How to Empower Generation Z for Better Health? A Cross-Generational Analysis of Health Information Seeking Behavior and Digital Health Literacy

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Abstracts

Purpose: This study aims to identify variations in health information-seeking behaviors between older adults and Generation Z (aged 18-26 years). We assess the differences in health empowerment and digital health literacy between the two age groups and examine the use of various information sources that may influence health empowerment and digital health literacy in both cohorts.

Methods: The Health Information National Trends Survey (HINTS) was adopted for further analysis in 2022. A total of 1,862 valid responses were analyzed from 3,389 Chinese respondents. Descriptive analysis, T-tests, and multiple linear regression were applied to the data.

Results: Generation Z, comprising 995 respondents (53.44%), demonstrated a higher likelihood of utilizing the internet for health-related information, while older generations tended to rely more on traditional media and interpersonal contacts. Online information-seeking was significantly associated with digital health literacy (Generation Z: β = .192, p < .001; Older generations: β = .337, p < .001). However, only seeking health information from healthcare professionals positively correlated with health empowerment (Generation Z: β = .070, p < .002; Older generations: β = .089, p < .001). Notably, despite more frequent internet use for health inquiries, Generation Z exhibited less interest in seeking health information overall, comparable digital literacy, and lower levels of health empowerment than older generations.

Implications: This study investigated and compared the health information-seeking of Generation Z and older individuals, aiming to enhance digital health literacy and health empowerment. Both groups displayed distinct preferences for information sources, and significant relationships were identified between health empowerment, eHealth literacy, and information-seeking behaviors.

Values: This research provides concrete evidence to understand health information-seeking habits in newer generations and highlights the differences in the utilization of various health information sources. These findings can inform strategies to promote health literacy and empowerment among Chinese citizens.

Keywords: health information seeking; digital health literacy; health empowerment; generation Z

1. Introduction

The term "Generation Z" refers to anyone born after 1995 who is known for being digitally savvy and consuming information through digital media (Glum 2015; Holmes 2011; Vogelsang et al. 2018). The emergence of Generation Z marks a new era in digital technology and information accessibility. This generation has grown up in a world where information is just a click away, and digital devices are an integral part of their daily lives. Early research indicates that younger participants tend to have stronger computer skills and are more likely to report accessing the Internet for health information (Jacobs et al. 2017; Van Dijk and Hacker 2003).

Different generations had varying practices for using information sources (e.g., Cotten and Gupta 2004; Spence et al. 2006). People of Generation Z, who are between the ages of 18 and 26 and have grown up with access to digital technology, are more likely to look for health-related material online and to use social media to interact with others about such issues (Jacobs et al. 2017; Van Dijk and Hacker 2003). In comparison, the older individuals prefer to access traditional sources such as libraries and paper-based materials while seeking health information (Medlock et al. 2015). There seems to be a strong association between being able to access health information, having digital health literacy, and being empowered in terms of one's health (Aydin and Kumru 2022; Papp-Zipernovszky et al. 2021). These factors may differ particularly for Generation Z and earlier generations in Chinese culture.

Moreover, empowering Generation Z with digital health literacy skills can lead to better health outcomes and a more informed population. Therefore, this analysis compares health information behavior between Generation Z and older generations. It will explore the relations between information inquiries with digital health literacy and health empowerment. By doing so, we can better understand how to equip the next generation with the tools and knowledge necessary to make informed decisions about their health and well-being in the digital age.

2. Literature Review & Research Questions

Several studies have explored the relationship between health empowerment, digital health literacy, and health information-seeking behavior (e.g., Fleary et al. 2018; Htay et al. 2022; Percheski and Hargittai 2011). Greater digital health literacy and empowerment have been associated with more frequent health information-seeking (Papp-Zipernovszky et al. 2021). Diviani et al. (2015) and Náfrádi et al. (2018) also concluded that online information-seeking exhibited a positive relationship with health literacy and empowerment, and was linked to improved health outcomes. In the subsequent sections, we discuss health information-seeking behavior, digital health literacy, and health empowerment by examining these relationships among Generation Z members.

2.1 Health information-seeking behavior (HISB)

People who seek information about their health, threats, illnesses, and health-protective measures are referred to as health information-seeking behavior (HISB) (Lambert and Loiselle 2007). Professional channels (e.g., medical professionals, health care practitioners), as well as lay people (e.g., family members) (Ford and Kaphingst 2009; Thapa et al. 2021) and traditional media sources (e.g., television, radio, newspapers, and social media), can all be utilized to acquire information. While the way and content carried by various information sources can vary widely.

The Internet has increasingly been acknowledged as a key source of health information; thus, an increasing number of Americans report using the Internet to find health-related information (Rains 2007). A similar trend appeared among other populations in China and European countries (Link et al. 2022; Zhao et al. 2020). The internet offers individuals

convenient access to a vast amount of health information, but the quality of this content can be questionable. User-generated health content on social media, in particular, does not ensure validity. Traditional media, while providing more reliable information, may not be timely or effectively reach specific groups, such as patients with mental disorders. Interpersonal information sources are considered the most trustworthy information sources in China (Lu et al. 2022). Family members and friends offer emotional support alongside information. Doctors and health professionals can tailor information to an individual's specific health needs based on their expertise. People also experience information-seeking differently between information channels, e.g., older individuals may struggle to utilize the internet as an information source but feel more confident in consulting from interpersonal information channels including family and friends, and trust information more from healthcare professionals (Simon et al. 2014; Turner et al. 2018). As a result, one of the goals of this study is to see if there are any variations in the use of information sources for HISB between Generation Z and the older populations. The following research question is posed in relation to it:

RQ1: How do Generation Z and older populations differ in terms of HISB across various communication channels? The usage of traditional communication channels, such television and print media, will be higher among older groups, but Generation Z will use social media channels substantially more often than older generations do for HISB.

2.2 Digital health literacy and HISB

In China, a comprehensive measurement tool, the Chinese eHealth Literacy Scale (C-eHEALS), has been designed to assess Chinese patients' eHealth literacy. The study, based on the eHEALS and adapted to the Chinese context, analyzed 347 patients in hospitals and demonstrated good reliability and validity (Chang and Schulz 2018). Four factors of eHealth literacy were identified: knowledge and skill, cognitive and affective attitudes, online communication, and self-efficacy. These findings underscore the importance of differentiating health literacy and digital health literacy and recognizing the unique skills digital health literacy entails.

Generation Z, having been exposed to and experienced digital technologies from a young age, is more accustomed to and competent in using online resources in their daily lives. Indeed, several studies have demonstrated that Generation Z possesses higher levels of digital literacy than older generations. For example, a study involving 522 Hungarians found that Generation Z exhibited higher levels of digital health literacy compared to older generations (Papp-Zipernovszky et al. 2021). While some studies have not explicitly compared Generation Z with older generations, age has shown significant correlations with digital health literacy. Older individuals tend to display lower levels of digital health literacy and less confidence in their online information-seeking and engagement abilities compared to their younger counterparts (Paige et al. 2018; van der Vaart et al. 2019).

It is reasonable to expect a positive relationship between internet usage as an information source and digital health literacy. However, it remains unclear whether information-seeking from other sources is associated with individuals' digital literacy (Papp-Zipernovszky et al. 2021). Understanding the relationships between the use of various information sources and digital literacy can provide valuable insights to address the information needs of individuals with lower digital literacy and develop effective health interventions. The following study question about digital health literacy is illustrated:

RQ2: How do older and younger populations differ from Generation Z in terms of digital health literacy? Given their early exposure to digital technologies, Generation Z is predicted to have a higher level of digital health literacy than older demographics.

2.3 Health Empowerment and HISB

Even though researching health issues online can result in more proactive disease management and decision-making, the use of false material online has drawn considerable attention (Schulz and Nakamoto 2022). For instance, incorrect knowledge regarding the Covid-19 virus's causes, transmission, and treatments may have prevented some people from implementing effective preventative measures during the pandemic (Brennen et al. 2020). However, medical professionals can give the individual personalized and accurate health information to consumers. In sum, there are few sources that go into further detail about the connection between health empowerment and getting knowledge about health from various sources. It is crucial to determine if health empowerment differs between Generation Z and older populations, given the exceptional quality of health information offered online. As a result, we further define study question three as:

RQ3: Will Generation Z have a higher level of health empowerment compared to older populations, as they are more likely to be exposed to health information and are more confident in using digital technologies to manage their health?

In comparison, traditional communication channels, such as face-to-face interactions with healthcare professionals, may have a more direct impact on health empowerment. Sak and others in 2017 investigated the correlative power of psychological empowerment and health literacy on older patients' participation in health care. A cross-sectional population-based study was conducted with a sample of 826 older adults in Switzerland. The results showed that both psychological empowerment and health literacy were positively associated with older patients' participation in health care, with psychological empowerment having a more substantial impact. The authors suggest that healthcare professionals can play a critical role in promoting health empowerment and health information seeking among their patients. The relationship between health empowerment and HISB can vary depending on the communication channels used. Understanding the impact of different channels on this relationship is essential for developing effective interventions to promote health empowerment and HISB among diverse populations. Thus, we elaborate the research question four as:

RQ4: Specifically, among members of Generation Z, will there be a good association between health empowerment and HISB across various communication platforms? Will growing usage of digital communication platforms for HISB, such as social media and health applications, as well as conventional communication channels, such as television and print media, be connected with higher levels of health empowerment?

3. Method

The current studies employed questionnaire items, incorporating the fundamental questions from the Health Information National Trends Survey (HINTS) conducted in both China and the United States. HINTS is a national survey that investigates public perception and utilization of health information. This poll was designed in alignment with the pre-existing HINTS projects in the United States, initiated by the National Cancer Institute (Rutten et al. 2006). The study metrics encompassed the frequency at which individuals sought health information from various sources. Additional questions were introduced, with some emphasizing health empowerment and digital health literacy. Consequently, the questionnaire items were organized into six categories: social networks, health information, health condition and behavior, healthcare experiences, and health information-seeking behavior.

3.1 Sampling & Procedure

This cross-sectional, web-based study was conducted between September and November 2022 by inviting Chinese residents from Mainland China. A total of 3,389 respondents were gathered for analysis. The questionnaire took approximately 15 minutes to complete. The screening criteria for participants included being Chinese, 18 years of age or older, having a specific gender, and residing in one of the mentioned regions. The response rate was 76.8%, with 3,389 individuals expressing interest in participating.. This project was supported by the University of Macau (UM) in Macao and the University of Lugano in Switzerland. The UM Ethical Committee approved the research (application code: SSHRE22-093).

3.2 Measurement

Higher values indicate worsening mental health, based on the average score of these four items using a 4-point scale (Table 1).

Table 1. Overview of variables.

Variable	Questionnaire	Scaling details
Health information seeking behavior	"Have you encountered health or medical information from [information source] in the past 12 months?" Information sources include: 1. TV; 2. Radio; 3. Newspapers/magazines; 4. Websites or search engines; 5. Social media; 6. Health-related or news applications; 7. Doctor or health specialists; 8. Family members; 9. Friends or colleagues.	4-category frequency scale, ranging from never (= 1) to always (= 4)
Digital health literacy	"Please indicate the extent to which each statement applies to you personally:" 1. I know how to find helpful health resources on the Internet. 2. I know how to use the Internet to answer my health questions. 3. I know what health resources are available on the Internet.	5-point scale from strongly disagree = 1 to strongly agree = 5

	4. I know where to find helpful health resources on the Internet. 5. I know how to use the health information I find on the Internet to help me. 6. I have the skills to evaluate the health resources I find on the Internet. 7. I can tell high quality from low-quality health resources on the Internet. 8. I feel confident in using information from the Internet to make health decisions.	
Health empowerment	"How much do you agree with the following statements?" 1. I will use the necessary means and goods to manage health effectively. 2. I can understand my disease better than anyone. 3. I can motivate myself to manage my health and make a better life. 4. I can make every possible effort to achieve health goals. 5. I am enthusiastic about my efforts to manage my health. 6. I know where I can ask for help to manage my disease. 7. I can manage my disease conditions. 8. I can make a realistic health plan.	5-point scale from strongly disagree = 1 to strongly agree = 5
Self-rate general health	"In general, how would you say your health?"	5-point scale from very bad = 1 to very good = 5.
Psychological distress	"Over the past 2 weeks, how often have you been bothered by any of the following problems?" 1. Little interest or pleasure in doing things. 2. Feeling down, depressed, or hopeless. 3. Feeling nervous, anxious or on edge. 4. Not being able to stop or control worrying.	Averaged scores of 4 items. 4-point scales from not at all = 1 to nearly every day = 4.

3.3 Statistical analysis

Utilizing SPSS version 28, statistical tests were performed. The report covered descriptive analysis first. The internal consistency and reliability of all scales, including the three measures for HISB discovered by evaluating digital health information and empowerment, were then confirmed using Cronbach's alpha coefficient. Finally, T-tests were run to compare health empowerment, digital health literacy, and HISB from various sources between Generation Z and older generations.

The relationship between HISB and digital health literacy was investigated using multiple linear regression with e-health literacy as the dependent variable. Through multiple linear regression with health empowerment as the dependent variable, the relationship between HISB and health empowerment was also investigated. Sociodemographic data and medical problems were included as covariates in regression models to account for confounding effects. Health empowerment was also considered as a controlled variable while e-health literacy was being tested, and vice versa. A 95% confidence level was used to establish statistical significance.

4. Results

A total of 1,862 valid responses were analyzed, with an average age of 32 years and a standard deviation (SD) of 13.578. Participants were divided into two age-based groups: Generation Z (aged 18-26, n = 995) and older generations (over 26 years, n = 867). Among the respondents, 64.3% (n = 1,197) were female and 35.7% (n = 665) were male. The majority of participants held a bachelor's degree or higher (68.4%, n = 1,250), and 21.8% (n = 396) earned less than 1,500 Chinese yuan per month.

Interpersonal channels (M = 2.68, SD = .673) were the most frequently utilized for seeking health information, followed by the internet (M = 2.67, SD = .601) and traditional media (M = 2.18, SD = .728). Participants also indicated high levels of digital literacy (M = 3.48, SD = .692) and health empowerment (M = 3.77, SD = .579). Our participants had a higher level of education and a greater proportion of females compared to the national census data from 2020. Specifically, while the census reported that only about 15.47% of Chinese people have a degree in junior college or above, our sample was more educated. Additionally, while females accounted for 48.76% of the national population, they were overrepresented in our sample.

4.1 Health information-seeking behavior

The older group was more likely to use traditional media (t = 10.541, P < .001) and interpersonal channels (t = 5.569, P < .001). However, compared to earlier generations, Generation Z was more likely to find health-related information online (t = -2.022, P = .043). Specifically, Generation Z was more likely to use websites or search engines (t = -2.933, P = .003) and social media (t = -3.009, P = .003) to discover health information. Table 2 compares different health information sources used by Generation Z and the older population, addressing RQ1 regarding HISB.

Table 2. Comparing health information seeking behavior: T-test analysis of Chinese generation Z vs. earlier generations.

Variables	Generation Z (n=995)		Older generation (n=867)		t (1860)	P
	Mean	SD	Mean	SD		
Health information seeking						
[a] Interpersonal sources***	2.63	.605	2.79	.586	5.569	<.001
[b] Traditional media***	2.02	.694	2.37	.723	10.541	<.001
[c] The Internet*	2.71	.664	2.65	.682	-2.022	.043

[a]: The average score for seeking health information from a doctor or health specialist, family member, and friend or colleague.
[b]: The average score for seeking health information from TV, radio, magazine or newspaper.
[c]: The average score for seeking health information from websites or search engines, health-related or news applications and social media (WeChat/Weibo/QQ/Blogs or forums).
*** P<0.001
*P<0.05

4.2 Digital health literacy and HISB

The *t*-test findings for digital health literacy among seniors and members of Generation Z are shown that there was no significant difference in the two groups' levels of eHealth literacy, despite a prior finding that Generation Z used the Internet more frequently than earlier

generations (t = -1.449, P = .148). Two groups reported they had comparable levels of digital health literacy in answer to the RQ2.

Digital health literacy and HISB via the Internet were favorably correlated in two age groups (Generation Z: β =.192, P < .001; Older population: β =.337, P < .001). An analysis of Generation Z's use of interpersonal networks significantly correlated their digital literacy (β =.096, P = .008). When exploring the factors that influence digital health literacy, we found a significant association between the use of the internet as a source of health information and an increased level of digital literacy, which was not surprising. Furthermore, interpersonal sources of information also demonstrated a positive correlation with digital literacy among Generation Z (β =.098, P = .008). Table 3 displays the outcomes of multiple linear models for eHealth literacy in relation to HISB.

Table 3. Multiple linear regression for eHealth literacy of the health information seeking behavior through communication channels.

Variables	Generation Z (n=995) Model 1a			Older generation (n=867) Model 1b		
	[1]Estimate	95% CI	P	[1]Estimate	95% CI	P
Age	-.035***	[-.055, -.015]	<.001	-.004	[-.008, .000]	.081
Gender	.022	[-.059, .102]	.597	.076	[-.009, .160]	.079
Education	.029	[-.014, .073]	.190	.010	[-.029, .050]	.603
Monthly income	.015	[-.005, .035]	.148	.017	[-.006, .040]	.154
Occupation	.101	[-.007, .209]	.068	.063	[-.048, .173]	.265
Chronic disease	-.022	[-.123, .079]	.668	-.034	[-.127, .059]	.473
Self-rate general health	-.034	[-.082, .014]	.160	-.003	[-.054, .061]	.907
Psychological distress	.094**	[.035, .154]	.002	.075*	[.004, .146]	.039
Health empowerment	.526***	[.460, .593]	<.001	.438***	[.352, .523]	<.001
Health information seeking						
The Internet	**.192***	[.127, .256]	<.001	**.337***	[.267, .406]	<.001
Traditional media	.011	[-.047, .070]	.702	.034	[-.031, .099]	.305
Interpersonal sources	**.096**	[.026, .167]	.008	.025	[-.050, .100]	.510
R^2	.323			.304		

[1]The reported coefficients in the table below are unstandardized.

*** P<0.001
**P<0.01
*P<0.05

4.3 Health Empowerment and HISB

The older group had considerably more empowerment regarding their health ($t = 5.194$, $P < .001$). The statistical analysis shows a strong association between age and health empowerment, with the older group reporting higher levels of control over their healthcare and greater confidence in managing their health. Therefore, the findings addressed RQ3, indicating that Generation Z may have less control over how they manage their health. However, the only significant correlation with health empowerment in both generations was found to be seeking health information from interpersonal sources (Generation Z: $\beta = .107$, $P < .001$; Older generation: $\beta = .066$, $P < .021$). Physicians, family members, and friends or coworkers were individually incorporated into the regression models to enhance comprehension. The most effective interpersonal avenue for correlating with increased health empowerment was found to be consulting doctors and health specialists (Generation Z: $\beta = .070$, $P < .002$; Older generation: $\beta = .089$, $P < .001$).

5. Discussion

5.1 Primary results and discussion

This study addresses the cross-generation differences regarding the use of different sources to seek health-related information, digital health literacy and health empowerment. Additionally, we examined the connections between health information seeking from various information sources with digital health literacy and health empowerment by contrasting how Chinese Generation Z and older populations searched for health information. The discussion that follows is highlighted.

The finding of distinct choices of health information sources across two age groups suggests that health professionals and policymakers should consider the preferences of different generations when delivering health information. When using various sources for health information, younger generations behave differently. The younger generation tends to seek out less health information than the older generation. Still, they do so more frequently online, using search engines and social media sites to discover health advice. Heavy use of the Internet among generation- Z members implies that using digital media instead of conventional media in youth-focused health campaigns can help reach a larger young audience. It is discovered that online sources have surpassed doctor visits and conventional media sources as the primary health and wellness knowledge source for Generation Z, consistent with earlier research (e.g., Fergie et al. 2016; Jones et al. 2013).

Digital health literacy is directly linked to internet-based information seeking. Acquiring information from doctors and health specialists also correlates with higher levels of Generation Z's digital literacy. This phenomenon may be attributed to the popularity of telemedicine among young people in China. For example, Ping An Good Doctor, a healthcare platform, has boasted over 12,000 service providers and nearly 23 million daily active users (Thomala 2023). The platform provides online appointment scheduling and real-time medical consultations for the Chinese population. Our survey questionnaire, however, did not differentiate between obtaining information from healthcare professionals in person or online. Consequently, telemedicine usage might be interpreted as seeking information from interpersonal channels rather than the internet. Regardless, the positive association with interpersonal channels suggests that disseminating health information through interpersonal channels could potentially address Generation Z's digital literacy shortcomings and contribute to bridge the digital divide in the new generation.

There is no direct connection between Generation Z's health empowerment and their use of media, including traditional and Internet sources. This insignificant results on media remained among the older generations. We discovered that the only source of health information that is associated with empowerment is from doctors or healthcare experts. This finding suggests that simply seeking health information online or through family members or friends may not empower individuals to take control of their health. Instead, the advice and guidance from physicians are necessary for individuals to feel empowered truly. There are numerous reasons that might apply. It makes sense to assume that people who can manage their own health have the propensity to interact with medical professionals and seek their advice, actively fulfilling the theoretical correlation. Another explanation is that patients who receive health information from doctors more frequently are informed by the information given by the experts, which fosters their interest or perception of control over their health.

5.2 Limitations

The current research has several limitations. One of the main drawbacks is the use of a Chinese random cross-sectional online poll during the COVID-19 pandemic outbreak

lockdown, which may have excluded those who do not have access to or are not comfortable using digital technologies, thus potentially limiting the representation of the complete Chinese population. This sampling technique is particularly disadvantageous to older or rural populations, which may affect the accuracy of the findings. Moreover, an initial cross-sectional study may not establish a clear cause-and-effect relationship, and unobserved confounding factors may have influenced the results. Although we managed to control a series of social-demographics and health conditions of participants, some potential covariates were missing in regression models (e.g., internet proficiency). To improve the study's validity, future research is suggested to use a multistage stratified sampling method consistent with earlier waves of the HINTS-China project in 2012 and 2017, which involved preparing respondents to conduct door-to-door interviews. Furthermore, experimental or long-term survey techniques are encouraged to provide a better understanding of the causal relationships between variables.

5.3 Implications for global communication in China

The new generations in China are increasingly turning to the internet to meet their information needs. As the internet provides a versatile platform for browsing and sharing information globally, it highlights the growing importance of international communication in China. Indeed, many Chinese individuals utilize Western social media platforms like YouTube to share their lives and perspectives on various topics of interest. For example, Liziqi, a prominent Chinese influencer, has over 170 million followers on YouTube. Her videos, showcasing traditional Chinese culture, cooking, and rural life, have attracted millions of viewers worldwide. This serves as a prime example of Chinese citizens leveraging foreign media platforms to promote and preserve their daily life.

It is also vital to determine how information obtained from international media can empower the new generation in managing their health and making informed health decisions. Understanding the ways in which overseas media influences health-related behaviors, attitudes, and beliefs in China's new generations can provide valuable insights for developing effective health interventions tailored to the needs and preferences of younger generations. Furthermore, it is important to identify potential harms that might arise from the use of foreign media, ensuring a comprehensive approach to educating and promoting younger people's health.

6. Conclusion

Our research revealed that while older adults use the internet significantly less than Generation Z, they engage in more social interaction, utilize traditional media, and exhibit greater health empowerment. Although more online health information utilization is favorably correlated with increased digital health literacy, it is important to note that only health information from healthcare professionals promotes better health empowerment. This cross-generational analysis has demonstrated the importance of empowering Generation Z with the necessary skills and knowledge to access, evaluate, and use health information online. By comparing the digital health literacy levels of this generation to those of older individuals, we have identified potential health disparities that may arise if younger generations lack these critical skills.

As digital technology continues to advance, it is essential that we prepare the next generation with the skills and knowledge necessary to navigate the digital world and make informed decisions about their health. The results of this study contribute to the growing body of knowledge on health information-seeking behaviors, digital health literacy, and health empowerment across different age groups. Additionally, it provides recommendations for healthcare providers and policymakers to improve health literacy and empowerment for both Generation Z and older adults.

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