Socioeconomic Disparities in eHealth Literacy and Preventive Behaviors during the COVID-19 Pandemic in Hong Kong: Cross-Sectional Study

Ziqiu Guo, Shengzhi Zhao, Ningyuan Guo, Yongda Wu, Xue Weng, Janet Yuen-Ha Wong, Tai Hing Lam, Man Ping Wang

Submitted to: Journal of Medical Internet Research
on: September 25, 2020

Table of Contents

Socioeconomic Disparities in eHealth Literacy and Preventive Behaviors during the COVID-19 Pandemic in Hong Kong: Cross-Sectional Study

Ziqiu Guo[1] MMed; Shengzhi Zhao[1] MPH; Ningyuan Guo[1] BSc; Yongda Wu[1] PhD; Xue Weng[1] PhD; Janet Yuen-Ha Wong[1] PhD; Tai Hing Lam[2] MD; Man Ping Wang[1] PhD

[1]School of Nursing University of Hong Kong Hong Kong HK
[2]School of Public Health University of Hong Kong Hong Kong HK

Corresponding Author:
Man Ping Wang PhD
School of Nursing
University of Hong Kong
21 Sassoon Road
Hong Kong
HK

Abstract

Background: Electronic health (eHealth) literacy would facilitate online information seeking and taking informed measures.

Objective: We studied socioeconomic disparities in eHealth literacy and online COVID-19 information seeking, and their associations with COVID-19 preventive behaviors.

Methods: The COVID-19 Health Information Survey (CoVHIns), using landline (n=500) and online surveys (n=1001), was conducted in adults in Hong Kong in April 2020. Chinese eHealth literacy scale (eHEALS, range 8¬–40) was used to measure eHealth literacy. COVID-19 preventive behaviors included wearing surgical masks, wearing fabric masks, washing hands, social distancing, and adding water/bleach to the household drainage system. Adjusted beta-coefficients and the slope indices of inequality (SII) for eHEALS score by socioeconomic status, adjusted odds ratios (aOR) for online COVID-19 information seeking by socioeconomic status, and aORs for high adherence to preventive behaviors by eHEALS score and online COVID-19 information seeking were calculated.

Results: The mean score of eHEALS was 26.10 (standard deviation, 7.70). Age was inversely, but education and personal income were positively associated with eHEALS score and online COVID-19 information seeking (all P for trend <0.05). Participants who sought online COVID-19 information showed high adherence to wearing surgical mask (aOR 1.56 95% CI [1.15-2.13]), washing hand (aOR 1.33 [1.05-1.71]), social distancing (aOR 1.48 [1.14-1.93]), and adding water/bleach to household drainage system (aOR 1.67 [1.28-2.18]). Those with the highest eHEALS score was associated with high adherence to wearing surgical mask (aOR 3.84 [1.63-9.05]), washing hand (aOR 4.14 [2.46-6.96]), social distancing (aOR 2.25 [1.39-3.65]), and adding water/bleach to the household drainage system (aOR 1.94 [1.19-3.16]), compared those with the lowest eHEALS score.

Conclusions: Chinese adults with higher socioeconomic status had higher eHealth literacy and online COVID-19 information seeking; both were associated with high adherence to the guideline on preventive behaviors during the COVID-19 pandemic.

(JMIR Preprints 25/09/2020:24577)
DOI: https://doi.org/10.2196/preprints.24577

Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?
Please make my preprint PDF available to anyone at any time (recommended).
Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.
✓ **No, I do not wish to publish my submitted manuscript as a preprint.**
2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**
Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v
Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <a href="http

Original Manuscript

Socioeconomic Disparities in eHealth Literacy and Preventive Behaviors during the COVID-19 Pandemic in Hong Kong: Cross-Sectional Study

Ziqiu Guo[1], MMed; Shengzhi Zhao[1], MPH; Ningyuan Guo[1], BSc; Yongda Wu[1], PhD; Xue Weng[1], PhD; Janet Yuen Ha Wong[1],PhD; Tai Hing Lam[2],PhD; Man Ping Wang[1]*, PhD

[1] School of Nursing, University of Hong Kong, Hong Kong, China.
[2] School of Public Health, University of Hong Kong, Hong Kong, China.

* Corresponding Author: Man Ping Wang; School of Nursing, The University of Hong Kong, 21 Sassoon Road, Hong Kong, China; Phone: +852 3917 6636; Fax: +852 2872 6079; Email: mpwang@hku.hk

Abstract

Background: Electronic health (eHealth) literacy would facilitate online information seeking and taking informed measures.
Objective: We studied socioeconomic disparities in eHealth literacy and online COVID-19 information seeking, and their associations with COVID-19 preventive behaviors.
Methods: The COVID-19 Health Information Survey (CoVHIns), using landline (n=500) and online surveys (n=1001), was conducted in adults in Hong Kong in April 2020. Chinese eHealth literacy scale (eHEALS, range 8–40) was used to measure eHealth literacy. COVID-19 preventive behaviors included wearing surgical masks, wearing fabric masks, washing hands, social distancing, and adding water/bleach to the household drainage system. Adjusted beta-coefficients and the slope indices of inequality (SII) for eHEALS score by socioeconomic status, adjusted odds ratios (aOR) for online COVID-19 information seeking by socioeconomic status, and aORs for high adherence to preventive behaviors by eHEALS score and online COVID-19 information seeking were calculated.
Results: The mean score of eHEALS was 26.10 (standard deviation, 7.70). Age was inversely, but education and personal income were positively associated with eHEALS score and online COVID-19 information seeking (all P for trend <0.05). Participants who sought online COVID-19 information showed high adherence to wearing surgical mask (aOR 1.56 95% CI [1.15-2.13]), washing hand (aOR 1.33 [1.05-1.71]), social distancing (aOR 1.48 [1.14-1.93]), and adding water/bleach to household drainage system (aOR 1.67 [1.28-2.18]). Those with the highest eHEALS score was associated with high adherence to wearing surgical mask (aOR 3.84 [1.63-9.05]), washing hand (aOR 4.14 [2.46-6.96]), social distancing (aOR 2.25 [1.39-3.65]), and adding water/bleach to the household drainage system (aOR 1.94 [1.19-3.16]), compared those with the lowest eHEALS score.
Conclusions: Chinese adults with higher socioeconomic status had higher eHealth literacy and online COVID-19 information seeking; both were associated with high adherence to the guideline on preventive behaviors during the COVID-19 pandemic.
Keywords: COVID-19; eHealth literacy; socioeconomic disparities; preventive behaviors; online information seeking

(291/450 word limits)

Introduction

Curbing the spread of COVID-19 depends on the public's timely adoption of appropriate preventive behaviors. Online health information is important in affecting preventive behaviors, particularly when physical distancing and stay-at-home during the pandemic have reduced face-to-face health communication [1]. A recent study showed seeking COVID-19 information from social networking apps and online news media was associated with preventive behaviors [2]. A tsunami of information and misinformation was disseminated online, and rapidly flowed and evolved via social media [3]. Exposure to online misinformation, or conspiracy beliefs about COVID-19 was associated with less adherence to prevention guidelines and worse physical and mental health outcomes [4,5]. The ability to seek, understand, and appraise online health information, and ultimately take well-informed actions to handle health problems can be assessed by electronic health (eHealth) literacy [6]. Higher eHealth literacy was associated with more active information searching and scrutiny [7,8]. Lack of access or capacity to understand online health information, in contrast, was associated with negligence on the health warnings and difficulty in making health decisions [9].

Appropriate processing and utilizing health information is complicated during the COVID-19 pandemic given the novel outbreak patterns and evolving information of the diseases [10]. Identifying the characteristics of groups at risk of lower eHealth literacy was important to inform effective health promotion, such as providing limited literacy resources [11]. Previous studies suggested that eHealth literacy was affected by sociodemographic, environmental, and contextual factors [12]. Disparities in eHealth literacy by education and income were observed in previous studies [13], but incongruent correlations between socioeconomic status and eHealth literacy were found across different population characteristics [8,14,15]. The COVID-19 pandemic disproportionately affected the lower socioeconomic status (SES) group who had a lack of access to health care, overcrowded living conditions with higher risks of disease transmission, and occupations not allowing work from home [16], which made existing socioeconomic inequalities sharper. Given eHealth literacy skill is not static and evolves as new social contexts changes [6], little is known about the disparities in eHealth literacy in the unique context of widening socioeconomic inequalities and overwhelming flux of COVID-19 related information (misinformation) were disseminated.

Hong Kong, the most developed and westernized city of China, has a larger income gap (Gini index 0.539 in 2016) compared with other developed countries [17], but internet use is prevalent across SES because of the advanced cyber-infrastructure and low cost of access to the Internet [18]. Nearly all people have experienced online health information searching during the COVID-19 pandemic [19]. Our previous study in 2009-2012 found disparities in SES affected online health information seeking behavior [20]. Considering the COVID-19 context may motive universal online information seeking behavior by triggering affective responses such as fear and anxiety [21], whether SES disparities in online health information seeking existed amidst the COVID-19 pandemic was unknown. The study's research questions were (1) are there socioeconomic disparities in online COVID-19 information seeking during the pandemic (2) are there socioeconomic disparities in eHealth literacy in those online information seekers (3) whether online information seeking and eHealth

literacy have associations with preventive behaviors during the COVID-19 pandemic. In a random sample of adults in Hong Kong, we examined socioeconomic disparities in online COVID-19 information seeking and eHealth literacy, and their associations with personal preventive behaviors during the COVID-19 pandemic.

Methods

Design and participants

The present study was part of the COVID-19 Health Information Survey (CoVHIns), which was a cross-sectional survey on Hong Kong adults aged 18 or above, investigating COVID-19 related information use, preventive behaviors, and wellbeing. The survey was conducted from April 9 to 23 after the peak of the second-wave outbreak, and social distancing measures were implemented. Data were collected using landline telephone and online surveys. All interviews were conducted by trained interviewers of Social Policy Research Limited using a Web-based Computer Assisted Telephone Interview (Web-CATI) system.

The details of CoVHIns have been reported elsewhere [22,23]. Briefly, a two-stage sampling method was adopted in the landline telephone survey. First, landline telephone numbers were retrieved from the residential telephone directories and randomly listed for interview. Invalid numbers, non-response (called for a maximum of 5 times), and ineligible households (aged <18 years or unable to communicate in Cantonese or Mandarin) were excluded. Second, once one household was successfully contacted, the eligible family member whose birthday was the closest to the interview date was invited to complete the interview. Each interview took about 20 minutes. A total of 816 landline telephone numbers were successfully sampled, with 500 participants consented and completed the interview (response rate 61.3%).

In addition, online survey randomly sampled participants from a representative panel of over 100,000 mobile phone users which was generated by sending text messages to a random list of mobile phone numbers provided by the Numbering Plan for Telecommunication Services (prefixes 5, 6, 9). Stratified random sampling by sex and age was adopted. Text messages with invitation were sent to the randomly selected members in the panel. Of 1623 eligible people reached, 1001 participants consented and completed the questionnaire online (response rate 61.7%). Ethics approval was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW-20-238).

Measurements

Online COVID-19 information seeking was self-reported (sought/no-sought). eHealth literacy was assessed in those who had sought online COVID-19 information given eHealth literacy is based on the experience of access to online information [24]. We used the Chinese version of the eHealth literacy scale (eHEALS) to measure eHealth literacy levels by asking participants' past last experience using the Internet for COVID-19 related information (Multimedia Appendix 1). The eHEALS contains 8 items on a 5-point Likert scale with options ranging from "strongly disagree" to "strongly agree." The total scores range from 8 to 40, with a higher score indicating higher eHealth literacy [25]. Cronbach's alpha coefficient was 0.95 in our study.

Consistent with the Chinese version of eHEALS [25], we found a unidimensional structure of the Chinese eHEALS with adequate model fitness (comparative fit index 0.974 [>0.95, acceptable], root mean square error of approximation 0.097 [close to 0.06, acceptable], and Tucker-Lewis index 0.964 [>0.95 acceptable]) [26]. We divided the eHEALS score into 4 categories (Q1-Q4) based on the quartile values (median 28, IQR 22-32) in accordance with previous studies using the median as the cutoff [7,27]. Specifically, Q1 was the interval of the overall eHEALS score range from the lowest value (8) to the value of 22, Q2 was the interval of the overall eHEALS score range from 22 to 28, Q3 was the interval of the overall eHEALS score range from 28 to 32, and Q4 was the interval of the overall eHEALS score range from 32 to the highest value (40).

Base on World Health Organization (WHO) guidance for prevention of the COVID-19 [28], we assessed the personal past 7 days preventive behaviors including: “wearing surgical masks when going out,” “wearing fabric masks when going out,” “washing hands with alcohol-based sanitizer,” “ adding water/bleach to the household drainage system,” “ keeping a social distance from people in public areas (e.g., 1.5 meters),” with responses of “never,” “occasionally,” “sometimes,” and “often.” (Multimedia Appendix 2) Adherence to personal preventive behavior was dichotomized (low adherence /high adherence) based on previous studies on the association between eHealth literacy and health behaviors [14,24]. Responses of “never,” “occasionally,” and “sometimes” were combined as low adherence and “often” was defined as high adherence.

Educational attainment and income were used as indicators of SES. Educational attainment was measured as categorical variables (“primary or below,” “secondary,” “tertiary or above”) by the highest education level attained. We measured monthly personal income by 6 pre-defined categories (from “≤HK$10000” to “≥HK$50001”). Since few participants had an income of “HK$40001-HK$50000” and “≥HK$50001”, the data were recoded into 4 categories: “≤ HK$10000,” “HK$10001-HK$20000,” “HK$20001-HK$30000,” and “>HK$30000” (US$1=HK$7.8) to obtain robust outcomes in the regression analyses.

Other demographic data included sex, age, and marital status (never been married, married/cohabitating, and divorced/separated/ widowed). Employment status was categorized as economically active (full-time work, part-time work) and economically inactive (student, homemaker, unemployed, and retiree) [29]. Having any chronic diseases was self-reported (any/none).

Statistical analysis

All data were weighted by sex, age, and educational attainment according to the 2016 population by-census to improve the representativeness of the sample.
First, disparities of online COVID-19 information seeking (dichotomized variable) by SES were assessed by multivariable logistic regression, which yielded adjusted odds ratios (aOR) of online COVID-19 information seeking. Second, socioeconomic disparities in eHealth literacy, being a continuous variable, were assessed by linear regression, which yielded unstandardized regression coefficients to reflect the eHEALS score change for a unit change in the independent variable. Third, to estimate the absolute difference in the eHEALS score between the most-advantaged

and most-disadvantaged, slope index of inequality (SII) was used. SII has been recommended by the World Health Organization and increasing SII indicates a severe inequality [30]. Income categories were first ranked from the lowest to highest and assigned the cumulative proportion of participants to each category by using the midpoint of range as the code for each category. eHEALS score was then regressed against the cumulative proportion of each income categories [30]. A similar analysis was computed for education-related SII. As each personal preventive behavior was dichotomized as low and high adherence, the associations (aOR and 95% confidence intervals [CI]) of online COVID-19 information seeking and eHEALS score with each personal preventive behavior were estimated by multivariable logistic regression adjusted for demographic variables, SES, and chronic disease. All analyses were performed by Stata 15.1 (Stata Crop LP, College Station, TX, USA).

Results

Table 1 shows the weighted sample (N=1501) included 52.6% of females, and 27.7% aged 60 years or older. About two thirds (66.1%) were married or cohabitating, and 62.9% were economically active. Most participants had attained secondary or tertiary above education. 37.5% of participants' monthly personal income was less than HK$10000, and 67.8% of participants self-reported had ever sought COVID-19 information on the Internet. The mean eHEALS score was 26.10 (standard deviation, 7.70).

Table 2 shows age was inversely associated with online COVID-19 information seeking (P for trend <0.001). Education (secondary education: aOR 1.55 [95% CI 1.10-2.18], tertiary or above education: aOR 2.98 [1.84-4.81]; P for trend <0.001), income (P for trend 0.025), without chronic diseases (aOR 1.56 [1.11-2.21]) were associated with online COVID-19 information seeking.

Table 3 shows age was inversely associated with eHEALS score (P for trend <0.001). Education (secondary education: adjusted β 3.58 [95% CI 1.98-5.18], tertiary or above education: adjusted β 6.22 [4.39-8.06]; P for trend <0.001), income (P for trend <0.001) was associated with eHEALS score. The estimated difference in eHEALS score between those at the highest and the lowest socioeconomic status by education was higher than that by income (SII 13.27 vs. 7.30). Sex, marital status, employment, and chronic diseases were not associated with the eHEALS score after adjusting for age and SES.

Table 4 shows participants who had sought online COVID-19 information showed higher adherence to wearing surgical masks (aOR 1.56 [1.15-2.13]), washing hand with alcohol-based sanitizers (aOR 1.33 [1.05-1.71]), adding water/bleach to household drainage system (aOR 1.67 [1.28-2.18]), and social distancing (aOR 1.48 [1.14-1.93]) compared with those who had not sought. Online COVID-19 information seeking was not associated with adherence to wearing fabric mask. In online COVID-19 information seekers, eHEALS score was associated with adherence to wearing surgical masks (Q2: aOR 1.44 [0.91, 2.30], Q3: aOR 2.05 [1.26-3.35], Q4: aOR 3.84 [1.63-9.05]; P for trend <0.001; overall score: aOR 1.04 [1.01, 1.07]). For adherence to washing hand with alcohol-based sanitizers, aOR (95% CI) was 1.77 (1.25-2.53) for Q2, 2.16 (1.52-3.09) for Q3, 4.14 (2.46-6.96) for Q4 (P for trend<0.001), and 1.06 (1.04, 1.08) for overall score. Similarly, eHEALS score was associated with

adherence to adding water/bleach to household drainage system (Q2: aOR 1.47 [1.02-2.15], Q3: aOR 1.89 [1.30-2.75], Q4: aOR 1.94 [1.19-3.16]; P for trend=0.001; overall score: aOR 1.04 [1.02, 1.06]), and social distancing (Q2: aOR 1.68 [1.16-2.44], Q3: aOR 1.58 [1.09-2.30], Q4: aOR 2.25 [1.39-3.65]; P for trend=0.002; overall score: aOR 1.03 [1.01, 1.05]). We observed no association between eHEALS score and wearing fabric masks (aORs in table 4 were adjusted for demographic variables, SES, and chronic disease).

Discussion

We have first shown socioeconomic disparities in online COVID-19 information seeking and eHealth literacy during the COVID-19 pandemic and both were in association with high adherence to COVID-19 related preventive behaviors, including wearing surgical masks, washing hands, adding water/bleach to the household drainage system, and social distancing.

Online COVID-19 information seeking was observed in younger participants in our study, which was in line with previous studies on online health information seeking behaviors [31]. A recent study also indicated that younger family members sought information online for the elderly during the pandemic [32]. Such age disparity in information seeking can be attributable to the higher penetration rate of internet devices such as personal computers and smartphone in younger than older group [18]. Small font sizes, crowded visual presentations, and distracting flashing on most online information sources could be barriers to online information seeking for the elderly [33]. More frequent health information seeking from traditional media such as radio and newspaper were observed for the elderly in our previous population-based study [20]. Our results that higher SES including educational attainment and income was associated with online COVID-19 information seeking were consistent with previous studies on online health information seeking conducted pre-COVID-19 [13,31]. Compared with our previous study conducted in 2009-2012 on measured SES disparities in online health information seeking, the ORs of online information seeking were found to decrease (e.g., tertiary or above education: 2.98 in 2020 vs. 8.00 in 2009–2012) [20]. Such a decrease in effect size could be due to the more popularity of internet devices in the general population in Hong Kong [34]. Alternatively, the decreased ORs could be attributable to increased information seeking behaviors in crisis events, which were suggested to be a way to reduce situation uncertainty and risk control [35].

We have further found age and SES disparities in eHealth literacy level, disclosing the disparities in online information locating, understanding, and utilize ability among those online COVID-19 information seekers. The relations between sociodemographic characteristics (age, SES) and eHealth literacy observed in our study were similar to previous findings on health literacy [36,37]. Our study focused on eHealth literacy because the Internet was the major platform for disseminating health information during the COVID-19 pandemic for its highly available and can instantly update information like preventive behaviors, access to social and health services. Considering the information on the Internet is complex and the misinformation on the Internet led to inappropriate behaviors [38], those used the internet for health but with limited eHealth literacy skills to discern the quality of different information were the potential risky population and worth more attention.

Stronger associations with eHealth literacy were observed for education than income in our study, probably reflects the notion that knowledge and skills are more affected by cognitive function than materials. The education-related disparity in eHealth literacy was larger than the income-related disparity in our study, which probably shown education plays a more crucial role in affecting eHealth literacy than income. Other studies also suggested that eHealth literacy disparities were due to knowledge gaps rather than merely physical barriers to the Internet [39]. We also noticed eHealth literacy and online COVID-19 information seeking have similar risk factors including older age and lower SES [13]. eHealth literacy enables online information seeking [8]; further studies can explore the extent to which low eHealth literacy hinders online information seeking in those with old age and low SES.

Successful control of the COVID-19 pandemic would need universal adherence to preventive behaviors that have been proved very effective in reducing the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [40]. Online COVID-19 information seeking was associated with adherence to preventive behaviors, suggesting the necessity of understanding the low SES group's barriers including low eHealth literacy to Internet use for health. Our participants with higher eHealth literacy showed high adherence to personal preventive behaviors, which was consistent with previous non-COVID-19 studies' findings that eHealth literacy correlated with health behaviors such as regular physical exercise and balanced diets [24,41,42]. Our study extended those findings to COVID-19 preventive behaviors in the specific COVID-19 pandemic context, in which more and more misinformation have been disseminated online. Low eHealth literacy could lead to difficulties in fact check and mistrust in coronavirus conspiracy beliefs, which would impede the performance of preventive behaviors [43]. Such eHealth literacy disparities led to disparities in performances on adherence to preventive guidelines, and its profound consequence is health inequality [44]. Online information should be better designed addressing target users' eHealth literacy level particularly for those in low SES to bridge the gap. Further research is needed to explore how to effectively improve eHealth literacy and the approach to use eHealth literacy to facilitate better health behaviors.

Our study had some limitations. First, the cross-sectional data cannot confirm causal association although it is unlikely that higher eHealth literacy or online COVID-19 information seeking would lead to higher education and income. Second, we measured perceived eHealth literacy instead of actual performance on the Internet. Some studies measured performed eHealth literacy and found a weak or moderate correlation between perceived eHealth literacy and performed eHealth literacy [15,45]. Third, eHEALS, the most commonly used validated scale, was developed at the early stage of internet technology; its fit with Web 2.0 related technologies (social media) was not clear because of the considerable changes of the Internet (more participative and interactive web) [46]. Future studies are needed to improve the model of eHealth literacy in the evolving Internet and COVID-19 pandemic [46,47]. Fourth, we did not collect data on channels of online COVID-19 information; further studies should include details of frequency and channels of online COVID-19 information seeking.

Conclusion

We provided the first evidence that Chinese adults with higher socioeconomic status had higher eHealth literacy and online COVID-19 information seeking; both were associated with high adherence to the guideline on preventive behaviors during the COVID-19 pandemic. Effective interventions are needed to enhance the low SES group's eHealth literacy skills to combat the COVID-19 pandemic.

Acknowledgements

Shengzhi Zhao, Janet Yuen Ha Wong, and Man Ping Wang conceived and designed the study. Ziqiu Guo, Yongda Wu, and Man Ping Wang did the data analysis. Ziqiu Guo, Ningyuan Guo, and Man Ping Wang drafted the manuscript. All authors interpreted the data, critical reviewed the manuscript, and provided final approval for publication submission.

We thank the Social Policy Research for conducting the survey and the participants for their responses in the study.

Conflicts of Interest

None declared

Abbreviations

eHEALS: eHealth literacy scale
SES: socioeconomic status

References

1. Zarocostas J. How to fight an infodemic. The Lancet Elsevier; 2020 Feb 29;395(10225):676. PMID:32113495
2. Liu PL. COVID-19 Information Seeking on Digital Media and Preventive Behaviors: The Mediation Role of Worry. Cyberpsychology Behav Soc Netw; 2020 Jun; [doi: 10.1089/cyber.2020.0250]
3. Xie B, He D, Mercer T, Wang Y, Wu D, Fleischmann KR, Zhang Y, Yoder LH, Stephens KK, Mackert M, Lee MK. Global health crises are also information crises: A call to action. J Assoc Inf Sci Technol 2020;71(12):1419–1423. [doi: https://doi.org/10.1002/asi.24357]
4. Tasnim S, Hossain MM, Mazumder H. Impact of Rumors and Misinformation on COVID-19 in Social Media. J Prev Med Pub Health 2020 May;53(3):171–174. PMID:32498140
5. Freeman D, Waite F, Rosebrock L, Petit A, Causier C, East A, Jenner L, Teale A-L, Carr L, Mulhall S, Bold E, Lambe S. Coronavirus conspiracy beliefs, mistrust, and compliance with government guidelines in England. Psychol Med 2020 May 21;1–13. [doi: 10.1017/S0033291720001890]
6. Norman CD, Skinner HA. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. J Med Internet Res 2006;8(2):e9. [doi: 10.2196/jmir.8.2.e9]
7. Neter E, Brainin E. eHealth Literacy: Extending the Digital Divide to the Realm of Health Information. J Med Internet Res 2012;14(1):e19. [doi: 10.2196/jmir.1619]
8. Wong DK-K, Cheung M-K. Online Health Information Seeking and eHealth Literacy Among Patients Attending a Primary Care Clinic in Hong Kong: A Cross-Sectional Survey. J Med Internet Res 2019;21(3):e10831. [doi: 10.2196/10831]
9. Pirisi A. Low health literacy prevents equal access to care. The Lancet Elsevier; 2000 Nov 25;356(9244):1828. PMID:11117924
10. Beaunoyer E, Dupéré S, Guitton MJ. COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. Comput Hum Behav 2020 Oct;111:106424. [doi: 10.1016/j.chb.2020.106424]
11. Morgan-Daniel J, Ansell M, Adkins LE. COVID-19 Patient Education and Consumer Health Information Resources and Services. J Consum Health Internet 2020 Jul 2;24(3):302–313. [doi: 10.1080/15398285.2020.1792166]
12. Levin-Zamir D, Bertschi I. Media Health Literacy, eHealth Literacy, and the Role of the Social Environment in Context. Int J Environ Res Public Health Multidisciplinary Digital Publishing Institute; 2018 Aug;15(8):1643. [doi: 10.3390/ijerph15081643]
13. Tennant B, Stellefson M, Dodd V, Chaney B, Chaney D, Paige S, Alber J. eHealth literacy and Web 2.0 health information seeking behaviors among baby boomers and older adults. J Med Internet Res 2015 Mar 17;17(3):e70. PMID:25783036
14. Mitsutake S, Shibata A, Ishii K, Oka K. Association of eHealth Literacy With Colorectal Cancer Knowledge and Screening Practice Among Internet Users in Japan. J Med Internet Res 2012;14(6):e153. [doi: 10.2196/jmir.1927]
15. van der Vaart R, van Deursen AJ, Drossaert CH, Taal E, van Dijk JA, van de Laar MA. Does the eHealth Literacy Scale (eHEALS) Measure What it Intends to Measure? Validation of a Dutch Version of the eHEALS in Two Adult Populations. J Med Internet Res 2011 Nov 9;13(4). PMID:22071338
16. Patel JA, Nielsen FBH, Badiani AA, Assi S, Unadkat VA, Patel B, Ravindrane R, Wardle H. Poverty, inequality and COVID-19: the forgotten vulnerable. Public Health 2020 Jun;183:110–111. PMID:32502699
17. Census and Statistics Department. Hong Kong 2016 Population By-census-Thematic Report – Household Income Distribution in Hong Kong. 2017. Available from: https://www.statistics.gov.hk/pub/B11200962016XXXXB0100.pdf
18. Census and Statistics Department. Thematic Household Survey Report No.69. Personal computer and Internet penetration. 2020. Available from:

https://www.statistics.gov.hk/pub/B11302692020XXXXB0100.pdf
19. Kwok KO, Li KK, Chan HHH, Yi YY, Tang A, Wei WI, Wong SYS. Community Responses during Early Phase of COVID-19 Epidemic, Hong Kong - Volume 26, Number 7—July 2020 - Emerging Infectious Diseases journal - CDC; [doi: 10.3201/eid2607.200500]
20. Wang MP, Viswanath K, Lam TH, Wang X, Chan SS. Social Determinants of Health Information Seeking among Chinese Adults in Hong Kong. PLOS ONE Public Library of Science; 2013 Aug 23;8(8):e73049. [doi: 10.1371/journal.pone.0073049]
21. Li J, Zheng H. Online InformationSeeking and Disease Prevention Intent During COVID-19 Outbreak. Journal Mass Commun Q 2020; [doi: 10.1177/1077699020961518]
22. Luk TT, Zhao S, Wong JYH, Wu YD, Ho SY, Lam TH, Wang MP. Exposure to health misinformation about COVID-19 and increased tobacco and alcohol use: a population-based survey in Hong Kong. Tobacco Control (in press). [doi: 10.1136/tobaccocontrol-2020-055960]
23. Zhao SZ, Wong JYH, Wu Y, Choi EPH, Wang MP, Lam TH. Social Distancing Compliance under COVID-19 Pandemic and Mental Health Impacts: A Population-Based Study. Int J Environ Res Public Health 2020 Sep 14;17(18):6692. [doi: 10.3390/ijerph17186692]
24. Mitsutake S, Shibata A, Ishii K, Oka K. Associations of eHealth Literacy With Health Behavior Among Adult Internet Users. J Med Internet Res 2016 Jul 18;18(7):e192. [doi: 10.2196/jmir.5413]
25. Shuai jun G, Xiao ming Y, Yu ying S, Dan N, Xue ming L, Lu W. [Adaptation and evaluation of Chinese version of eHEALS and its usage among senior high school students]. Chin J Health Educ 29(2):106–108.
26. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model Multidiscip J Routledge; 1999 Jan 1;6(1):1–55. [doi: 10.1080/10705519909540118]
27. Richtering SS, Hyun K, Neubeck L, Coorey G, Chalmers J, Usherwood T, Peiris D, Chow CK, Redfern J. eHealth Literacy: Predictors in a Population With Moderate-to-High Cardiovascular Risk. JMIR Hum Factors 2017;4(1):e4. [doi: 10.2196/humanfactors.6217]
28. World Health Organization. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected: interim guidance, 25 January 2020. [Internet]. 2020. Available from: https://apps.who.int/iris/handle/10665/330674
29. Census and Statistics Department. Hong Kong Poverty Situation Report 2018 [Internet]. 2019. Available from: https://www.statistics.gov.hk/pub/B9XX0005E2018AN18E0100.pdf
30. World Health Organization. Health Equity Assessment Toolkit (HEAT): Software for exploring and comparing health inequalities in countries. Built-in database edition. Version 2.0. 2017. Available from: https://www.who.int/gho/health_equity/heat_technical_notes.pdf
31. Din HN, McDaniels-Davidson C, Nodora J, Madanat H. Profiles of a Health Information-Seeking Population and the Current Digital Divide: Cross-Sectional Analysis of the 2015-2016 California Health Interview Survey. J Med Internet Res 2019 14;21(5):e11931. PMID:31094350
32. Zhao X, Fan J, Basnyat I, Hu B. Online Health Information Seeking Using “#COVID-19 Patient Seeking Help” on Weibo in Wuhan, China: Descriptive Study. J Med Internet Res 2020 Oct 15;22(10):e22910. [doi: 10.2196/22910]
33. Czaja SJ, Boot WR, Charness N, Rogers WA. Designing for Older Adults: Principles and Creative Human Factors Approaches, Third Edition. CRC Press; 2019. ISBN:978-1-351-68225-1
34. Census and Statistics Department. Usage of Information Technology and the Internet by Hong Kong Residents, 2000 to 2016. 2017 p. 16. Available from: https://www.censtatd.gov.hk/hkstat/sub/sp120.jsp?productCode=FA100109

35. Jones NM, Thompson RR, Schetter CD, Silver RC. Distress and rumor exposure on social media during a campus lockdown. Proc Natl Acad Sci National Academy of Sciences; 2017 Oct 31;114(44):11663–11668. PMID:29042513
36. Rikard RV, Thompson MS, McKinney J, Beauchamp A. Examining health literacy disparities in the United States: a third look at the National Assessment of Adult Literacy (NAAL). BMC Public Health 2016 Sep 13;16(1):975. [doi: 10.1186/s12889-016-3621-9]
37. Neter E, Brainin E, Baron-Epel O. The dimensionality of health literacy and eHealth literacy. Eur Health Psychol 2015;17(6):275–280.
38. Jayasinghe R, Ranasinghe S, Jayarajah U, Seneviratne S. Quality of online information for the general public on COVID-19. Patient Educ Couns 2020 Aug; [doi: 10.1016/j.pec.2020.08.001]
39. Viswanath K, Finnegan JR. The Knowledge Gap Hypothesis: Twenty-Five Years Later. Ann Int Commun Assoc 1996 Jan;19(1):187–228. [doi: 10.1080/23808985.1996.11678931]
40. Cowling BJ, Ali ST, Ng TWY, Tsang TK, Li JCM, Fong MW, Liao Q, Kwan MY, Lee SL, Chiu SS, Wu JT, Wu P, Leung GM. Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: an observational study. Lancet Public Health 2020 May 1;5(5):e279–e288. [doi: 10.1016/S2468-2667(20)30090-6]
41. Hsu W, Chiang C, Yang S. The effect of individual factors on health behaviors among college students: the mediating effects of eHealth literacy. J Med Internet Res 2014 Dec 12;16(12):e287. PMID:25499086
42. Kim S-H, Son Y-J. Relationships Between eHealth Literacy and Health Behaviors in Korean Adults: CIN Comput Inform Nurs 2017 Feb;35(2):84–90. [doi: 10.1097/CIN.0000000000000255]
43. Chong YY, Cheng HY, Chan HYL, Chien WT, Wong SYS. COVID-19 pandemic, infodemic and the role of eHealth literacy. Int J Nurs Stud 2020 Aug;108:103644. PMID:32447127
44. Sentell T, Vamos S, Okan O. Interdisciplinary Perspectives on Health Literacy Research Around the World: More Important Than Ever in a Time of COVID-19. Int J Environ Res Public Health Multidisciplinary Digital Publishing Institute; 2020 Jan;17(9):3010. [doi: 10.3390/ijerph17093010]
45. Neter E, Brainin E. Perceived and Performed eHealth Literacy: Survey and Simulated Performance Test. JMIR Hum Factors 2017 Jan 17;4(1):e2. PMID:28096068
46. Norman C. eHealth Literacy 2.0: Problems and Opportunities With an Evolving Concept. J Med Internet Res 2011;13(4):e125. [doi: 10.2196/jmir.2035]
47. Griebel L, Enwald H, Gilstad H, Pohl A-L, Moreland J, Sedlmayr M. eHealth literacy research-Quo vadis? Inform Health Soc Care 2018 Dec;43(4):427–442. PMID:29045164

Table 1. Demographic variables, socioeconomic status, chronic disease, and online COVID-19 information seeking of the sample (N=1501).

	N	Unweighted %	Weighted % [a]
Sex			
Male	672	44.8	47.5
Female	829	55.2	52.6
Age (years)			
18-39	497	33.1	33.8
40-59	509	33.9	38.5
≥60	495	33.0	27.7
Marital status			
Never been married	353	23.5	24.7
Married/cohabitating	1053	70.2	66.1
Divorced/separated/widowed	95	6.3	9.2
Education			
Primary or below	247	16.5	23.2
Secondary	864	57.6	45.4
Tertiary or above	390	26.0	31.4
Income (HK$) [b]			
≤10000	519	34.6	37.5
10001-20000	519	34.6	30.7
20001-30000	268	17.9	17.5
>30000	195	13.0	14.3
Employment			
Economically active	981	65.4	62.9
Economically inactive	520	34.6	37.1
Chronic diseases [c]			
Any	187	12.5	15.0
None	1314	87.5	85.0
Sought online COVID-19 information			
Yes	1040	69.3	67.8
No	461	30.7	32.2

[a] Weighted by sex, age, and education distributions of the 2016 population by-census.
[b] US$1 = HK$7.8
[c] Self-reported by participants if had been diagnosed with chronic diseases (e.g., hypertension, diabetes, cancer).

Table 2. Association of demographic variables, socioeconomic status, and chronic disease with online COVID-19 information seeking (N=1501).

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

[a] The proportion weighted by sex, age, and education distributions of the 2016 population by-census.

[b] Mutually adjusted for the variables in the table.

[c] US$1 = HK$7.8

[d] Self-reported by participants if had been diagnosed with chronic diseases (e.g., hypertension, diabetes, cancer).

	Sought (%) [a]	Non-sought (%) [a]	Association	
	(n=1040)	(n=461)	Unadjusted OR (95% CI)	Adjusted OR (95% CI) [b]
Sex				
Male	481 (49.6)	191 (42.9)	1	1
Female	559 (50.4)	270 (57.1)	0.82 (0.66, 1.03)	0.83 (0.65, 1.06)
Age (years)				
18-39	411 (41.4)	86 (17.8)	1	1
40-59	391 (41.4)	118 (32.4)	0.69 (0.51, 0.95)*	0.86 (0.60, 1.23)
≥60	238 (17.1)	257 (49.9)	0.19 (0.14, 0.26)***	0.40 (0.27, 0.61)***
P for trend			<0.001	<0.001
Marital status				
Never been married	290 (30.1)	63 (13.5)	1	1
Married/cohabitating	702 (64.4)	351 (69.7)	0.43 (0.32, 0.59)***	0.90 (0.62, 1.30)
Divorced/separated/ widowed	48 (5.5)	47 (16.8)	0.22 (0.14, 0.36)***	0.65 (0.37, 1.15)
Education				
Primary or below	105 (13.2)	142 (44.3)	1	1
Secondary	597 (47.1)	267 (41.8)	3.02 (2.26, 4.04)***	1.55 (1.10, 2.18)*
Tertiary or above	338 (39.8)	52 (13.9)	8.79 (5.98, 12.93)***	2.98 (1.84, 4.81)***
P for trend			<0.001	<0.001
Income (HK$) [c]				
≤10000	304 (28.7)	215 (55.9)	1	1
10001-20000	360 (32.3)	159 (27.4)	1.60 (1.24, 2.07)***	0.97 (0.69, 1.36)
20001-30000	208 (20.6)	60 (11.0)	2.45 (1.75, 3.43)***	1.06 (0.69, 1.63)
>30000	168 (18.4)	27 (5.7)	4.40 (2.83, 6.85)***	1.79 (1.04, 3.06)*
P for trend			<0.001	0.025
Employment				
Economically inactive	293 (27.5)	227 (57.4)	1	1
Economically active	747 (72.5)	234 (42.6)	2.47 (1.97, 3.10)***	1.18 (0.84, 1.65)
Chronic diseases [d]				
Any	91 (9.5)	96 (26.7)	1	1
None	949 (90.5)	365 (73.3)	2.74 (2.01, 3.74)***	1.56 (1.11, 2.21)*

Table 3. Associations of demographic variables, socioeconomic status and chronic diseases with eHEALS score [a] in online COVID-19 information seekers (N=1040).

	Mean (SD)	Unadjusted β (95% CI)	Adjusted β (95% CI) [b]	SII [c]
Sex				
Male	26.00 (7.51)	0	0	
Female	26.19 (7.86)	0.19 (-0.75, 1.13)	-0.01 (-0.83, 0.80)	
Age (years)				
18-39	28.84 (6.07)	0	0	
40-59	27.18 (6.12)	-1.67 (- 2.61, -0.72)**	-0.77 (-1.82, 0.28)	
≥60	19.60 (8.79)	-9.24 (-10.33, -8.16)***	-5.48 (-6.91, -4.05)***	
P for trend		<0.001	<0.001	
Marital status				
Never been married	28.99 (5.93)	0	0	
Married/cohabitating	25.07 (7.93)	-3.92 (-4.95, -2.90)***	-1.03 (-2.09, 0.02)	
Divorced/separated/widowed	23.65 (9.07)	-5.35 (-7.64, -3.06)***	-1.83 (-3.93, 0.27)	
Education				13.27***
Primary or below	17.56 (8.45)	0	0	
Secondary	25.40 (6.80)	7.84 (6.42, 9.26)***	3.58 (1.98, 5.18)***	
Tertiary or above	29.98 (6.34)	12.42 (10.92, 13.92)***	6.22 (4.39, 8.06)***	
P for trend		<0.001	<0.001	
Income (HK$) [d]				7.30***
≤10000	23.86 (8.27)	0	0	
10001-20000	25.38 (7.63)	1.52 (0.38, 2.65)**	-0.40 (-1.69, 0.88)	
20001-30000	27.74 (6.74)	3.88 (2.57, 5.19)***	0.62 (-0.86, 2.10)	
>30000	29.67 (6.07)	5.81 (4.41, 7.22)***	2.25 (0.63, 3.88)**	
P for trend		<0.001	<0.001	
Employment				
Economically inactive	23.40 (8.75)	0	0	
Economically active	27.16 (6.97)	3.76 (2.74, 4.78)***	0.39 (-0.89, 1.66)	
Chronic diseases				
None	26.42 (7.50)	0	0	
Any	22.71 (8.89)	-3.71 (-5.35, -2.07)***	-0.85 (-2.31, 0.60)	

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

[a] eHEALS score: eHealth literacy scale score (8-40); higher score indicating higher eHealth literacy.

[b] Mutually adjusted for the variables in the table.

[c] SII: slope index of inequality; the absolute difference in eHEALS score between the most advantaged and most-disadvantaged groups; higher score indicated higher disparity in eHEALS score.

[d] US$1 = HK$7.8

Table 4. Adherence to preventive behaviors by online COVID-19 information seeking and eHEALS score.

	Wear surgical mask [a]		Wear fabric mask [a]		Wash hand with alcohol-based sanitizers [a]		Add water/bleach to household drainage system [a]		Social distancing (e.g. 1.5 meters) [a]	
	n (%)	aOR (95% CI) [c]	n (%)	aOR (95% CI) [c]	n (%)	aOR (95% CI) [c]	n (%)	aOR (95% CI) [c]	n (%)	aOR (95% CI) [c]
Sought online COVID-19 information (n=1501)										
No	359 (77.9)	1	85 (18.4)	1	191 (41.4)	1	122 (26.5)	1	122 (26.5)	1
Yes	899 (86.4)	1.56 (1.15, 2.13)**	166 (16.0)	0.84 (0.61, 1.15)	572 (55.0)	1.33 (1.05, 1.71)*	385 (37.0)	1.67 (1.28, 2.18)***	377 (36.3)	1.48 (1.14, 1.93)**
eHEALS score categories in online COVID-19 information seekers (n=1040)										
Q1 [b]	224 (79.4)	1	38 (13.5)	1	109 (38.7)	1	83 (29.4)	1	76 (27.0)	1
Q2 [b]	244 (85.9)	1.44 (0.91, 2.30)	44 (15.5)	1.17 (0.72, 1.90)	153 (53.9)	1.77 (1.25, 2.53)**	102 (35.9)	1.47 (1.02, 2.15)*	108 (38.0)	1.68 (1.16, 2.44)**
Q3 [b]	309 (89.6)	2.05 (1.26, 3.35)**	64 (18.6)	1.39 (0.86, 2.22)	210 (60.9)	2.16 (1.52, 3.09)***	142 (41.2)	1.89 (1.30, 2.75)**	130 (37.7)	1.58 (1.09, 2.30)*
Q4 [b]	122 (94.6)	3.84 (1.63, 9.05)**	20 (15.5)	1.12 (0.59, 2.12)	100 (77.5)	4.14 (2.46, 6.96)***	58 (45.0)	1.94 (1.19, 3.16)**	63 (48.8)	2.25 (1.39, 3.65)**
P for trend		<0.001		0.39		<0.001		0.001		0.002
eHEALS score (continuous variable) in online COVID-19 information seekers (n=1040)										
Overall score		1.04 (1.01, 1.07)**		1.01 (0.99, 1.04)		1.06 (1.04, 1.08)***		1.04 (1.02, 1.06)***		1.03 (1.01, 1.05)**

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

[a] All preventive behaviors: high adherence (“often”) vs. low adherence (“never”, “occasionally”, and “sometimes”).

[b] eHEALS score was divided into 4 categories (Q1-Q4) based on the quartile values (median 28, IQR 22-32); higher score indicating higher eHealth literacy.

[c] aOR: adjusted odds ratio; adjusted for sex, age, marital status, employment, education, income, and chronic diseases.

Supplementary Files

Multimedia Appendixes

eHealth Literacy Scale.
URL: https://asset.jmir.pub/assets/c08e76b75ee0f18f8c462cab0b6735a6.pdf

Unweighted prevalence of preventive behaviors by online COVID-19 information seeking (N=1501).
URL: https://asset.jmir.pub/assets/fa209231934ef81e5d5f5c879b4c9eb8.pdf