often lack the critical skills to assess the credibility of the health information they encounter on these platforms. As a result, they may be exposed to misleading or dangerous health advice.

For example, TikTok and similar platforms are known for promoting health fads or recommending the use of unverified supplements and medications. In some cases, influencers on these platforms have promoted the use of prescription drugs or other potentially harmful substances without medical oversight. This poses a significant public health risk, as adolescents may follow these recommendations without understanding the potential side effects or dangers. This highlights the need for stricter regulation of health content on social media and greater digital literacy education among adolescents. (Bozzola et al., 2022; Milenkova & Lendzhova, 2021).

In addition to the risk of promoting unsafe medications, social media platforms often circulate health tips that lack scientific backing, encouraging behaviors such as extreme diets or excessive use of certain supplements. Adolescents are particularly vulnerable to these trends, as they are more likely to trust the influencers they follow without critically evaluating the information. Ensuring that adolescents understand how to discern reliable health information from dangerous or false claims is crucial in mitigating the negative impact of social media on their health behaviors.

The study highlights the dual impact of digital technology on adolescent health behaviors in coastal areas. On the one hand, technology acts as an enabler, providing adolescents with easy access to information that encourages healthier lifestyle choices. On the other hand, barriers such as limited digital literacy, misinformation, and unequal access to technology hinder its full potential. The findings suggest that digital health interventions tailored to these regions should not only focus on providing access to technology but also on improving digital literacy and verifying the credibility of information.

Social factors, particularly peer influence, were observed to significantly shape how adolescents engage with health information. In coastal communities like Mandangin Island,

where familial and social ties are strong, peer groups serve as critical mediators of behavior change. These findings align with previous research showing that social interactions strongly influence health behavior adoption among adolescents. The enduring reliance on parents, teachers, and health workers reflects deeply rooted cultural norms that prioritize interpersonal guidance over self-directed digital exploration. At the same time, the increased use of platforms like TikTok and YouTube demonstrates that adolescents are not passive recipients of information but are actively seeking knowledge through contemporary means, especially when conventional channels fail to address their needs for privacy and relevance.

Peer dynamics play a crucial role in shaping adolescents' behavior, both online and offline. The social value attached to being "informed" or "in trend" can be a strong motivator but also a source of pressure that leads to uncritical acceptance of information. This social contagion effect, combined with the algorithmic nature of digital platforms, often pushes adolescents toward sensational or popular content, regardless of its accuracy or appropriateness. The digital divide, as revealed in this study, is not merely a matter of infrastructure but also of cognitive and educational disparities. Many adolescents lack the evaluative skills to distinguish between credible health advice and misleading or harmful content. In this way, social media becomes both a driver of health knowledge and a potential threat to adolescent well-being.

These findings contribute to the broader discourse on health equity and digital transformation, particularly in remote and underserved communities. They reinforce the urgency of integrating digital health literacy into public health initiatives and educational systems, especially in regions where traditional infrastructures cannot fully meet the needs of a digitally connected generation. The study also underscores the digital divide that persists in rural and coastal regions, exacerbating health inequities. Adolescents from lower-income families face greater barriers to accessing digital tools, which limits their ability to benefit from the health resources available online. This divide must be addressed to ensure that digital health interventions are inclusive and effective in promoting health equity.

While this study offers meaningful insights into the intersection of adolescent health behavior and digital media usage in a coastal setting, several limitations must be acknowledged. First, the research was conducted within a site-specific context, the island of Mandangin, which has unique cultural, infrastructural, and socio-economic characteristics. As such, the findings may not be fully generalizable to other rural or urban areas in Indonesia or beyond. Second, the reliance on qualitative methods, including self-reported data through interviews, introduces the possibility of response bias, particularly in socially sensitive discussions such as reproductive health or peer influence. Adolescents may have either underreported or

exaggerated certain experiences due to perceived social desirability or discomfort during the interviews.

Moreover, access to digital devices and internet connectivity varied significantly among participants, potentially skewing the representation of digital engagement and literacy. Lastly, the study did not involve triangulation with other stakeholders such as parents, teachers, or health workers, whose perspectives could have enriched the analysis and added contextual depth to adolescents' narratives.

Based on the findings, several practical recommendations can be proposed for policymakers, educators, and digital platform designers. For policymakers, there is an urgent need to invest in infrastructure that reduces the digital divide in underserved communities. This includes expanding internet access, providing public digital learning spaces, and offering community-based training programs in digital literacy, particularly health information verification skills. Educators should integrate digital health literacy into the school curriculum, encouraging critical thinking, ethical online behavior, and the ability to assess the credibility of online content. Teachers and school health programs must be equipped with updated training and resources to guide students in navigating both conventional and digital health information landscapes.

For digital platform designers and content creators, greater attention must be given to ensuring age-appropriate, culturally relevant, and scientifically accurate content is accessible and engaging to adolescents. Algorithms that currently promote popularity-based content over reliability must be recalibrated to prioritize trustworthiness and verified information, especially in the health domain. Finally, cross-sector collaboration is essential. Public health authorities, educational institutions, and digital media companies should work together to develop inclusive strategies that empower adolescents to become informed, critical, and safe consumers of health information in the digital age.

Despite these insights, several limitations should be acknowledged. First, the study was conducted in a single coastal community, which may limit the generalizability of the findings. Second, the perspectives of parents, teachers, and health workers were not included in the analysis. The absence of these perspectives represents an important limitation because adolescent health behaviors are shaped by broader social environments. Future research should consider multi-stakeholder perspectives and longitudinal approaches to better understand how digital health behaviors evolve.

CONCLUSION

The adaptation of digital technology among coastal adolescents in improving health behavior is influenced by both opportunities and challenges. Although digital platforms provide broader access to health information, unequal technology access, limited digital literacy, and sociocultural factors still restrict their effectiveness. Peer groups also play an important role in encouraging the adoption of health behaviors promoted through digital media, highlighting the importance of context-based interventions. To maximize the benefits of digital technology in adolescent health promotion, practical strategies are needed. Local health departments should train community health workers and school staff to deliver structured digital health education that is accurate, age-appropriate, and culturally sensitive. Schools can integrate digital health literacy into their curricula, particularly in evaluating online health information critically and promoting responsible digital engagement. Collaboration with digital platform developers is also important to improve content moderation and adapt health messages for adolescents in underserved areas.

Future research should include longitudinal studies to examine behavioral changes and patterns of digital engagement over time. In addition, developing and evaluating mobile health (mHealth) applications tailored for adolescents in coastal and underserved regions may provide scalable and context-specific solutions. Overall, strengthening digital health literacy and reducing the digital divide through multi-stakeholder collaboration are essential to reducing health inequities and supporting adolescents in making informed health decisions. These efforts are also important for advancing United Nations Sustainable Development Goal 3 (Good Health and Well-being) and SDG 10 (Reduced Inequalities), particularly for adolescents in geographically isolated coastal communities.

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