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World Medical & Health Policy is a quarterly, peer-reviewed journal that considers the many factors shaping global health. We publish articles employing overlapping disciplines that include health policy and politics, political science, health economics, medical ethics, and public health. The journal's approach is unified by a thoroughgoing concern with critically examining the contexts within which policy is made, as well as more traditional considerations of processes, outcomes, and influences.

In converting empirical evidence into policy, ***World Medical & Health Policy*** helps policymakers design and promote programs that improve health outcomes, particularly for vulnerable populations. By bringing a global policy perspective to medical practice, the journal navigates the often-tangled world of global economic imperatives, international diplomacy, international agreements, the law, natural and humanmade disasters, humanitarian interventions, the social determinants of health, and local and international standards of care. The journal is committed to publishing practitioners' opinions and case studies alongside academic research articles.

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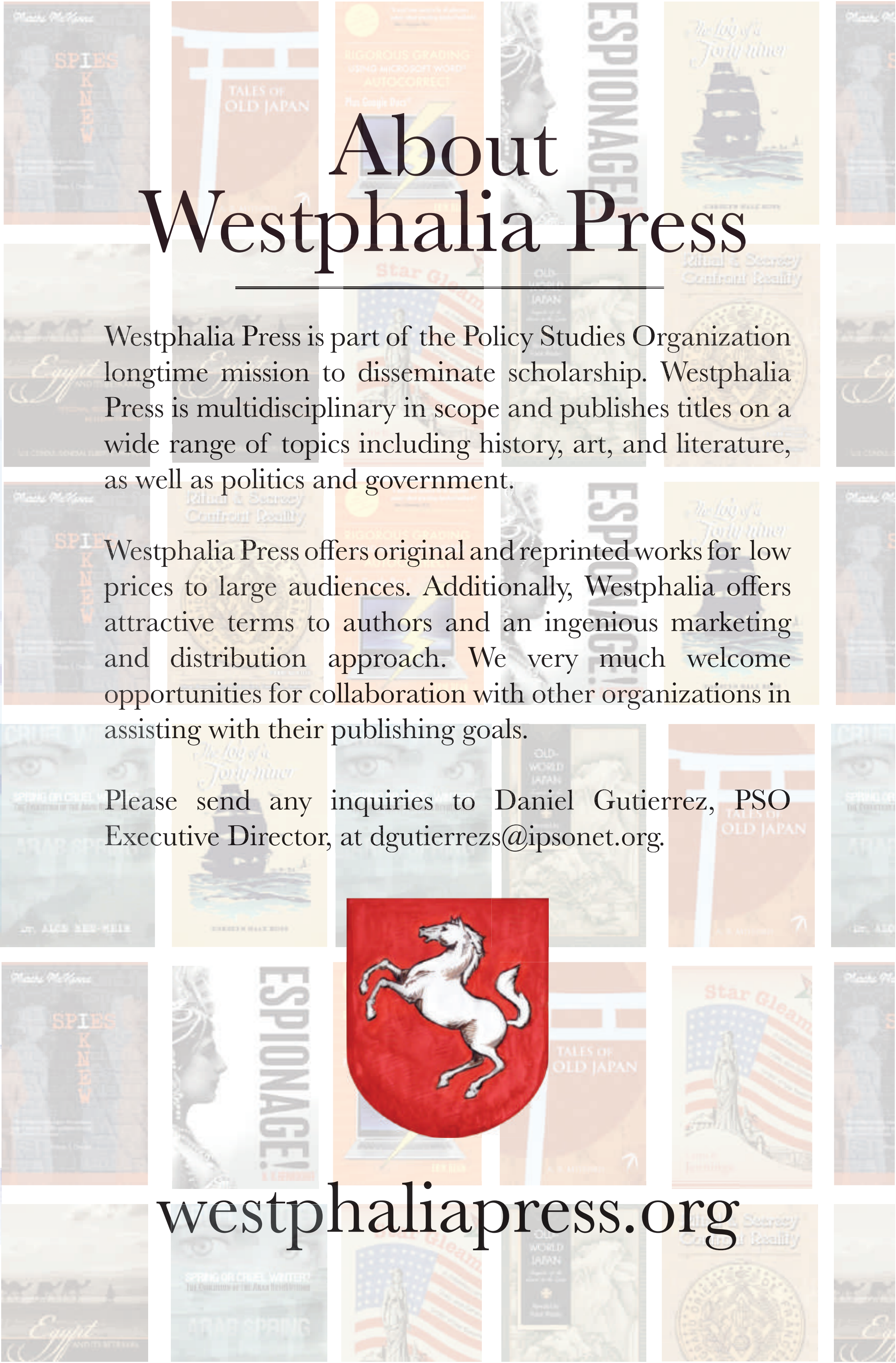

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EDITORIAL

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Addressing challenges to effectively disseminate relevant health information

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Abstract

Providing access to relevant, accurate, and timely health information is critically important for promoting public health in local, national, and global contexts, especially when confronting challenging health issues, such as a global pandemic.

KEYWORDS

global health, health communication, health information dissemination

Providing access to relevant, accurate, and timely health information is critically important for promoting public health in local, national, and global contexts, especially when confronting challenging health issues, such as a global pandemic. The coronavirus disease 2019 (COVID-19) pandemic has shown us how important it is to inform key public audiences about impending health risks and strategies for minimizing these risks. Yet, we have learned (the hard way) during the pandemic that serious information dissemination problems can hamper effective responses to major health threats both within and between many countries.

The pandemic has provided a vivid example of how communication efforts must be designed and implemented to promote cooperation and coordination among groups of people and between nations to stop the spread of contagion and to mobilize efforts to care for those who become infected. Sadly, there have been multiple communication missteps with efforts to effectively disseminate needed health information to address the pandemic. Ineffective public communication has led to dangerous societal problems such as underestimating the seriousness of the pandemic, spreading dangerous misinformation that led to confusion and errant responses to the pandemic, and failing to provide sufficient rationale to motivate widespread adoption of important prevention, and control guidelines.

Addressing large-scale health issues is often tremendously complex for health-care consumers, providers, and others involved in the modern health-care system. Relevant health information is the most valuable resource for health system participants to help them make sense of health complexities and to enable them to make good decisions about how to best address health problems. Yet, contrary to public understanding, competent health communication must involve intricate strategies to match the communication processes to meet the information needs and preferences of different groups of people who often desperately need relevant information to guide their health decisions and actions. This is why research about the dissemination of health information is important for evaluating the effectiveness of the communication strategies used and for guiding the design of new health communication policies, programs, practices, and technologies.

This special issue of *World Medical & Health Policy* reports the most relevant current research, theory, programs, technologies, commentary, and policy applications concerning the best strategies for addressing the challenges to disseminate health information effectively to different audiences around the globe. Important health information dissemination issues are examined concerning strategies for designing messages to provide key groups of people with important and up-to-date health information in ways that they can understand and use for promoting health. The articles examine strategies for employing the most appropriate communication channels for reaching and influencing different groups of people, providing multiple messages over time with the use of different communication channels for reinforcing evolving health information and policies, as well as for evaluating audience exposure, interpretation, and response to messages to make sure the information disseminated is helping to guide effective health promotion decisions and activities. Research concerning the dissemination of health information is crucial for evaluating communication problems, such as misunderstandings that could lead to negative health consequences. Such data can guide the development of refined communication strategies, programs, and policies for enhancing and guiding health information dissemination.

The first article in the special issue, by Hesse et al. (2022) “Don't Drop the Patient: Health Information in a Post-Pandemic World” examines the complexities of effective health information dissemination efforts that too often fail to adequately inform the public about important health issues, leading to many unintended and dangerous negative communication effects, such as serious misunderstandings that can promote troubling health errors. The article explains how the use of an evidence-based human-centered design implementation strategy can help guide improved health information dissemination efforts for use within the modern health-care system.

The next group of articles reports findings from four exciting projects affiliated with the International Studies Investigating Global Health Information Trends (INSIGHTS) research collaborative. These studies, which build upon the groundbreaking US-based Health Information National Trends Survey (HINTS) research program introduced by the National Cancer Institute (NIH), help to internationalize health information dissemination research, providing a global perspective on health communication.

“Of Seekers and Non-Seekers: Characteristics of COVID-19-Related Information-Seeking Behaviors” by Link et al. reports findings from a nationally representative survey of the Health Information National Trends Survey-Germany. The article describes differences between Germans who deliberately seek health information with those who are less likely to seek health information. These findings can help guide the design of strategic health communication initiatives to reach all segments of society to help promote broad access to and use of relevant health information.

The article by Pena-y-Lillo (2022), “A Profile of the Health Information Seeker in Chile: Introducing the Chilean Health Information Environments (EIS) Survey,” introduces the first wave of the Health Information Environments survey conducted in Chile-based upon the HINTS research instrument. It is the first national study to examine health information acquisition in Chile. The article describes how the data from this survey can guide the implementation of evidence-based communication strategies to meet the health information needs of the Chilean population.

The Otsuki et al. (2022) article, “A Nationally Representative Cross Sectional Survey on Health Information Acquisition Access for Consumers in Japan: A Protocol for the INFORM study,” presents the first wave of data collection from the INFORM study in Japan (part of the INSIGHTS collaborative). The study uses an adapted version of the HINTS survey instrument and is the first nationally representative study to examine health information acquisition in Japan. Data from this research program is designed to help guide strategies for disseminating relevant information to promote cancer prevention and screening in Japan, since cancer is a major health risk and cause of mortality in Japan. Plans are underway to initiate collection of a second national wave of survey data in Japan and to begin conducting cross-national comparisons with other countries collecting HINTs-based health information data.

The last of the four INSIGHTS research collaborative articles in the special issue "Applying the Comprehensive Model of Information Seeking to Understand Chronic Illness Information Scanning: Hong Kong Evidence," by Fung et al. (2022) reports the first wave of a HINTS-based survey in Hong Kong that examines public information seeking about chronic disease, which is a major health issue in Hong Kong. The study uses the Comprehensive Model of Information Seeking (CMIS) to examine how people in Hong Kong engage in health information scanning concerning chronic disease prevention and care. Several applications from the data collected are suggested in the article for guiding health information dissemination efforts in Hong Kong.

Garcia's (2022) "Reproductive Health Information Seeking Matters: Predictors and Perceived Barriers Among Young Peruvian Women" reports an online survey of young Peruvian women's experiences seeking reproductive health information. Similar to the Fung et al. (2022) article, this study was also grounded in the Comprehensive Model of Information Seeking (CMIS). Study findings suggest that individual personal characteristics have strong influences on health information seeking among members of this population and these factors should be used to guide reproductive health information dissemination campaigns in Peru.

The next group of three articles each provide fascinating case studies about unique health information dissemination issues that have occurred in different countries during the COVID-19 pandemic. For example, in "Evaluating South African and Namibian governments' Use of Digital Media During COVID-19," Sitto et al. (2022) analyzed government-initiated online communication activities during the pandemic to evaluate the effectiveness of information dissemination efforts. They note in the article the problems these government communicators had with using digital communication channels and recommend strategies for adapting online communication efforts to better match the characteristics of the digital media platforms used and the unique communication preferences and competencies of specific audiences.

The Nasri et al. (2022) article, "Dynamic Governance of the First Wave of COVID-19 in Tunisia: An Interoperability Analysis," propose an innovative interoperability index to examine information dissemination strategies used by governments during pandemics. In their analysis of the Tunisian government's communication during the pandemic, they found that interoperability measures helped to identify changing message strategies patterns that were used over different phases of the pandemic and could be used to proactively help guide responsive health communication strategies over time.

The final three pieces in the special issue are commentary articles. In "Communication in Context: How Culture, Structure, and Agency Shape Health and Risk Communication about COVID-19 in Ghana," Adekunle and Mohammed (2022) examine key processes and outcomes of COVID-19 information dissemination in Ghana, highlighting the structural factors that contributed to health inequities during the pandemic. They describe how analysis of health information needs and gaps can be used to develop communication strategies for helping to reduce health disparities.

The Neylan et al. (2022) article, "Strategies to Counter Disinformation for Healthcare Practitioners and Policymakers," examines the thorny health communication issue of how health-care providers and health communicators can effectively help patients overcome problems related to being unduly influenced by dangerous medical disinformation campaigns. They review the use of a range of innovative intervention strategies and policies that should be considered to help counter disinformation campaigns.

The final article in the special issue, "Ensuring Equity in Access to Online Courses: Perspectives from the WHO Health Emergency Response," by George et al. (2022) and her intrepid colleagues from the World Health Organization (WHO), describes the innovative WHO open-source learning platform that they launched to provide worldwide access to free self-paced asynchronous online educational modules concerning serious global health issues. They describe how care was taken to make this online health information resource easily accessible to different populations around the globe regardless of the language used or even to whether there is access to sophisticated digital technology in different regions. This is a good article to end the special issue because it illustrates the kinds of concerted efforts that have been taken by the WHO to disseminate relevant and timely health information effectively around the globe.

There are several key findings and lessons learned from the different articles presented in this special issue that should be used to guide health information dissemination policies and practices. Health communication is complex. Audiences are different. One size does not fit all. Care needs to be taken to craft the right messages, sent over-familiar channels, for specific audiences. This means that health communicators need to learn about and adapt communication to meet the unique needs of the different audiences they want to communicate with.

Public health communicators need to ask important questions and gather revealing data about several key issues to guide effective health information dissemination. For example, what are the relevant health concerns of the audiences they want to reach? What are the communication preferences of intended audience members? What kinds of communication infrastructures do members of the different audiences have available? How can health communication programs become more interactive so audience members can ask questions and seek needed health information and support? Can we situate health information dissemination programs so they can promote discussion and communication reinforcement across important social networks? Can we encourage members of different audiences to help with information dissemination efforts? How can we use evaluation data to guide refinements in health communication strategies to continually meet audience information needs as health and societal issues evolve? The ideas presented in this special issue provide rich suggestions about how to answer these relevant questions about effective health information dissemination!

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ORIGINAL ARTICLE

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A nationally representative cross-sectional survey on health information access for consumers in Japan: A protocol for the INFORM Study

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Abstract

In Japan, risk behaviors for cancer remain inadequately controlled, often due to a lack of necessary information and support to guide consumers in cancer control decisions. The use of strategic health communication efforts based on social marketing has substantial potential to provide groups of consumers who are underinformed or misinformed with relevant cancer information, both to reinforce their cancer awareness, knowledge, attitudes, and beliefs and to strengthen behaviors to prevent cancer. The INFORM Study monitors these variables nationally and identifies populations most in need of cancer-related information. A nationally representative cross-sectional mail survey was used to investigate consumer behaviors related to cancer prevention and screening, as well as cancer knowledge, attitudes and beliefs, and access to and use of trusted cancer information. A total of 10,000 Japanese aged 20 years or older were selected by two-stage stratified random sampling. The self-administered questionnaire consisted of core items from the Health Information National Trends Survey in the United States with some additional items not covered in HINTS but important in Japan. This national survey is expected to play an important role in promoting effective dissemination of evidence-based recommendations.

KEYWORDS

cancer control, evidence-based recommendation, health communication, questionnaire survey

Key points

1. This is the first nationwide survey of cancer control in Japan to monitor communication channel, personal characteristics such as knowledge and attitude, behavioral characteristics, socioeconomic and geographical characteristics.
2. We identify the populations who are in most need of cancer-related information and their access to and use of cancer information, and provide the basis for tailoring of messages to each segmented group's needs and interests.
3. This national survey can play an important role in promoting effective dissemination of evidence-based recommendations and implementation of evidence-based interventions to prevent cancer.

INTRODUCTION

Cancer control is a national public health priority in Japan (Ministry of Health, Labor and Welfare, 2018a). Previous research has shown that 57% of cancer deaths in men and 30% in women are attributable to preventable risk factors (Inoue et al., 2012). Although "evidence-based cancer prevention recommendations for Japanese" (Sasazuki et al., 2018) were issued in 2006, the prevalence of smoking in Japan is still high, at 27% in men and 8% in women in 2019 (Ministry of Health, Labor and Welfare, 2019a), and is even higher among low-income or low-educated people (Fukuda et al., 2005b; Hanibuchi et al., 2015; Martikainen et al., 2001; Nishi et al., 2004; Tabuchi & Kondo, 2017). Similarly, although "evidence-based guidelines for organized cancer screening" (Hamashima, 2018) have been issued since 2003, participation rates in the 2019 screening program were only 37%–54% (Ministry of Health, Labor and Welfare, 2019b). This rate of screening is lower than those in other countries with a similar socioeconomic status, such as the United States, United Kingdom, Netherlands, Australia, New Zealand, South Korea, and so forth (Organisation for Economic Co-operation and Development, 2020). Further, the participation rate in cancer screening varies widely based upon domestic socioeconomic status in Japan (Fukuda et al., 2005a; Fukuda et al., 2007; Hama et al., 2016).

To reach as many people as possible who do not follow recommendations for cancer prevention and control in an effective way, activities such as health communication campaigns based on the concept of social marketing, which includes principles such as targeting specific audiences and tailoring messages (Evans, 2006; Kotler & Zaltman, 1971), can be useful (Gordon et al., 2006; Wakefield et al., 2010; Wei et al., 2011). Among the many frameworks proposed for the design of such campaigns (European Center for Disease Prevention and Control, 2014), Noar et al. (2012) presented their core principles for health communication campaigns as the Audience-Channel-Message-Evaluation (ACME) framework. In the ACME framework, the "Audience" component identifies primary audiences. Primary audiences are relatively homogeneous subgroups based on socioeconomic, personal, and behavioral characteristics (Lee & Kotler, 2019). The "Channel" component selects communication channels (newspapers, television, internet, health professionals, etc.) that best reach primary audiences and create persuasive messages for them. In Japan, however, data for audience segmentation and channel selection for health communication about cancer control are scarce (Egawa et al., 1998; Miyagi et al., 2014; Tsuchiya, 2015), and a national survey is needed to assess how these variables vary across population subgroups and geographically.

Since 2003, the United States' Health Information National Trends Survey (HINTS) has collected a wealth of information to guide audience segmentation and channels for cancer control campaigns (Kreps & Finney Rutten, 2011). The design of HINTS is based on a framework that shows relationships among information exposure and information seeking, knowledge, attitudes, beliefs, behavioral intentions, and actions in individuals (Nelson et al., 2004). This information is useful in segmentation aimed at including multiple individual characteristics.

We designed the present study with a primary focus on cancer prevention and screening, and on envisioning future nationwide health communication campaigns using the ACME framework. To obtain the information required for the Audience and Channels components of the framework, we designed a survey questionnaire using a modified version of the HINTS framework (Figure 1; described in detail in Methods) and conducted a national survey among the Japanese public. To identify primary audiences who do not follow recommendations for cancer prevention and control and who should be actively provided with information to promote health behaviors, we collected information on variables such as health behavior; personal characteristics such as cancer awareness, knowledge, attitudes,

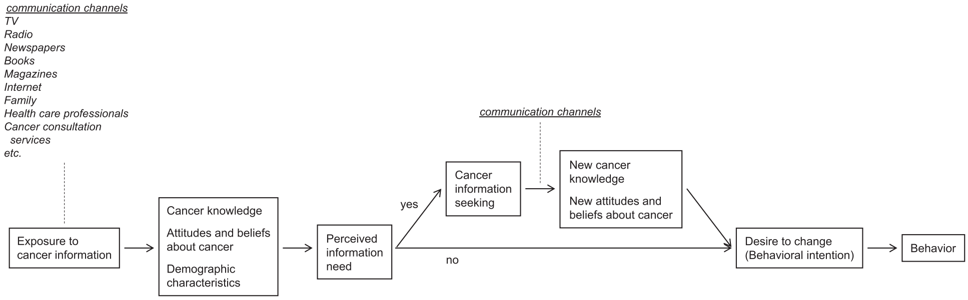


FIGURE 1 Conceptual framework of the study. It was developed with reference to the HINTS framework (Nelson et al., 2004)

and beliefs; and socioeconomic characteristics. To select communication channels to reach primary audiences, we collected information on factors such as channels these audiences access and trust to obtain the cancer information.

SURVEILLANCE METHODOLOGY

Study design

The study was designed as a nationally representative cross-sectional mail survey conducted by self-administered questionnaire.

Sampling method

The sampling strategy used for this national survey was the same as that used for the Census conducted by the Japanese government. Ten thousand Japanese were sampled using a two-stage stratified random sampling, with census area (established 2015 by the Statistics Bureau of the Ministry of Internal Affairs and Communications) as the primary sampling unit and individuals aged 20 years or older as the secondary sampling unit. From 35 strata stratified by crossing nine regions and four municipality groups by population size, 500 census areas were randomly sampled with probability proportional to the size of the stratum. The regions were the Hokkaido, Tohoku, Kanto, Koshinetsu and Hokuriku, Tokai, Kinki, Chugoku, Shikoku, Kyushu and Okinawa districts, and the municipality groups by population size were 21 major cities, cities with a population of 200,000 or more, other cities, and towns and villages. Twenty persons were randomly sampled from each census area. Exclusion criteria for subjects were not set.

Sample size

In this national survey, we estimated a 35% response rate to the questionnaire, with reference to the rate obtained in HINTS (Finney Rutten et al., 2020). As expressed in the following equations, we calculated a sample size for one group of 2195.2 using the WHO sample size calculator (World Health Organization, 2018) such that the margin of error retained the recommended value (0.05). Then, to retain the recommended value after arbitrarily dividing the respondents into quintiles, we set the total sample size at 10,000.

1 group sample size:

$$n = 1.96^2 \times 0.5 \times \frac{1 - 0.5}{0.05^2} \times \frac{2}{0.35} = 2195.2,$$

where level of confidence measure (for the 95% confidence level) was 1.96, margin of error was 0.05, baseline level of the indicators was 0.5, design effect was 2, and expected response rate was 0.35.

All sample size (5 groups):

$$n = 2195.2 \times 5 = 10,976 \fallingdotseq 10,000.$$

Conceptual framework

We repurposed the theoretical framework used in HINTS (Nelson et al., 2004) to identify the Audience and Channels within the ACME framework (Noar et al., 2012) that will inform effective cancer control health communication campaigns in the future (Figure 1). This framework provides an understanding of how people obtain cancer information and how the information affects cancer prevention and cancer communication behavior (Finney-Rutten et al., 2011). People shape their perceived information needs based on their knowledge about cancer, their attitudes and beliefs about cancer, and their demographic characteristics, which leads to a desire to change (behavioral intention) and behavior (Kreps et al., 2017). Their knowledge, attitudes, and beliefs are formed both by the cancer information received passively in the absence of any experience in seeking cancer information, and from the information they seek actively according to their own needs (Hornik et al., 2013; Johnson & Case, 2012; Niederdeppe et al., 2007). People act according to the behavioral intentions formed by the new knowledge, attitudes, and beliefs that result from the relevant information they access (Kreps, 2020a). In the present study, to comprehend the route from information access to health behavior in people who do not engage in recommended health behaviors, we will evaluate media exposure, experience of cancer information seeking, selection of channels for obtaining information, and channel characteristics. We will then identify primary audiences that should be proactively reached with information to promote health behaviors and the communication channels that will reach them.

Questionnaire

The research group members first set high-priority research questions for cancer control and then selected items in their respective academic fields mainly from the existing questionnaire. Items were initially selected from the HINTS in the United States (Table 1). In addition, we added items which are important to assess in the Japanese population, such as gastric cancer, hepatitis virus, salt intake, and the use of heated tobacco products, as derived from previous national surveys conducted by the Japanese government (Comprehensive Survey of Living Conditions [Ministry of Health, Labor and Welfare, 2016a], National Health and Nutrition Survey [Ministry of Health, Labor and Welfare, 2016b, 2018b], National Cancer Opinion Survey [Cabinet Office, 2016], etc.), or from previous studies. If there were no appropriate items relevant to the research question, we created original questions. The questionnaire consisted of the following 11 sections: (A) looking for information about cancer (seeking experience, communication channels, information content, satisfaction with seeking cancer information, and trusted information sources); (B) communication (communication with healthcare professionals, social networks, and health literacy); (C) health status/lifestyle habits, etc. (health status, perceived health control, food environment, food knowledge about cancer prevention, intakes of vegetables, fruit, and

TABLE 1 The items of questionnaire and their sources or references

	Items	Source/Reference
A: Seeking information about cancer		
1	Have you ever looked for information about cancer from any source?	Health Information National Trends Survey (HINTS) 3-B1
	1. Yes	
	2. No→ Go to question A5	
2	The most recent time you looked for cancer information, where did you go first?	HINTS3-B4, National Cancer Opinion Survey (Cabinet Office, 2016) (modified)
	(Mark only one.)	
	1. Books	
	2. Brochures, pamphlets, etc.	
	3. Cancer organization (Japan Cancer Society, Foundation for Promotion of Cancer Research, etc.)	
	4. Family	
	5. Friend/coworker	
	6. Physicians	
	7. Healthcare professionals other than physicians	
	8. Internet sites (National Cancer Center Japan website, “Ganjoho.jp (Cancer Information Service)”)	
	9. Internet sites (other than the above “Ganjoho.jp”)	
	10. Library	
	11. Magazines	
	12. Newspapers	
	13. Cancer consultation services (Cancer Counseling and Support Center, etc.)	
	14. Complementary, alternative, or unconventional practitioner	
	15. Other → *Please specify below:*	

TABLE 1 (Continued)

	Items	Source/Reference
3	What type of information were you looking for? (Mark all that apply.) 1. Specific cancer 2. Cancer organizations (Japan Cancer Society, Foundation for Promotion of Cancer Research, etc.) 3. Information on cancer in general 4. Paying for medical care 5. Insurance 6. Causes of cancer/Risk factors for cancer 7. Prevention of cancer 8. Screening/Testing/Early detection 9. Symptoms of cancer 10. Diagnosis of cancer 11. Treatment/Cures for cancer 12. Where to get medical care 13. Prognosis/Recovery from cancer 14. Coping with cancer/Dealing with cancer 15. Information on complementary, alternative, or unconventional treatments 16. Palliative care 17. Someone's cancer experiences	HINTS3-B3 (modified)

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	18. Impact of Coronavirus Disease 2019 (COVID-19) on cancer	
	19. Other → *Please specify below:*	
4	Based on the results of your most recent search for information about cancer, how much do you agree or disagree with each of the following statements?	HINTS4 Cycle2-A6
	(Mark only one for each.)	
	(1) It took a lot of effort to get the information you needed	
	(2) You felt frustrated during your search for the information	
	(3) You were concerned about the quality of the information	
	(4) The information you found was hard to understand	
	1. Strongly agree 2. Somewhat agree 3. Somewhat disagree 4. Strongly disagree	
5	In general, how much you trust information about cancer from each of the following?	HINTS4 Cycle2-A8 (modified)
	(Mark only one for each.)	
	(1) Physicians	
	(2) Healthcare professionals other than physicians	
	(2) Family or friends	
	(3) Newspapers or magazines	
	(4) Radio	
	(5) Internet	
	(6) Television	
	(7) Government health agencies (Ministry of Health, Labour and Welfare, National Cancer Center, etc.)	

TABLE 1 (Continued)

	Items	Source/Reference
	(8) Public Interest Incorporated Foundations (Japan Cancer Society, Foundation for Promotion of Cancer Research etc.)	
	1. Not at all 2. A little 3. Some 4. A lot	
B: Communication		
In Question B below, we would like to ask you about communication related to healthcare and health, including but not limited to "cancer."		
1	In the past 12 months, not counting times you went to an emergency room, how many times did you go to a doctor, nurse, or other health professional to get care for yourself?	HINTS4 Cycle2-C4
	(Mark only one.)	
	0. None → Go to question B4	
	1. 1 time	
	2. 2 times	
	3. 3 times	
	4. 4 times	
	5. 5–9 times	
	6. 10 or more times	
2	The following questions are about your communication with all doctors, nurses, or other health professionals you saw during the past 12 months…	(1)(2)(3)(4)(5)(8)(9): HINTS4 Cycle2-C5
	(Mark only one for each.)	(6)(7): HINTS1-HC4
	How often did they do each of the following:	
	(1) Give you the chance to ask all the health-related questions you had?	
	(2) Give the attention you needed to your feelings and emotions?	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	(3) Make sure you understood the things you needed to do to take care of your health?	
	(4) Explain things in a way you could understand?	
	(5) Spend enough time with you?	
	(6) Show respect for what you had to say	
	(7) Listen carefully to you	
	(8) Involve you in decisions about your health care as much as you wanted?	
	(9) Help you deal with feelings of uncertainty about your health or health care?	
	1. Always 2. Usually 3. Sometimes 4. Never	
3	In the past 12 months, how often did you feel you could rely on your doctors, nurses, or other health care professionals to take care of your health care needs?	HINTS4 Cycle2-C6
	(Mark only one.)	
	1. Always 2. Usually 3. Sometimes 4. Never	
4	In general, how often do you do each of the following? Take with you to your doctor visits a list of questions or concerns you want to cover.	HINTS4 Cycle3-D3a
	(Mark only one.)	
	1. Always 2. Usually 3. Sometimes 4. Never	
5	Next are some questions about your participation in community organizations. By community organization we mean any group that you might participate in such as neighborhood associations or community circles, volunteer fire companies, senior citizen's clubs, sports clubs, hobby groups, culture lessons, volunteer groups, religious groups, and other social or industrial groups.	HINTS2-SN1 (modified)

TABLE 1 (Continued)

	Items	Source/Reference
	How many community organizations are you currently a member of?	
	(Answer in number.)	
	( ) ※0 → Go to question B7	
6	{Does this/Do any of these} community organization{s} provide you with information on health?	HINTS2-SN2
	1. Yes	
	2. No	
7	Do you have friends or family members that you talk to about your health?	HINTS2-SN3
	1. Yes	
	2. No → Go to question B9	
8	How frequently do you talk to these friends or family members about health? Would you say….	HINTS2-SN4
	(Mark only one.)	
	1. very frequently,	
	2. somewhat frequently, or	
	3. not very frequently?	
9	How many people live near you who you can rely on in case you need a ride to visit your health care provider?	HINTS2-SN5
	(Answer in number.)	
	( )	
10	How much do you participate in community events including festivals, cleaning activities, flower planting activities, and socializing parties? In this question, "community" vaguely refers to the area corresponding to the elementary school district.	HINTS2-SN6 (modified)

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	(Mark only one.)	
	1. every week,	
	2. once or twice a month,	
	3. a few times a year, or	
	4. never?	
11	Do you think that you will be able to find or make use of information about diseases or health if necessary?	Communicative and Critical Health Literacy scale (Ishikawa et al., 2008)
	(Mark only one for each.)	
	(1) Able to collect information from various sources such as newspapers, books, TV programs, and the Internet	
	(2) Able to find information I need from a variety of sources	
	(3) Able to understand information and provide it to other people	
	(4) Able to evaluate the reliability of the information	
	(5) Able to make plans or decide on actions to take for improving health	
	1. Absolutely not 2. Rather not 3. Not sure 4. Probably yes 5. Definitely yes	
C: Health status/Lifestyle habits, etc.		
1	In general, would you say your health is…	HINTS5 Cycle1-G1
	(Mark only one.)	
	1. Excellent,	
	2. Very good,	
	3. Good,	
	4. Fair, or	

TABLE 1 (Continued)

	Items	Source/Reference
	5. Poor?	
2	Overall, how confident are you about your ability to take good care of your health?	HINTS4 Cycle1-D3
	(Mark only one.)	
	1. Completely confident	
	2. Very confident	
	3. Somewhat confident	
	4. A little confident	
	5. Not confident at all	
3	Has a doctor ever told you that you had any of the following medical conditions:	HINTS4 Cycle2-F3 (modified)
	(Mark only one for each.)	
	(1) Diabetes or high blood sugar?	
	(2) High blood pressure or hypertension?	
	(3) A heart condition such as heart attack, angina, or congestive heart failure?	
	(4) Cellebrovascular diseases including stroke	
	(5) Chronic lung disease, asthma, emphysema, or chronic bronchitis?	
	(6) Arthritis or rheumatism?	
	(7) Depression or anxiety disorder?	
	1. Yes 2. No	
4	We will ask you about the situation in the past 2–3 months.	Ozawa et al. (2013)
	How many vegetable dishes (mainly made from vegetables) do you usually eat per day? Please consider that one dish means about one small bowl.	

(Continues)

TABLE 1 (Continued)

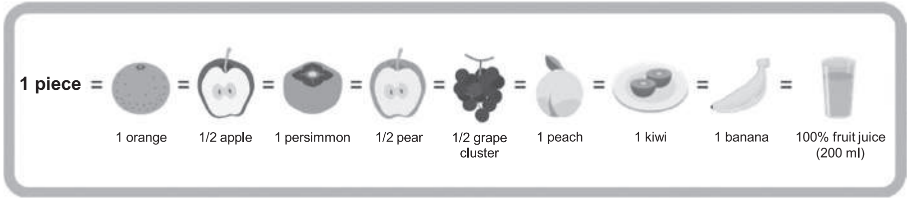
	Items	Source/Reference
	(Mark only one.) 1. Almost zero 2. 1 to 2 dishes 3. 3 to 4 dishes 4. 5 to 6 dishes 5. 7 or more dishes	
5	We will ask you about the situation in the past 2–3 months. Usually, how many pieces of fruit do you eat per day? (Mark only one.) **1.** Almost none **2.** Less than a piece **3.** A piece **4.** 2 pieces **5.** 3 or more pieces A “piece” of fruit means, for instance, one whole orange. For bigger fruits like apples, half is counted as a piece. For a pack of 100% juice on the market, one bottle (200 ml) is counted as a piece. 	Japanese Food Guide (Ministry of Agriculture, Forestry and Fisheries, 2005)

TABLE 1 (Continued)

	Items	Source/Reference
6	We will ask you about the situation in the past 2–3 months. This question asks about the area you live in and residents of the area. Please choose one option for each of the following three. The size of an “area” means a school district or a municipality. (Mark only one for each.) (1) In this area, it is easy to obtain a nutritionally balanced meal, for example, based on staple foods, main dishes, side dishes, etc. (2) This area is blessed with trustworthy shops and producers in terms of food safety. (3) In this area, I can purchase the necessary ingredients at supermarkets and food stores, and I have transportation methods to go shopping, so I do not feel inconvenienced in everyday shopping. 1. agree 2. relatively agree 3. no opinion 4. relatively disagree 5. disagree	The Survey on the Present Condition and Consciousness of Dietary Education (Ministry of Agriculture, Forestry and Fisheries, 2010), Komatsu et al. (2020)
7	This question asks about your “miso soup.” How is your miso soup seasoned with? (Mark only one.) **1.** Very slightly seasoned **2.** Slightly seasoned **3.** Moderately seasoned **4.** Strongly seasoned **5.** Very strongly seasoned	The Japan Public Health Center-based prospective Study (JPHC study) Food frequency questionnaires (National Cancer Center, 2000)
8	We would like to ask you about “cod/salmon roe.” Remember the meals you had in the past 12 months, and answer how often you ate it on average. (Mark only one.) 1. Did not eat it 2. 1-3 times a month	JPHC study Food frequency questionnaires (National Cancer Center, 2000)

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	3. 1-2 times a week	
	4. 3-4 times a week	
	5. 5-6 times a week	
	6. Once a day or more often	
9	For each of the cancer types (1) to (4), choose the most effective item for prevention. If you do not know, circle "Don't know."	Original
	(Mark only one for each.)	
	(1) Stomach cancer	
	1. Lowering salt intake 2. Soy isoflavone 3. Shark cartilage 4. I don't know	
	(2) Esophagus cancer	
	1. Agaricus 2. Vegetables 3. Vinegar 4. I don't know	
	(3) Colorectal cancer	
	1. Vitamin A 2. Propolis 3. Limiting alcohol intake 4. I don't know	
	(4) Breast cancer	
	1. Linseed oil 2. Healthy body weight 3. Lycopene 4. I don't know	
10	How many times do you drink alcohol (sake, shochu, beer, whiskey, etc.) per week? Circle one of the following options.	National Health and Nutrition Survey Lifestyle Questionnaire Q3 (Ministry of Health, Labor and Welfare, 2016b)
	(Mark only one.)	
	1. Every day	
	2. 5 to 6 days per week	
	3. 3 to 4 days per week	
	4. 1 to 2 days per week	

TABLE 1 (Continued)

	Items	Source/Reference
	5. 1 to 3 days per month	
	6. Almost none → Go to question C12	
	7. I quit drinking → Go to question C12	
	8. I don't drink (cannot drink alcoholic beverages) → Go to question C12	
11	This question is for those who answered 1 to 5 in C10. How much do you drink alcohol per day, expressed in terms of the amount of sake? Choose one from the following options.	National Health and Nutrition Survey Lifestyle Questionnaire (Ministry of Health, Labour and Welfare, 2016b)
	(Mark only one.)	
	1. Less than 1 go (180 ml)	
	2. 1 to 2 gos (360 ml)	
	3. 2 to 3 gos (540 ml)	
	4. 3 to 4 gos (720 ml)	
	5. 4 to 5 gos (900 ml)	
	6. 5 gos (900 ml) or more	
	* One go of sake (15% of alcoholic content/180 ml) is about equivalent to the following:	
	1 middle-sized bottle of beer (5%/500 ml), Shochu 0.6 go (25%/110 ml), 1/4 bottle of wine (14%/180 ml), a glass of double whiskey (43%/60 ml), 1.5 cans of chu-hai (5%/520 ml).	
12	We will ask you about the situation in the past 2–3 months.	Original
	Usually, how many days a week do you walk or perform physical activities of the same or higher intensity? "Physical activities" refer to all activities including work, housework, commuting, brisk walking, bicycle pedaling, dance, and other sports.	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	(Mark only one.)	
	1. 1 day a week	
	2. 2 days a week	
	3. 3 days a week	
	4. 4 days a week	
	5. 5 days a week	
	6. 6 days a week	
	7. 7 days a week	
	0. Don't perform physical activities → Go to question C14	
13	We will ask you about the situation in the past 2–3 months.	Original
	On days when you walk or perform any physical activity of the same or higher intensity, how much time do you usually spend in it?	
	(Answer in number.)	
	( ) hours ( ) minutes	
14	Do you intend to improve your lifestyle, such as with exercise or diet?	Standard health checkup and health guidance programs Questionnaire Q21 (Revised version) (Ministry of Health, Labour and Welfare, 2018c)
	(Mark only one.)	
	1. No	
	2. Intend to improve (about in the next 6 months)	
	3. Intend to improve soon (about in the next month), and gradually started	
	4. Already started (less than 6 months)	
	5. Already started (longer than 6 months)	

TABLE 1 (Continued)

	Items	Source/Reference
15	We will ask you about the situation in the past 2–3 months. On a typical weekday and weekend, about how many hours do you… (Answer in number.) watch television……. ( ) hours (weekday)/( ) hours (weekend) listen to the radio……. ( ) hours (weekday)/( ) hours (weekend) use the internet for personal reasons……. ( ) hours (weekday)/( ) hours (weekend)	HINTS FDA2-A5 (modified)
16	In the past seven days, how many days did you read a newspaper? (Answer in number.) ( ) days	HINTS FDA2-A7
17	Do you think the following items cause cancer? Answer for each item. (Mark only one for each.) (1) Tobacco (2) Other people's tobacco smoke (3) Liquors/alcohol (4) Insufficient intake of vegetables/fruits (5) Excessive intake of salt (6) Unbalanced diet (7) Food additives	Report of Ministry of Health, Labour and Welfare cancer research grant: Internet survey on cancer information service (Hirohashi et al., 2006) (modified)

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	(8) Burnt fish or meat	
	(9) Lack of exercise	
	(10) Obesity	
	(11) Stress	
	(12) Air pollution	
	(13) Environmental hormones	
	(14) Germs and viruses	
	(15) Heredity	
	1. Yes 2. No 3. I don't know	
D: Smoking		
In Question D below, “tobacco” includes cigarettes, heated tobacco products, and all other types of tobacco products.		
1	Do you smoke? Circle one of the following options.	National Health and Nutrition Survey Lifestyle Questionnaire (draft) Q5 (Ministry of Health, Labour and Welfare, 2018b)
	(Mark only one.)	
	1. Smoke every day	
	2. Smoke sometimes	
	3. Smoked previously, but have not smoked for more than a month → Go to question D7	
	4. No → Go to question D8	
2	Choose the tobacco products you currently smoke.	National Health and Nutrition Survey Lifestyle Questionnaire (draft) Q5-1 (Ministry of Health, Labour and Welfare, 2018b)
	(Mark all that apply.)	
	1. Cigarette	

TABLE 1 (Continued)

	Items	Source/Reference
	2. heated tobacco products → Go to question D4	
	3. Others → Go to question D4	
	* An heated tobacco products is a new type of tobacco product. It works by electrically heating tobacco or processed tobacco instead of burning it. It is composed of a stick or cartridge filled with tobacco and a dedicated device to set it in.	
3	How many cigarettes do you (including those who "sometimes smoke") smoke per day?	National Health and Nutrition Survey 2018 Lifestyle Questionnaire (draft) Q5-2 (Ministry of Health, Labour and Welfare, 2018b)
	(Answer in number.)	
	( ) cigarettes	
4	How long have you been a habitual smoker?	A Standard Procedure Book for Smoking Cessation Therapy, 6th Edition Questionnaire on Smoking Cessation Therapy Questionnaire Q3 (The Japanese Circulation Society, The Japan Lung Cancer Society, Japanese Cancer Association, The Japanese Respiratory Society, 2014)
	(Answer in number.)	
	( ) years	
5	At any time in the past year, have you stopped smoking for one day or longer because you were trying to quit?	HINTS4 Cycle4-I3
	1. Yes	
	2. No	
6	Are you seriously considering quitting smoking in the next six months?	HINTS4 Cycle4-I4
	1. Yes	
	2. No	
7	In the past 1 year, did you have any experience of being advised to quit smoking at a hospital or any medical institution?	Original

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	1. Yes	
	2. No	
8	How much do you think quitting cigarette smoking can help reduce the harmful effects of smoking?	HINTS4 Cycle4-I11
	(Mark only one.)	
	1. Not at all	
	2. A little	
	3. Some	
	4. A lot	
9	Heated tobacco products (PloomTech, iQOS, glo, etc.), a new type of tobacco products, have been commercially available. These products are intended to produce “vapor” (aerosol) containing nicotine by heating tobacco. What do you think of heated tobacco products as compared with cigarettes?	HINTS FDA-D7 (modified)
	(Mark only one.)	
	1. They are much less harmful.	
	2. They are less harmful.	
	3. They are as harmful.	
	4. They are more harmful.	
	5. They are much more harmful.	
	6. Don't know about their harmfulness.	
	7. Have never heard of heated tobacco products.	
	8. Have heard of heated tobacco products before but don't know them well.	
10	Do any of the people living with you smoke?	Original

TABLE 1 (Continued)

	Items	Source/Reference
	1. Yes	
	2. No → Go to question D12	
	3. I live alone. → Go to question D12	
11	Which tobacco product(s) do the persons who live with you currently smoke?	Original
	(Mark all the tobacco products that at least one of the persons living with you smokes.)	
	1. Cigarettes	
	2. Heated tobacco products	
	3. Others	
12	For each of the following tobacco products, which statement best describes the rules about smoking inside your home?	HINTS4 Cycle3-I12 (modified)
	(Mark only one for each.)	
	(1) Cigarettes	
	(2) Other types of tobacco including heated tobacco products	
	1. Smoking is not allowed anywhere inside your home	
	2. Smoking is allowed some places or at some times	
	3. Smoking is allowed anywhere inside your home	
	4. There are no rules about smoking inside your home	
13	For each of the following tobacco products, how much do you agree or disagree to the idea of making rules about forbidding smoking at your home (inside your home)?	Created with reference to Brose et al. (2017)
	(Mark only one for each.)	
	(1) Forbidding smoking cigarettes indoors	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	(2) Forbidding smoking other types of tobacco products including heated tobacco products indoors	
	1. Strongly agree	
	2. Somewhat agree	
	3. Neither agree nor disagree	
	4. Somewhat disagree	
	5. Strongly disagree	
	6. Don't know	
E: Cancer screening		
1	Do you think that *Helicobacter pylori* infection is a cause of stomach cancer?	Original
	1. Yes	
	2. No	
	3. I don't know	
2	Have you had stomach cancer screening such as stomach X-ray examination or gastric endoscopy?	Original
	1. Yes	
	2. No	
	3. I don't know	
3	Have you ever had to check for colon cancer?	HINTS4 Cycle2-L7 (modified)
	1. Yes	
	2. No	
	3. I don't know	

TABLE 1 (Continued)

	Items	Source/Reference
4	Have you ever undergone lung cancer screening (chest X-ray, sputum testing, etc.) before? 1. Yes 2. No 3. I don't know	Original
5	Do you think that hepatitis B/C virus infection is a cause of liver cancer? 1. Yes 2. No 3. I don't know	Original
6	Have you undergone “hepatitis virus testing”? 1. Yes 2. No 3. I don't know	National Survey on Hepatitis Screening uptake Questionnaire Q3 (Ministry of Health, Labour and Welfare, 2011) (modified)
7	Have you ever heard of HPV? HPV stands for Human Papillomavirus. It is not HIV, HSV, or herpes. 1. Yes 2. No	HINTS4 Cycle3-K2
8	Do you think HPV can cause cervical cancer? 1. Yes 2. No 3. Not sure	HINTS4 Cycle3-K3

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
9	In your opinion, how successful is the HPV vaccine at preventing cervical cancer? (Mark only one.) 1. Not at all successful 2. A little successful 3. Pretty successful 4. Very successful 5. Don't know	HINTS4 Cycle4-K6
Are you male or female?		
Female → Go to question E10		
Male → Go to question E12		
10	How long ago did you have your most recent Pap test to check for cervical cancer? (Mark only one.) 1. A year ago or less 2. More than 1, up to 2 years ago 3. More than 2, up to 3 years ago 4. More than 3, up to 5 years ago 5. More than 5 years ago 6. I have never had a Pap test	HINTS4 Cycle4-J3
11	Mammography is an X-ray examination to detect breast cancer. When did you last undergo mammography?	HINTS4 Cycle4-J5 (modified)

TABLE 1 (Continued)

	Items	Source/Reference
	(Mark only one.)	
	1. A year ago or less	
	2. More than 1, up to 2 years ago	
	3. More than 2, up to 3 years ago	
	4. More than 3, up to 5 years ago	
	5. More than 5 years ago	
	6. I have never had a mammogram	
12	Only male, please answer.	HINTS4 Cycle4-K11 (modified)
	Have you had prostate-specific antigen screening for prostate cancer?	
	1. Yes	
	2. No	
	3. I don't know	
13	As far as you know, do you think the following statements about cancer screening (fecal occult blood test, mammography, cervical cytology, etc.) are true, or do you think they are false?	HINTS4 Cycle4-K14 (modified)
	(Mark only one for each.)	(1): HINTS3-L4(2)
	(1) Getting checked regularly for cancer helps find cancer when it's easy to treat	(2): HINTS4 Cycle4-K14a
	1. Strongly agree 2. Somewhat agree 3. Somewhat disagree 4. Strongly disagree	(3)(4): Created with reference to Crothers et al. (2016)
	(2) These tests can definitely tell that a person has cancer.	
	1. Ture 2. False 3. Don't Know	(5): Created with reference to Lewis et al. (2006)
	(3) Cancer screening can cause further physical burden depending on additional testing.	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	1. True 2. False 3. Don't know	
	(4) Every “cancer” detected by cancer screening grows to a life-threatening extent.	
	1. True 2. False 3. Don't know	
	(5) I will keep on undergoing cancer screening as long as I live no matter how old I get.	
	1. Strongly think so 2. Think so 3. Don't think so 4. Don't think so at all	
F: Using the internet to find information		
1	Do you ever go on-line to access the Internet or World Wide Web, or to send and receive e-mail?	HINTS4 FDA-B1
	1. Yes	
	2. No → Go to question G1	
2	How often do you access the Internet through each of the following?	HINTS4 FDA-B2
	(Mark only one for each.)	
	(1) Computer at home	
	(2) Computer at work	
	(3) Computer at school	
	(4) Computer in a public place (library, community center, other)	
	(5) On a mobile device(cell phone/smart phone/tablet)	
	(6) On a gaming device/”Smart TV”	
	(7) Other ( )	
	1. Daily 2. Sometimes 3. Never 4. NIA	

TABLE 1 (Continued)

	Items	Source/Reference
3	In the past 12 months, have you used the Internet to look for health or medical information for yourself?	HINTS4 Cycle2-B4
	1. Yes	
	2. No	
4	Sometimes people use the Internet to connect with other people online through social networks like Facebook, Twitter, Instagram, and LINE. This is often called "social media."	HINTS5 Cycle1-B10 (modified)
	In the last 12 months, have you used the Internet for any of the following reasons?	
	(Mark only one for each.)	
	(1) To visit a social networking site, such as Facebook	
	(2) To share health information on social networking sites, such as Facebook or Twitter	
	(3) To write in an online diary or blog (i.e., Web log)	
	(4) To participate in an online forum or support group for people with a similar health or medical issue	
	(5) To watch a health-related video on YouTube	
	1. Yes 2. No	
5	Have you ever made a video call using applications such as LINE, Skype, Zoom, and Facetime?	Original
	1. Yes	
	2. No	
6	Please indicate if you have each of the following.	HINTS5 Cycle2-B6 (modified)
	(Mark all that apply.)	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	1. Tablet computer (for example, an iPad, Galaxy Tab, Media Pad)	
	2. Smartphone (for example, an iPhone, Android)	
	3. Basic cell phone only → Go to question G1	
	4. I do not have any of the above → Go to question G1	
7	On your tablet or smartphone, do you have any “apps” related to health and wellness?	HINTS5 Cycle1-B6
	(Mark only one.)	
	1. Yes	
	2. No	
	3. Don't know	
8	Has your tablet or smartphone…	HINTS5 Cycle1-B7
	(Mark only one for each.)	
	(1) Helped you track progress on a health-related goal such as quitting smoking, losing weight, or increasing physical activity?	
	(2) Helped you make a decision about how to treat an illness or condition?	
	(3) Helped you in discussions with your health care provider?	
	1. Yes 2. No	
G: Beliefs about cancer		
1	How likely are you to get cancer in your lifetime?	HINTS4 Cycle1-G1
	(Mark only one.)	
	1. Very unlikely	
	2. Unlikely	

TABLE 1 (Continued)

	Items	Source/Reference
	3. Neither unlikely nor likely	
	4. Likely	
	5. Very likely	
2	How much do you agree or disagree with each of the following statements?	(1)(2)(3)(4): HINTS5
	(Mark only one for each.)	Cycle1-N2
	(1) It seems like everything causes cancer	(5): HINTS3-CS-08
	(2) There's not much you can do to lower your chances of getting cancer	(6): HINTS5 Cycle1-N3
	(3) There are so many different recommendations about preventing cancer, it's hard to know which ones to follow	
	(4) When I think about cancer, I automatically think about death	
	(5) Cancer is most often caused by a person's behavior or lifestyle	
	(6) I'd rather not know my chance of getting cancer	
	1. Strongly agree 2. Somewhat agree 3. Somewhat disagree 4. Strongly disagree	
3	How worried are you about getting cancer?	HINTS5 Cycle1-N4
	(Mark only one.)	
	1. Not at all	
	2. Slightly	
	3. Somewhat	
	4. Moderately	
	5. Extremely	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
H: Cancer history		
1	Have you ever been diagnosed as having cancer?	HINTS5 Cycle1-M1
	1. Yes	
	2. No → Go to question H4	
2	At which site(s) of the body did “cancer” develop?	HINTS1-CH2 (modified)
	(Mark all that apply.)	
	1. Oral cavity/pharynx/larynx	
	2. Esophagus	
	3. Stomach	
	4. Large intestine	
	5. Liver	
	6. Gallbladder/bile duct	
	7. Pancreas	
	8. Lung	
	9. Breast	
	10. Uterine cervix	
	11. Uterine body	
	12. Ovary	
	13. Kidney/bladder	
	14. Prostate	
	15. Blood (malignant lymphoma, leukemia, etc.)	
	16. Others ( )	

TABLE 1 (Continued)

	Items	Source/Reference
3	How many years has it been since you were first diagnosed as having “cancer”?	HINTS1-CH3 (modified)
	(Answer in number.)	
	( ) years	
4	Have any of your family members ever had cancer?	HINTS5 Cycle1-N5
	1. Yes	
	2. No	
	3. Not sure	
5	Has anyone close to you, such as your best friend, been diagnosed as having “cancer” before?	Original
	1. Yes	
	2. No	
	3. Not sure	
I: Genetics		
1	Genetic tests that analyze your DNA for potential health risks are currently being marketed by companies directly to consumers. Have you heard or read about these genetic tests?	HINTS4 Cycle3-F1 (modified)
	1. Yes	
	2. No	
2	Do you want to undergo commercially available genetic testing?	Development of evidence-based and efficient personalized breast cancer prevention methods based on genetic, environmental and lifestyle-related factors. A research grant from the Japan Agency for Medical Research and Development (AMED) (Katanoda & Matsuo, 2017) (JP15ck0106177) (modified)
	(Mark only one.)	
	1. Yes	
	2. No	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
	3. Can't say	
	4. Have undergone testing before	
3	How accurate do you think is the result of commercially available genetic testing?	Development of evidence-based and efficient personalized breast cancer prevention methods based on genetic, environmental and lifestyle-related factors. A research grant from AMED (Katanoda & Matsuo, 2017) (JP15ck0106177) (modified)
	(Mark only one.)	
	1. Accurate	
	2. Almost accurate	
	3. Can't say	
	4. Not very accurate	
	5. Not accurate	
	6. Don't know	
4	Which of the following diseases do you think are the most strongly associated with heredity? (Mark all that apply.)	Original
	1. Stomach cancer	
	2. Colorectal cancer	
	3. Lung cancer	
	4. Breast cancer	
	5. Cervix cancer	
	6. Prostate cancer	
	7. Pancreatic cancer	
	8. Liver cancer	
	9. Ovarian cancer	

TABLE 1 (Continued)

	Items	Source/Reference
	10. Uterine body cancer	
	11. Diabetes	
	12. Hypertension	
	13. Heart disease (angina, myocardial infarction)	
	14. Stroke	
J: Basic information		
1	Are you male or female?	HINTS4 Cycle1-E1
	1. Male	
	2. Female	
2	What is your age?	HINTS4 Cycle1-E1
	( ) Years old	
3	Height	
	( ) cm	
4	Weight	
	( ) kg	
5	Please write your postal code.	Original
	(-)	
6	In the past 6 months, did your occupation or employment status change because of the COVID-19 outbreak?	Original
	1 Yes	
	2 No	

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
7	This question asks about your main current job. What is your type of business? (Mark only one.) **1.** None **2.** None (retired) **3.** Housewife (househusband) **4.** Student **5.** Managerial worker **6.** Specialist/Technician (Healthcare professional) **7.** Specialist/Technician (Others) **8.** Office clerk **9.** Sales 10. Service 11. Security 12. Agriculture/Forestry/Fishery 13. Production/Processing 14. Transportation/Machine operation 15. Construction/Mining 16. Shipment/Cleaning/Packing 17. Others	Comprehensive Survey of Living Conditions Household Questionnaire Q16 (Ministry of Health, Labour and Welfare, 2016a) (modified)
8	For those who chose 5 to 16 for J7, what is your current employment status? (Mark only one.)	JPHC-NEXT study Questionnaire (National Cancer Center, 2020)

TABLE 1 (Continued)

	Items	Source/Reference
	1. Regular employee/staff 2. Contract employee/staff 3. Temporary employee/staff 4. Part-timer 5. Self-employed/business owner	
9	Which is the last school you graduated from? If you dropped out of a school, choose the last school you graduated from. (Mark only one.) 1. Elementary school 2. Junior high school 3. High school/Middle school in the prewar system 4. Vocational school 5. College/Technical college 6. University/Graduate school	Comprehensive Survey of Living Conditions Household Questionnaire Q10 (Ministry of Health, Labour and Welfare, 2016a) (modified)
10	This question asks about your marital status. If you are living together in unregistered marriage, please choose 1. (Mark only one.) 1. Married 2. Never married 3. Widowed 4. Divorced	Comprehensive Survey of Living Conditions Household Questionnaire Q5 (Ministry of Health, Labour and Welfare, 2016a)

(Continues)

TABLE 1 (Continued)

	Items	Source/Reference
11	How many people, including yourself, usually live together and share the same livelihood (How many household members are there)? (Household members shall include those who are absent because of unaccompanied posting, hospitalization, and other reasons) (Answer in number.) ( ) people	Comprehensive Survey of Living Conditions Household Questionnaire Q1 (Ministry of Health, Labour and Welfare, 2016a) (modified)
12	How many people under the age of 20 do you live with? (Answer in number.) ( ) people ※0 → Go to question J14	Original
13	How old is the youngest person in the above? (Answer in number.) ( ) years old	Original
14	How much is your annual household (you and your family members) income (immediate pretax income)? (Mark only one.) 1. JPY 2 million or less 2. JPY 2–4 million 3. JPY 4–6 million 4. JPY 6–8 million 5. JPT 8–10 million 6. JPY 10–15 million 7. JPY 15–20 million 8. JPY 20 million or more	Communications Usage Trend Survey Questionnaire (For Households) Q9 (3) (Ministry of Internal Affairs and Communications, 2017)

TABLE 1 (Continued)

	Items	Source/Reference
K: COVID-19		
The last questions relate to COVID-19.		
1	In the past 30 days, how often did you search for information about COVID-19?	HINTS-Germany
	(Mark only one.)	
	1. Not even once in the past 30 days	
	2. Less often than once a week (1-3 times a month)	
	3. Once a week	
	4. Several times a week	
	5. Once a day	
	6. Several times a day	
2	How much are you worried about COVID-19?	HINTS-Germany
	(Mark only one.)	
	1. Not worried at all	
	2. Rather not worried	
	3. Neutral	
	4. Rather worried	
	5. Very worried	

salty food, alcohol drinking, physical activity, intention to change health behavior, media exposure, and knowledge about causes of cancer); (D) tobacco use (smoking habits, intention to quit smoking, beliefs about health risks, and smoking rules at home); (E) screening (knowledge about the cause of infection-related cancers, screening history, and beliefs about screening); (F) use of the Internet to find information (usage frequency, seeking information using the Internet, social networking services, and health applications); (G) beliefs about cancer; (H) cancer history; (I) direct-to-consumer genetic testing; (J) basic information (demographic characteristics and socioeconomic status); and (K) information seeking for and concern about COVID-19 (Table 1). The last items on COVID-19 were added from the HINTS-Germany research program to investigate how people were affected by the COVID-19 pandemic (Link et al, 2021; World Health Organization, 2020). In cases where the original question asked about daily habits, the word “usual” was left unchanged, so that the same question could be used in future repeat surveys. However, to make clear the timeframe of the questions, we added the direction that answers should refer to “the situation of the past 2 or 3 months.” Thus, the questions actually ask about the situation during the COVID-19 pandemic. This corresponded to the period from May to July 2020.

Translation

English or German items were translated into Japanese according to a guideline by The Professional Society for Health Economics and Outcomes Research Taskforce (Wild et al., 2005). First, two Japanese translation versions were made independently by a member of our research group and a professional translator who had a medical or psychological background. These two versions were compared and merged into a single Japanese version. Next, the Japanese version was back-translated into English or German by another professional translator. We asked researchers who developed the original questions to compare the original and back-translated versions to check them for content discrepancies, which we then corrected for wording. The revisions were then further discussed with the researchers until the discrepancies were resolved. Moreover, we asked the researchers to make sure that the modified expressions retained the same meaning after additional changes were made based on the cognitive debriefing described in the next paragraph.

Pilot study

A mail survey was conducted using the self-administered questionnaire in 300 Japanese people as a pilot study in February 2019. The pilot study was conducted to ascertain the feasibility of conducting a national survey. A response rate of more than 35% was used as a criterion for feasibility. Subjects aged 20 years or older were selected by two-stage stratified random sampling using the same method as in the national survey. The invitation letter and the questionnaire were mailed to subjects and the completed questionnaires were returned by them. We sent a reminder to nonrespondents by postcard and sent a 500 yen (US$4.70) cash voucher to all respondents.

The results of the pilot study showed a response rate of 44% (Figure 2), which was higher than the estimated 35% rate we expected. Moreover, the response rate was higher than 35% in all sex and age groups. For the key question in this study, cancer information seeking, the largest proportion of respondents reported that they looked for cancer information on the “Internet sites (other than National Cancer Center Japan website, “Ganjoho.jp [Cancer Information Service]”)” (Figure 3). On the other hand, the proportion of respondents who answered “A lot” to the question about trust in the cancer information

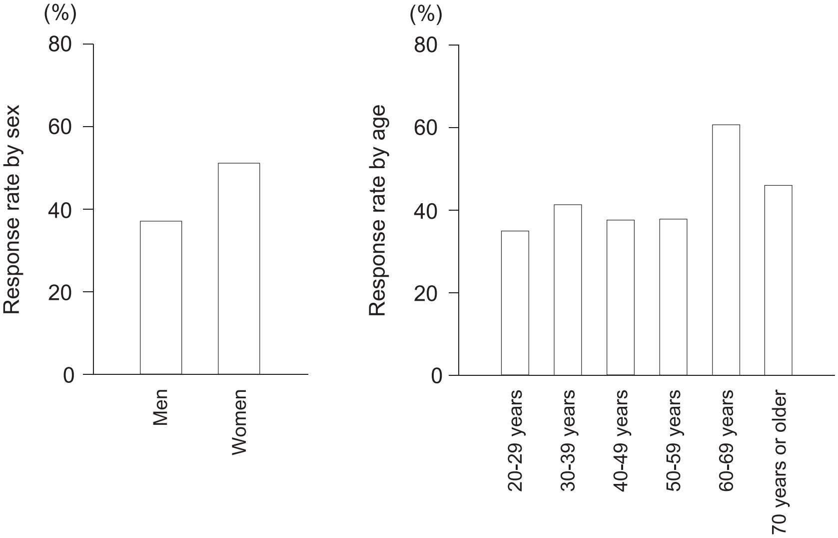


FIGURE 2 Response rates by sex and age groups in the pilot study

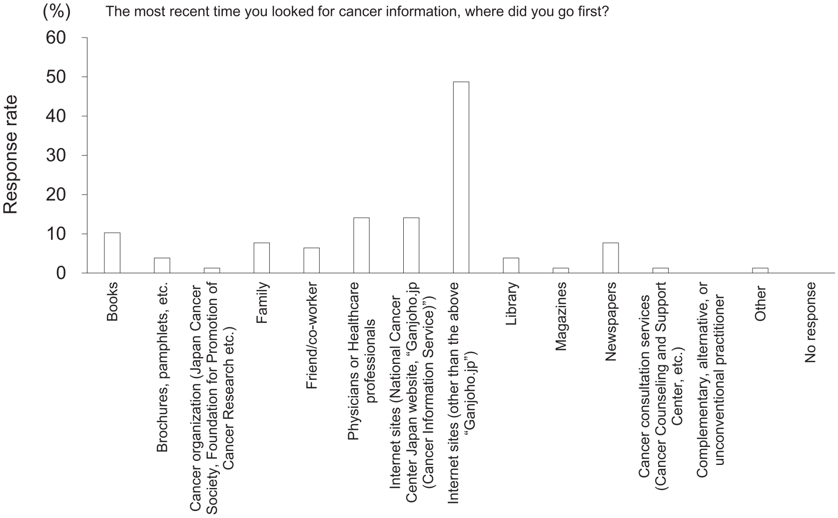


FIGURE 3 Channels which respondents recently accessed first when looking for cancer information in the pilot study

source was low for the Internet and highest for Physicians (Figure 4). As explained in the section on questionnaire modification, some of the results from the question on cancer screening were used to inform modification of the questionnaire for the national survey.

Questionnaire modification

We modified the questionnaire based on the results of the cognitive debriefing process and the pilot study. Cognitive debriefing ensures that the questionnaire respondents understand the intent of the questions and that the questionnaire is culturally acceptable and appropriate

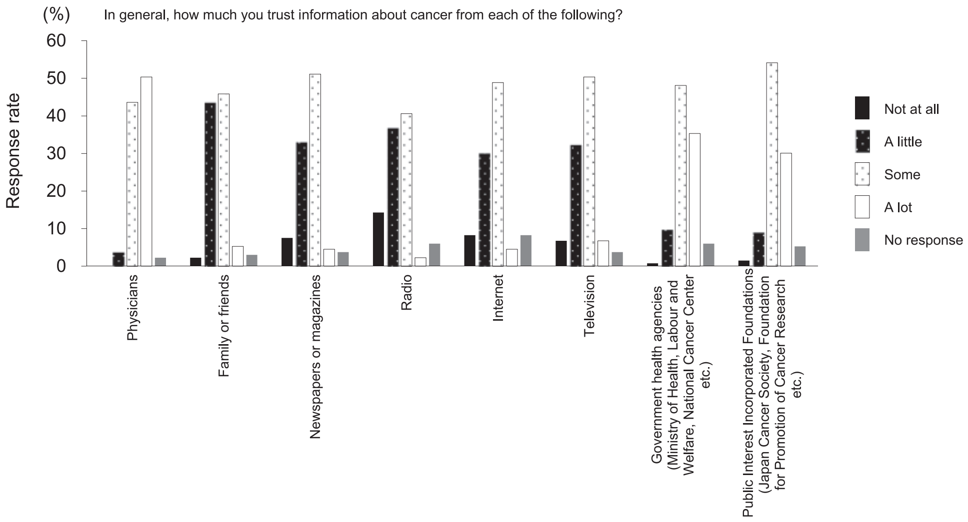


FIGURE 4 Respondents' most trusted sources of cancer information in the pilot study

for the context of the target population. Modifying the text, wording, layout, and so forth of the questionnaire based on the results of cognitive debriefing can reduce the likelihood of multiple interpretations of the questions (Presser et al., 2004). In this study, the cognitive debriefing process was conducted with people who were not researchers or healthcare professionals before the pilot study ($n = 6$; one person each from the 20–70s age deciles; three men and three women) and before the national survey ($n = 22$, 3 in their 30s, 11 in their 40s, 2 in their 50s, 4 in their 60s, 1 in their 70s, 1 in their 80s; one was a cancer survivor; 5 men and 17 women). We asked these volunteers to respond to whether the intent and wording of the items in the questionnaire were easy to understand. If not, we asked why, and revised the questionnaire accordingly.

Responses to the pilot study about the causes of cancer and about cancer screening experiences were used to improve the questionnaire for the national survey, for the following reasons. The pilot survey revealed that a high proportion of respondents did not know the cause of gastric or liver cancer and had not heard of Human Papillomavirus, and a low proportion of respondents had had the hepatitis virus test (Figure 5), which suggested that correct knowledge is lacking even in a population which was considered to have a healthy lifestyle, such as those who responded the questionnaire (Hill et al., 1997; Klesges et al., 1999; Macera et al., 1990). Therefore, to grasp how many people do not know about the type of screening they received, the option "I do not know" was added to the items on gastric cancer and colon cancer screening and hepatitis virus testing experience in the national survey questionnaire. In addition, an item about lung cancer screening experience was added because the Japanese Government recommends lung cancer screening as a health promotion service (Ministry of Health, Labor and Welfare, 2002, 2008).

Data analysis

For the results of the national survey, we will consider whether to adjust for nonresponse bias by weighting (Maitland et al., 2017) using sex and age information in the 35 sampling strata. Imputation for data partially missing from the questionnaire will be also considered.

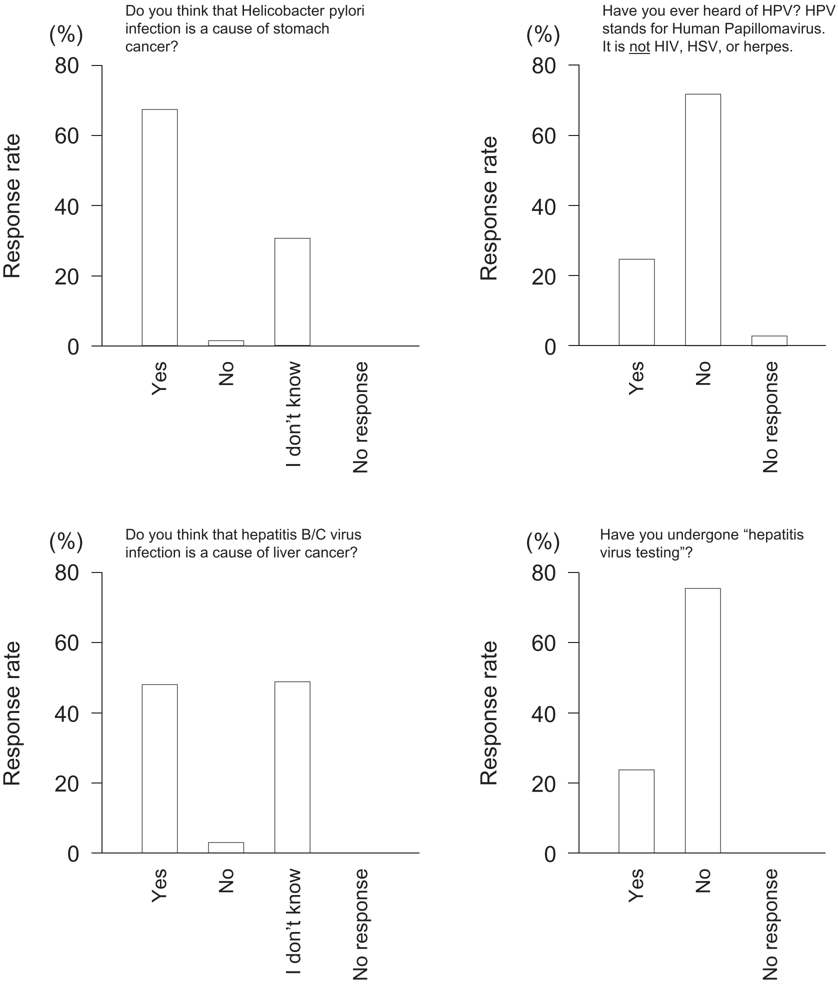


FIGURE 5 Responses about the cause of cancer and cancer screening experiences in the pilot study

The response rate of the questionnaire and the distribution of answers for each item will be described. Related analysis such as cross tabulation and logistic regression analysis will be performed for each research question. We will compare the distribution of responses to the items adopted from the national surveys by the Japanese government with those in the original surveys.

NATIONAL SURVEY AND FUTURE PROSPECTS

The pilot study conducted to assess the feasibility of the national survey had a response rate of 44%, which exceeded the target rate (35%) (Figure 2). We, therefore, determined that the survey method (e.g., mail survey, questionnaire, reminder, voucher) was appropriate, and launched the national survey from August 2020.

A limitation of this study is that answers to the questionnaire, particularly those to questions asking about lifestyle, will be affected by the COVID-19 pandemic. We will estimate the COVID-19 effect to some extent by evaluating answers to section K of the questionnaire (information seeking for and concern about COVID-19). A reduction in effect due to the COVID-19 pandemic will be confirmed by comparisons to similar repeated surveys in the future, and the baseline will be considered by comparison with other national survey data such as the National Comprehensive Survey of Living Conditions (Ministry of Health, Labor and Welfare), National Health and Nutrition Survey (Ministry of Health, Labor and Welfare), and so forth. The second limitation is that information on health behavior is obtained by self-reporting, which does not ensure validity. Nevertheless, knowledge and beliefs can be useful information because they are only available by self-reporting. The third limitation is that the cross-sectional design of our study does not directly demonstrate cause-and-effect relationships. When estimating causal effects, we will use statistical approaches such as propensity score matching analysis to minimize bias due to confounding variables. The fourth limitation is that the data may have been obtained from a healthier than average population (Hill et al., 1997; Klesges et al., 1999; Macera et al., 1990). Therefore, we will examine the generalizability of the results by examining the consistency of common items with those of government surveys (National Comprehensive Survey of Living Conditions, National Health and Nutrition Survey, etc.), which have a higher response rate than is expected for this study.

This will be the first nationwide health communication survey in Japan to monitor cancer information seeking, knowledge, attitudes, beliefs, and behaviors among Japanese. Using data from this national survey, we will identify appropriate primary audiences who are in need of relevant cancer information and identify communication channels to reach these groups by the following steps. First, for each cancer prevention and communication behavior, we will identify multiple target groups who do not engage in recommended cancer prevention (Sasazuki et al., 2018) and screening (Hamashima, 2018) behaviors. We will use the data of responses to the survey to identify relevant audience segments for health communication campaigns according to demographic characteristics (e.g., sex, age, residential area) and personal characteristics (e.g., knowledge, attitudes, beliefs). Second, we will identify the best available communication channels for delivering evidence-based cancer information to each segmented group. Third, the results obtained in this study will be updated by conducting periodic national surveys once every two or three years to identify information access and use trends. In the United States, the iterative data of HINTS is used for the Healthy People 2020 and 2030 initiatives (U.S. Department of Health and Human Services) to evaluate the objectives of health communication and health information technology. In the future, the INFORM Study's findings on trends in the health communication environment will also be implemented into Japan's policies for cancer prevention and control, as is done with HINTS.

Our findings on audience segmentation and communication channels will facilitate tailoring and targeting of messages to each segmented group's needs and interests, which will, in turn, lead to strategic selection of health communication campaigns aimed at promoting important behavior modifications. For example, the results of the pilot study showed that while most Japanese people seek cancer information on the Internet, the most trusted source of information is likely to be physicians (Figure 4). This is in line with the HINTS results (Hesse et al., 2005; Hesse et al., 2010). HINTS showed that access to information and trust in information sources varies according to income, education, age, and sex (Hesse et al., 2005; Richardson et al., 2012). The results of our national survey will allow us to identify the primary audiences in the population who trust physicians. If physicians are actively informed of the characteristics of primary audiences such as sex, age, education, cancer beliefs, and so forth through government health agencies or their relevant professional association or academic societies, it will be easier for them to encourage their patients to undergo cancer screening and improve their lifestyle, including smoking cessation. Similarly, the findings on other communication channels will also be beneficial in the dissemination of information, as mass media information disseminators for the internet, television, radio, and magazines would be able to appropriately reflect the characteristics of the primary audiences in articles and broadcasts. In addition, HINTS reported that people who were confused about cancer prevention recommendations (Han et al., 2007) and had fatalistic beliefs about cancer (Niederdeppe & Levy, 2007) tended to be reluctant to engage in health behaviors. The audience's beliefs may also be useful for the development of tailored messages in Japan.

These approaches are particularly important when aimed at socioeconomically disadvantaged groups. This is because these groups tend to have insufficient knowledge about health information (Espinosa de Los Monteros & Gallo, 2011), which is related to a lack of access to available information and low health literacy (Berkman et al., 2011; McCloud et al., 2016; Perez et al., 2016). By reducing communication inequalities (Finney-Rutten et al., 2011), our findings can contribute to cancer control in Japan.

We are planning the second survey to focus on cancer treatment and survivorship instead of cancer prevention and screening. The government recommends the National Cancer Center's cancer information website for the public ("Ganjoho.jp [Cancer Information Service]") and the "Cancer Consultation Support Centers" at cancer hospitals as information sources for people who face challenges related to cancer diagnosis, treatment, and survivorship (Basic Plan to Promote Cancer Control Programs). However, the pilot survey showed that only 10% of respondents had access to "Ganjoho.jp." The second survey will include awareness of Cancer Information Service and Cancer Counselling and Support Centers, which will provide information to help primary audiences be reached more effectively.

There is also great potential to conduct cross-national comparisons between similar HINTS-based surveys conducted in Japan, China, Germany, and several other countries as part of the INSIGHTS (International Studies to Investigate Global Health Information Trends) research consortium to identify opportunities for international collaboration to promote global cancer prevention and control (Kreps, 2020b). Tracking and comparing access to and use of health information and relevant public health policies across countries with different cancer burdens (Global Burden of Disease Cancer Collaboration et al., 2019; Martikainen et al., 2001) based on political, economic, and cultural factors will help countries identify problems and solutions to optimize health communication and incorporate them into national and local cancer control. In turn, this will help to reduce global inequalities in health. The consortium, if successful, will be the first international comparative study in the field of health communication for cancer control.

In conclusion, this national survey will play an important role in promoting the dissemination of evidence-based recommendations for cancer prevention and control in Japan, and thereby contribute to a significant reduction in the national cancer burden.

AUTHOR CONTRIBUTIONS

Masayo Hayakawa, Kota Katanoda, Tomohiro Matsuda, Yutaka J. Matsuoka, Hirokazu Takahashi, Miyako Takahashi, Manami Inoue, Itsuro Yoshimi, Gary L. Kreps, Yosuke Uchitomi, and Taichi Shimazu designed the project. Aki Otsuki, Junko Saito, Akiko Yaguchi-Saito, Maiko Fujimori, Masayo Hayakawa, Kota Katanoda, Tomohiro Matsuda, Yutaka J. Matsuoka, Hirokazu Takahashi, Miyako Takahashi, Itsuro Yoshimi, Gary L. Kreps, Yosuke Uchitomi, and Taichi Shimazu selected the items in the questionnaire and improved the questionnaire. All authors wrote, reviewed, and approved the manuscript.

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Akiyama (Keio University); Rina Miyawaki (Meiji University); Rie Akamatsu, Yui Kawasaki & Kahori Fujisaki (Ochanomizu University); Hirono Ishikawa, Yoshiharu Fukuda & Runa Ogawa (Teikyo University); Haruhiko Imamura (Toho University); Hiroyuki Sasai & Seigo Mitsutake (Tokyo Metropolitan Institute of Gerontology); Hiroko Noguchi (Musashino University); and Naomi Sakurai (Cancer Solutions Co., Ltd.). We gratefully acknowledge Dr. Richard P. Moser, Dr. Kelly D. Blake, Dr. Bradford W. Hesse (National Cancer Institute), and Prof. Eva Baumann (Hanover University of Music, Drama, and Media) for consulting with us during the instrument development process. This study was supported by the National Center Consortium in Implementation Science for Health Equity (N-EQUITY) funded by the Japan Health Research Promotion Bureau (JH) Research Fund (Number 2019-(1)-4). This project is supported by the National Cancer Center Research and Development Fund (30-A-18; 2021-A-19).

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

No underlying data are associated with this article.

ETHICS STATEMENT

Ethical approval for this study was granted by the Research Ethics Committee of the National Cancer Center (research project numbers: 2018-319 for the pilot study and 2019-290 for the national survey). The results of the national survey will be published in peer-reviewed journals and presented at academic conferences. Additionally, it is possible that the data of the survey will be opened to the public in the future, after approval of the Research Ethics Committee has been obtained.

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Of seekers and nonseekers: Characteristics of Covid-19-related information-seeking behaviors

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Abstract

During health crises like the coronavirus disease 2019 (Covid-19) pandemic, it is crucial that individuals are able and willing to adequately respond to information. Individuals who deliberately seek information have an enhanced capacity to act on it and are capable of informed assessments of risks and self-protective behaviors. In contrast, overexposure to Covid-19 news as well as non-seeking can constitute information-related inequalities and hamper individuals' coping with the health crisis. Having this global health communication challenge in mind, our research aims to understand what characterizes non-, medium, and frequent seekers, considering sociodemographic and socioeconomic factors, health status, affective risk responses, efficacy assessments, trust in information sources, and satisfaction with information. This study is based on data of the second wave of the Health Information National Trends Survey (HINTS) Germany. Among 2602 participants, analysis revealed that 23.3% of the respondents did not actively seek information about Covid-19, while 34.3% of them intensively monitored information. Nonseekers, compared to medium and frequent seekers, were characterized by a lower socioeconomic status, lower affective risk responses, lower perceived information-related self-efficacy, and lower trust in information sources. These findings provide indications for strategic health approaches and can guide initiatives to address adequate use of health information.

KEYWORDS

Covid-19, frequent seeking, information overload, information seeking, informational inequalities, non-seeking, overexposure

Key Points

- Identifying and characterizing groups differing in their frequency of Covid-19 information seeking is relevant since being able and willing to adequately respond to information is crucial for combating health crises.
- 23.3% of respondents of a German representative study did not actively seek information, while 34.3% intensively monitored information about Covid-19.
- Medium and frequent seekers of Covid-19-related information show similar preference patterns regarding the used sources, with public broadcasting being the preferred source of information about Covid-19.
- Nonseekers, compared to medium and frequent seekers, were characterized by a lower socioeconomic status (SES), lower affective risk responses, lower perceived information-related self-efficacy, and lower trust in information sources.
- Planners of informational interventions, health communicators, as well as health professionals, need to be aware of the profiles of nonseekers as well as frequent seekers to find adequate strategies to overcome barriers and design adequate supportive information.

INTRODUCTION

Health crises like the coronavirus disease 2019 (Covid-19) pandemic are characterized by numerous types of uncertainties associated with limited scientific knowledge, a high death rate, and a worldwide spread of the disease (Karlsen & Kruke, 2018; Rosenthal et al., 1989; Song et al., 2021; Tandoc & Lee, 2020). To combat the crisis, not only are medical interventions and public dissemination of information necessary (Bento et al., 2020) but it is also crucial how individuals deal with the available information, which is the focus of the current study (Garfin et al., 2020; Johnson & Case, 2012; Liu, 2020; Zarocostas, 2020). Modes of information transaction (Atkin, 1973) can be distinguished in strategies such as active information seeking—a purposeful acquisition of information from selected information channels and sources (Brashers, 2001; Johnson & Meischke, 1993; Zimmerman & Shaw, 2020)—or information non-seeking, which is a passive form of inattention to information or nonuse of information sources (Atkin, 1973). Whether individuals actively acquire information or remain passive during the Covid-19 pandemic determines their level of knowledge and comprehension of the crisis, their ability to assess the risk Covid-19 poses to their health, their decision to adopt Covid-19 prevention behaviors like maintaining distance, self-isolating at home, or vaccine decision making (Crowley et al., 2021; Garfin et al., 2020; Johnson & Case, 2012; Liu, 2020; Zarocostas, 2020), and their well-being by fostering their management of uncertainties (Capone et al., 2020; Kim et al., 2020; Tandoc & Lee, 2020).

On the one hand, active information seeking about the Covid-19 pandemic is perceived as crucial for combating the crisis, and on the other hand, being frequently confronted with news and permanently monitoring information about Covid-19 might be associated with potential risks such as information overload and overexposure, information and health anxiety, a higher probability of being confronted with misinformation, and more negative beliefs and affect (Kim et al., 2020; Roussi & Miller, 2014; Skarpa & Garoufallou, 2021; Soroya et al., 2021; Tull et al., 2020).

Non-seeking of health information, in contrast, might serve as a countermeasure for anxieties and fears triggered by information (Soroya et al., 2021) and the accumulative psychological distress of overexposure to Covid-19 news (Mohammed et al., 2021; Qu et al., 2021). While non-seeking enables individuals to remain calm (Gallotti et al., 2020; Garrett, 2020), it is also associated with missing novel and vital information, underestimating the risks posed by Covid-19, reducing compliance with self-protective behaviors (Siebenhaar et al., 2020), and increased informational, health, and social inequalities (Viswanath & Kreuter, 2007).

Against the larger context of informational and communication inequalities associated with the chosen mode of information transaction during the pandemic (Atkin, 1973; Ramanadhan & Viswanath, 2006), this study aims to understand the prevalence and predictors of non-, medium, and frequent information seeking more deeply and, thus, how the German public manages information about Covid-19. Whereas current research identifies various thematic patterns of information seeking (e.g., Mangono et al., 2021) or predicts information seeking or avoidance (e.g., Kim & Hong, 2021; Link, 2021b; Soroya et al., 2021), our study aims to develop and compare profiles of frequent, medium, and nonseekers. Such a focus on various profiles distinguished by their frequency of information seeking is crucial to assess the outlined risks of overexposure and non-use. The profiles of frequent, medium, and nonseekers during the Covid-19 pandemic in Germany are characterized by predictors proven relevant to explain health information-seeking behaviors (HISBs; Ramanadhan & Viswanath, 2006; Wang et al., 2021; Zimmerman & Shaw, 2020): sociodemographic and socioeconomic factors, individuals' health status and affective risk response, their abilities to search for information, their trust in various information sources, and satisfaction with information. Comparing characteristics along these determinants provides insights for developing appropriate health communication strategies to adequately address different groups, that is, to reach nonseekers and improve individuals' empowerment for decision making. Further, knowledge about the characteristics of non-, medium, and frequent seekers sheds light on the underlying factors contributing to informational inequalities. These are critical efforts in health promotion (Kreps, 2008) and in combating national and global health crises.

Information seeking and non-seeking during the Covid-19 pandemic

Focusing on the modes of information transaction, Aktin (1973) distinguishes several classes of information exposure and nonexposure. All of them are cognitive and communicative activities (Brashers et al., 2000, 2002; Case, 2007) distinguished by their purposefulness, their costs, that is, the effort to perform a particular behavior, and their expected rewards. For our study, we did not focus on the ratio between effort and reward of various information behaviors, but highlighted the frequency at which individuals seek information about the Covid-19 pandemic. We understand the frequency of information seeking as relevant to acquire up-to-date information during a rapidly developing pandemic and reflect the frequency against the background of challenges such as information overload and knowledge deficits prevalent during the pandemic (Mohammed et al., 2021; Skarpa & Garoufallou, 2021; Soroya et al., 2021). Based on the frequency and associated challenges, two classes of information transaction are of relevance: the modes of active information seeking and of information non-seeking, which are further described in the following paragraphs.

Active information seeking is understood as the purposeful acquisition of information from selected information channels and sources to achieve certain goals like knowledge gain, attitude formation, decision making, or coping with uncertainties (Brashers, 2001; Johnson & Meischke, 1993; Zimmerman & Shaw, 2020). Information seeking is an actively determined, effortful behavior with high expected rewards (Atkin, 1973). Current studies in Germany, as our country of reference, as well as in other countries describe information seeking as very prevalent during the Covid-19 pandemic, particularly, during its early phase (Bento et al., 2020; Jurkowitz & Mitchell, 2020; van Eimeren et al., 2020). A German trend study showed for the period between March 2020 and October 2021 that between 52% and 76% of the German Internet users searched often or very often for Covid-19 information (COSMO, 2021).

According to Galarce and colleagues (2011), information seeking can be described as a complex, multistage process, defined by the triggers that cause information needs, the perceptions of which sources and information can contribute to meet these needs, the selection and use of sources, and the outcomes of the information search (Galarce et al., 2011; Link et al., 2021). A key component of the process of information seeking is the choice of a useful information source among a wide range of available interpersonal sources and media channels (Galarce et al., 2011). The source selection is determined by source characteristics such as access to expertise, tailorability, anonymity, or convenience, which are different in various sources (Rains & Ruppel, 2016). The most common sources individuals used during the Covid-19 pandemic include the Internet characterized by high tailorability, anonymity, and access to expertise, traditional media like newspapers and public broadcasting services providing access to expertise in a convenient and anonymous form (van Eimeren et al., 2020), and family and friends characterized by high convenience (Ho et al., 2020; Soroya et al., 2021). First findings on Covid-19 information overload suggest that it is associated with source selection. In particular, individuals who receive information via public broadcasting were more likely to report information overload (Mohammed et al., 2021).

The converse of information seeking is called *non-seeking*, information ignoring, or disinterest in information (Atkin, 1973; Lambert et al., 2009; Narayan et al., 2011; Ramanadhan & Viswanath, 2006). It is a passive form of inattention to information or nonuse of information sources. Non-seeking occurs when information is perceived as not worthy of expending the resources necessary to obtain and process them (Atkin, 1973). Therefore, it is assumed to be driven by a limited interest or by a lack of perceived personal relevance of certain information (Atkin, 1973; Lambert et al., 2009). Non-seeking is distinct from information avoidance, which can also be understood as a type of nonselection. However, information avoidance is a deliberate decision to avoid attention and exposure to certain information (Howell et al., 2014; Sweeny et al., 2010), which is assumed to be less frequent than non-seeking (Atkin, 1973). In contrast to the number of studies focusing on information-seeking behaviors, the state of research on non-seeking behaviors is scarce (Link, 2021a). Concerning the Covid-19 pandemic, recent studies reported that a significant number of individuals needed a break from news about Covid-19 (Siebenhaar et al., 2020; Soroya et al., 2021; Tandoc & Lee, 2020). For a German online sample, it was shown that the proportion of people who never or rather seldomly search for information about Covid-19 varies between 8% and 23% in the period between March 2020 and October 2021 (COSMO, 2021). A German examination of HISB in a broader health context identifies one in five as nonseekers (Link, 2021a), while based on the US sample of the Health Information

National Trends Survey (HINTS) nearly half of the respondents are categorized as nonseekers of cancer information (Ramanadhan & Viswanath, 2006).

Based on the current state of research, there is a need to examine the prevalence of the three groups of non-, medium, and frequent seekers of information about Covid-19 in the German population. With this study, we address this research gap. Besides the first research objective to describe how frequently German residents access information about the Covid-19 pandemic (research question 1, RQ1), we also ask which sources medium and frequent seekers turn to (research question 2, RQ2). Therefore, we state the following research questions:

RQ1: How prevalent are frequent-, medium-, and non-seeking of information about the Covid-19 pandemic among German residents?

RQ2: Which information sources do German residents use when searching for information about the Covid-19 pandemic, depending on their status as frequent or medium seekers?

Profiles of non-, medium, and frequent seekers

To learn more about non-, medium, and frequent seekers among German residents and to distinguish who is reached or remains unreached by information publicly distributed, we consider predictors proven relevant to explain HISBs (Ramanadhan & Viswanath, 2006; Wang et al., 2021; Zimmerman & Shaw, 2020): sociodemographic and socioeconomic factors, health status and affective risk response, information- and health-related self-efficacy, trust in various information sources, and satisfaction with information. We will elaborate on these factors below.

We consider *sociodemographic and socioeconomic characteristics* such as age, gender, and SES as they are known determinants of HISB (Lambert & Loiselle, 2007; Link et al., 2021; Zimmerman & Shaw, 2020) and provide insights about information disparities regarding the question which groups of people have higher or lower willingness and abilities to engage in HISB. Extant research distinguishing seekers and nonseekers found differences in the profiles of seekers and nonseekers linked to age, gender, and education (Link, 2021a; Ramanadhan & Viswanath, 2006). Individuals with a higher interest in health information are found to be more often female, younger, and highly educated, whereas a lower SES was found to be associated with a higher probability of information overload (Kim et al., 2007).

Health status and affective responses to risk perceptions are also considered to be predictors of HISB (Griffin et al., 1999; Kahlor, 2010). We assume that both determine the personal relevance of information about the Covid-19 pandemic and impact individuals' willingness to engage with information relevant to acquire adequate knowledge and understanding about the pandemic (Lanciano et al., 2020; Magnan et al., 2021; Tull et al., 2020). Whereas research about the role of the individual health status remains heterogeneous, affective risk responses like concerns and worries are an integral predictor in various models like the Risk Information Seeking and Processing Model (Griffin et al., 1999; Wang et al., 2021; Yang et al., 2014). Affective risk responses are experiences of negative or positive feelings triggered by cognitive judgments of the perceived health threats posed (Kahlor, 2010), for example, by Covid-19. Negative risk responses are known to motivate an individual to seek information about the risk, particularly when the threat is likely to be realized (Griffin et al., 1999; Kahlor, 2010; Yang & Kahlor, 2013), and motivate actions how to behave on the risk, for example, engage in protective behaviors such as hand washing or social distancing to mitigate the spread of Covid-19 (Magnan et al., 2021).

Efficacy assessments are another integral part of models explaining HISB (Afifi & Weiner, 2004; Rimal & Real, 2003), particularly *information- and health-related self-efficacy*. Information-related self-efficacy describes an individual's perception of possessing the ability to perform health information seeking or complete communication tasks (Afifi & Weiner, 2004), whereas health-related self-efficacy describes an individual's confidence in their ability to take good care of their health. Both are assumed to be relevant to fight and prevent informational, health, and social inequalities as it is known that both perceived competencies lead to more active engagement, higher interest, motivation, and use of health information (Afifi & Weiner, 2004; Anker et al., 2011; Krantz et al., 1980). In contrast, a lack of self-efficacy or a drop of self-efficacy beliefs during the Covid-19 pandemic (Ritchie et al., 2020) might be a reason for non-seeking and may distinguish nonseekers from seekers.

Channel beliefs (Griffin et al., 1999) such as *trust in information sources* are another cognitive factor associated with HISB (Johnson & Meischke, 1993; Ramanadhan & Viswanath, 2006; Wang et al., 2021). During the Covid-19 pandemic, the question of which sources individuals trust is considered particularly critical as trust is associated not only with exposure to certain sources but also with belief in false information (Melki et al., 2021). Moreover, findings show that nonseekers perceive information sources as less trustworthy than information seekers (Ramanadhan & Viswanath, 2006) and indicate that individuals are more likely to consult multiple information sources when they do not trust a single one (Soroya et al., 2021), which could be related to more frequent information seeking. Thus, both non-seeking and frequent information seeking may be expressions of distrust.

Given the enormous amount and partially problematic quality of information on Covid-19 (Eysenbach, 2020), we not only consider individuals' trust in various information sources but also include *satisfaction with the available information* to characterize groups of non-, medium, and frequent seekers. Thus, we also aim to analyze how individuals perceive the available information and the information environment and how this shapes their HISB.

To sum up, our third objective is to identify and examine the profiles of non-, medium, and frequent seekers. Therefore, we developed the following research question:

RQ3: How can non-, medium, and frequent seekers be characterized in relation to sociodemographic factors, SES, health status, affective risk responses, information-related and health-related self-efficacy, trust in various information sources, and satisfaction with the available information?

METHODS

Survey transfer and adaptation

HINTS Germany is a franchise trademark of HINTS US and was started in 2018 as a cooperative project between the Hanover Centre for Health Communication and the Stiftung Gesundheitswissen, Berlin. This way, a close methodological analogy to the HINTS US original was intended, while simultaneously considering national conditions necessitating adaptations.

HINTS Germany is based on the questionnaire of HINTS 5, Cycle 1, which was translated using the TRAPD-framework (Translation, Review, Adjudication, Pretest and Documentation) in a "team translation" approach (for details, see Survey Research Center, 2016). Thereafter, a cognitive pretest ($n = 13$) and a field pretest ($n = 47$) were conducted to detect possible comprehension problems. Other than HINTS 5, Cycle 1 using a mail survey as a mode of data collection, we switched to a telephone survey (computer-assisted telephone interviewing [CATI]), since Germany has no central address registry and online panels usually lack representativeness. For further information about HINTS Germany, please see Baumann et al. (2020).

Based on the first wave conducted in 2019, the second wave of HINTS Germany was fielded from May to August 2020. We again used a CATI approach, but made some changes to the questionnaire (e.g., we included four questions adopting general health- or cancer-related questions to Covid-19-related information seeking). In total, 2602 respondents participated in the second wave, where the median interview length was 32 min and the response rate was 19.4%. The mean age was 48.28 (*SD* = 16.98) and 50.1% of the sample were female.

Measures

Dependent variable: Frequency of active Covid-19-related HISB

The frequency of Covid-19-related HISB was assessed with one item asking for the number of times the respondents have been searching for Covid-19-related information during the 30 days before the interview. The participants were asked to assess the frequency on a scale ranging from 1 ("never") to 6 ("more than once a day"). To supplement the description of individuals' HISB, respondents were asked to report the *sources of information* they used most frequently when searching for information about Covid-19 (Table 1). Both questions were not adapted from HINTS US, but developed for the second wave of HINTS Germany, which included some items with a specific focus on the Covid-19 pandemic.

Independent variables

As *sociodemographic variables*, we included gender and age. Further, the SES of the respondents was calculated as a function of the weighted household income and the level of education, indicating a low, medium, or high SES.

Adopted from HINTS US, *general health status* was assessed with a validated item asking the respondents to rate their health on a five-point Likert-type scale ranging from 1 ("very good") to 5 ("very bad"). To measure affective risk responses, respondents were asked to rate their level of concern and worry about the risk posed by the Covid-19 pandemic on a five-point Likert-type scale ranging from 1 ("not concerned at all") to 5 ("very concerned"). This item was adopted from the cancer context captured in the HINTS US to the context of Covid-19 relevant in the second wave of HINTS Germany.

The considered types of *self-efficacy* were measured in line with the HINTS US measurements. Per efficacy assessment, a single item was used. Information-related self-efficacy was assessed by asking for the respondents' self-rated confidence in their ability to get information about health or medical topics if they needed it. Participants' health-related self-efficacy was assessed with an item asking for their self-rated confidence in their ability to take good care of their health. The applicability of both self-efficacy statements was measured on five-point Likert-type scales ranging from 1 ("not confident at all") to 5 ("completely confident").

The *trust in health information from eleven sources* (e.g., doctors, family and friends, diverse media sources; see Table 2) was evaluated as in the HINTS US with a single item per source using a five-point Likert-type scale ranging from 1 ("not at all") to 5 ("very strong").

The level of satisfaction with information about Covid-19 was also assessed using a five-point Likert-type scale ranging from 1 (“very dissatisfied”) to 5 (“very satisfied”). This item was also developed for the second wave of HINTS Germany and not adopted from HINTS US.

Data analysis procedures

To examine the prevalence of frequent to non-seeking behavior (RQ1) as well as to describe which sources are preferred by medium and frequent seekers (RQ2), descriptive statistics were computed for all the included variables. To answer RQ3 aiming to characterize frequent, medium, and nonseekers, we calculated the analysis of variance with the types of information-seeking behavior as an independent factor and the characterizing variable as the dependent variable. Due to the widespread absence of homogeneity of variances among the independent variable distinguishing the types of frequent to non-seeking, post hoc tests were conducted with Tamhane's *T*2. All analyses were performed using SPPS® (version 27). Missing values were deleted list-wise and Type I error rate was set to 0.05 across all analyses. To counteract the problem of multiple comparisons, we calculated the Bonferroni–Holm-corrected α-levels (see Table 3). Weights were calculated using data from the 2016 German Mikrozensus on age, sex, level of education, and place of residence. Additionally, these weights were calibrated to population totals by calculating 50 Jackknife replicate weights for each case, to reduce the sampling variance of estimators (Baumann et al., 2020; Westat, 2017).

RESULTS

The prevalence and preferred sources of non-, medium, and frequent seekers

The first research question (RQ1) aimed to describe the prevalence of non-seeking to frequent seeking of information. The mean of Covid-19-related information seeking was $M = 3.40$ ($SD = 1.66$), showing that respondents on average searched between one and several times per week. To distinguish between frequent, medium, and nonseekers, we divided the respondents into three groups. The first was the nonseekers of Covid-19-related information, which comprised a group of 23.3% respondents ($n = 606$). The second group was labeled medium seekers and comprised participants who reported seeking information less than once a week to several times a week. This group was most prevalent, with 42.4% ($n = 1102$). The third group comprised the frequent seekers, who reported monitoring news and actively seeking information daily or several times a day. Frequent seekers accounted for 34.3% ($n = 890$).

To answer the second research question (RQ2) regarding the preferred information sources of medium and frequent seekers, we found similar patterns for both types (see Table 1). Across both groups, public service broadcasting and its online offerings were most often the preferred source for information about Covid-19. More than one respondent in three (37.7%) preferred public broadcasting. Frequent-seekers (44.2%) relied on these offerings more than medium seekers (32.5%). National and weekly newspapers and their online offerings (15.3%), traditional media sources on social media (14.7%), and the Internet and search engines (11.9%) were mentioned by more than 10% of the respondents. The share of individuals preferring newspapers was comparable between medium seekers (15.4%) and frequent seekers (15.3%), traditional media on social media (medium seekers:

TABLE 1 Preferred information sources by frequency of Covid-19-related HISB

	Covid-19-related HISB frequency		
	Medium seekers, *n* (%)	Frequent seekers, *n* (%)	Total, *n* (%)
Public service broadcasting and its online offerings	356 (32.5)	386 (44.2)	742 (37.7)
National newspapers, weekly newspapers, and their online offerings	168 (15.4)	134 (15.3)	302 (15.3)
Traditional media on social media	180 (16.5)	109 (12.5)	289 (14.7)
Internet in general, search engines	153 (14.0)	81 (9.3)	234 (11.9)
Information from administration, research facilities, politicians, and scientists	113 (10.3)	70 (8.0)	183 (9.3)
Radio stations and their online offerings	62 (5.7)	61 (7.0	123 (6.3)
Other	62 (5.6)	33 (3.7))	95 (4.8)
Total	1094 (100.0)	874 (100.0)	1968 (100.0)

Note: $N = 1968$; associations between Covid-19-related HISB frequency and preferred information source: $X^2 = 48.5$, $p < 0.001$; Cramer's $V = 0.157$, $p < 0.001$.

Abbreviations: Covid-19, coronavirus disease 2019; HISB, health information-seeking behavior.

16.5% vs. frequent-seekers: 12.5%), and the Internet and search engines (medium seekers: 14.0% vs. frequent seekers: 9.3%) were more often preferred by medium seekers than by frequent seekers (see Table 1). Further sources the participants mentioned were information from the administration, research facilities, politicians, and scientists (9.3%) and radio stations and their online offerings (6.3%). Frequent seekers (7.0%) more often reported radio stations to be relevant than medium seekers (5.7%), whereas medium seekers (10.3%) preferred to turn to information from the administration, research facilities, politicians, and scientists, compared to frequent seekers (8.0%).

Profiles of non-, medium, and frequent seekers

Research question 3 (RQ3) was concerned with describing and comparing the profiles of non-, medium, and frequent seekers (see Tables 2 and 3). Comparing the types of seekers with reference to their sociodemographic factors, we found that frequent-seekers ($M = 54.95$; $SD = 15.86$) were about 10 years older than medium seekers ($M = 44.28$; $SD = 16.00$) and nonseekers ($M = 45.75$; $SD = 17.34$). This difference between frequent seekers on the one hand and medium and nonseekers on the other was significant (F (2, 2594) = 115.23, $p < 0.001$, $\eta^2 = 0.082$). The share of females was higher among the medium seekers (52.0%) and frequent seekers (50.0%), compared to the nonseekers (46.8%). Respondents with a low SES were overrepresented in the group of the nonseekers (36.5%), compared to medium seekers (25.6%) and frequent seekers (22.5%). In turn, high SES was seldom found in the group of nonseekers (16.7%).

Regarding the perceived health status, we found that all groups evaluated their health status as good, with nonseekers perceiving it as slightly better ($M = 2.06$, $SD = 0.88$) than frequent seekers ($M = 2.18$, $SD = 0.88$), but the difference was not significant after α-correction. The more situation-bound affective responses to the Covid-19 pandemic were in line with these general perceptions. Nonseekers reported to be less concerned about

TABLE 2 Descriptive group characteristics and differences by frequency of Covid-19-related HISB

	Covid-19-related HISB frequency			
	Nonseekers, *M* (SD)	**Medium seekers, *M* (SD)**	**Frequent seekers, *M* (SD)**	**Total, *M* (SD)**
Age	45.75 (17.34)^{a}	44.28 (16.00)^{b}	54.95 (15.86)$^{a, b}$	48.28 (16.98)
Gender (% female)	46.8	52.0	50.0	50.1
SES (% low)	36.5	25.6	22.5	27.1
SES (% medium)	46.8	46.7	47.3	46.9
SES (% high)	16.7	27.7	30.2	26.0
General health status[a]	2.06 (0.88)	2.11 (0.83)	2.18 (0.88)	2.12 (0.86)
Health-related self-efficacy[b]	4.08 (0.89)	4.03 (0.77)^{a}	4.14 (0.87)^{a}	4.08 (0.84)
Information-related self-efficacy[b]	3.43 (1.05)^{a}	3.53 (0.87)^{b}	3.65 (0.87)$^{a, b}$	3.55 (0.92)
Affective risk responses[c]	2.51 (1.30)$^{a, b}$	3.06 (1.13)$^{a, c}$	3.54 (1.15)$^{b, c}$	3.10 (1.24)
Trust in health information from				
A doctor[d]	3.98 (1.11)$^{a, b}$	4.14 (0.89)^{a}	4.23 (0.89)^{b}	4.13 (0.95)
Family and friends[d]	3.15 (1.20)	3.08 (1.02)	3.21 (1.03)	3.14 (1.07)
Newspapers[d]	2.48 (1.15)$^{a, b}$	2.80 (0.98)^{a}	2.88 (1.07)^{b}	2.75 (1.06)
Other health professionals[d]	3.49 (1.25)$^{a, b}$	3.85 (0.91)^{a}	3.84 (1.00)^{b}	3.76 (1.04)
The Internet[d]	2.51 (1.10)$^{a, b}$	2.70 (0.97)^{a}	2.73 (1.12)^{b}	2.67 (1.06)
Social media[d]	1.79 (1.10)	1.85 (0.96)	1.90 (1.10)	1.85 (1.04)
TV[d]	2.62 (1.20)$^{a, b}$	2.89 (1.00)$^{a, c}$	3.09 (1.07)$^{b, c}$	2.90 (1.09)
Books[d]	2.88 (1.26)$^{a, b}$	3.21 (1.18)^{a}	3.12 (1.22)^{b}	3.10 (1.22)
Public health authorities[d]	3.28 (1.41)$^{a, b}$	3.79 (1.12)^{a}	3.79 (1.11)^{b}	3.67 (1.21)
Nonprofit organizations[d]	2.74 (1.22)$^{a, b}$	3.16 (0.97)$^{a, c}$	3.03 (1.09)$^{b, c}$	3.02 (1.08)
Health insurance funds[d]	3.29 (1.25)	3.38 (1.05)	3.46 (1.15)	3.39 (1.14)
Satisfaction with information about COVID-19[e]	3.53 (1.25)^{a}	3.53 (1.02)^{b}	3.69 (1.14)$^{a, b}$	3.59 (1.12)

Note: Data represent means (standard deviations) of the respective five-point scales. Exceptions are gender and SES. Same letters (a, b, c) indicate significant differences ($p < 0.05$) in post hoc tests using Tamhane $T2$.

Abbreviations: Covid-19, coronavirus disease 2019; HISB, health information-seeking behavior.

[a] Scale ranging from 1 ("very good") to 5 ("very bad").

[b] Scale ranging from 1 ("not confident at all") to 5 ("completely confident").

[c] Scale ranging from 1 ("not concerned at all") to 5 ("very concerned").

[d] Scale ranging from 1 ("not at all") to 5 ("a lot").

[e] Scale ranging from 1 ("very dissatisfied") to 5 ("very satisfied").

TABLE 3 Summary of differences among means of groups of Covid-19-related HISB frequency and effect sizes (ANOVAs)

	ANOVA			Post hoc test: Tamhane *T*2			Effect size	
Variables	***F* (*df*1, *df*2)**	***p***	α_{corr}	**Nonseekers versus medium seekers**	**Nonseekers versus frequent seekers**	**Medium seekers versus frequent seekers**	η^2	ε^2
Age	115.23 (2, 2594)	<0.001	0.003	1.477	−9.191***	−10.668***	0.082	0.081
General health status	3.438 (2, 2561)	0.032	0.025	−0.047	−0.116*	−0.069	0.003	0.002
Health-related self-efficacy	4.771 (2, 2589)	0.009	0.010	0.049	−0.067	−0.116*	0.004	0.003
Information-related self-efficacy	9.817 (2, 2569)	<0.001	0.006	−0.100	−0.212***	−0.112*	0.008	0.007
Affective risk responses	135.789 (2, 2575)	<0.001	0.003	−0.544***	−1.025***	−0.480***	0.095	0.095
Trust in health information from								
A doctor	12.959 (2, 2587)	<0.001	0.006	−0.160**	−0.254***	−0.093	0.010	0.009
Family and friends	3.665 (2, 2567)	0.026	0.013	0.073	−0.057	−0.131*	0.003	0.002
Newspapers	28.095 (2, 2530)	<0.001	0.004	−0.321***	−0.409***	−0.088	0.022	0.021
Other health professionals	27.936 (2, 2570)	<0.001	0.005	−0.362***	−0.353***	0.009	0.021	0.021
The Internet	7.824 (2, 2415)	<0.001	0.007	−0.184**	−0.218**	−0.034	0.006	0.006
Social media	1.863 (2, 2.402)	0.155	0.05	−0.057	−0.111	−0.053	0.002	0.001
TV	34.792 (2, 2556)	<0.001	0.004	−0.274***	−0.475***	−0.201***	0.027	0.026
Books	12.960 (2, 2372)	<0.001	0.005	−0.324***	−0.233**	0.092	0.011	0.010
Public health authorities	41.031 (2, 2544)	<0.001	0.003	−0.506***	−0.513***	−0.008	0.031	0.030
Nonprofit organizations	28.669 (2, 2434)	<0.001	0.004	−0.427***	−0.298***	0.129*	0.023	0.022
Health insurance funds	3.618 (2, 2527)	0.027	0.017	−0.092	−0.164*	−0.072	0.003	0.002
Satisfaction with information about Covid-19	5.483 (2, 2551)	0.004	0.008	−0.004	−0.157*	−0.152**	0.004	0.003

$^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

Abbreviations: α_{corr}, Bonferroni–Holm-corrected α-level; ANOVA, analysis of variance; Covid-19, coronavirus disease 2019; HISB, health information-seeking behavior.

Covid-19 ($M = 2.51$, $SD = 1.30$) than medium seekers ($M = 3.06$, $SD = 1.13$) and frequent seekers ($M = 3.54$, $SD = 1.15$). These differences among all the three groups were significant and explained a rather high amount of variance, F (2, 1575) = 135.79, $p < 0.001$, $\eta^2 = 0.095$.

Regarding the types of self-efficacy considered to characterize nonseekers to frequent seekers, a linear trend across the frequency of seeking behaviors was supported for information-related self-efficacies. Nonseekers evaluated their competencies as the lowest ($M = 3.43$, $SD = 1.05$), vis-a-vis medium seekers ($M = 3.53$, $SD = 0.87$) and frequent seekers ($M = 3.65$, $SD = 0.87$). The differences between nonseekers/medium seekers and frequent seekers were significant, but rather small (F (2, 2569) = 9.82, $p < 0.001$, $\eta^2 = 0.008$). The self-assessed health-related self-efficacy was relatively high across all the groups considered. We found a significant, but rather weak difference (F (2, 2589) = 4.77, $p = 0.009$, $\eta^2 = 0.004$), between medium seekers who reported the lowest level of confidence ($M = 4.03$, $SD = 0.77$) and frequent seekers who felt most confident ($M = 4.14$, $SD = 0.87$).

Concerning the amount of trust in health information from different sources, all differences among the three groups reached statistical significance at the 95% level, with the exception of trust in health information from social media and health insurance funds (see Tables 2 and 3). We found similar patterns regarding the ranking of the trustworthiness of the sources, with different levels of trust among non-, medium, and frequent seekers (see Tables 2 and 3). Across all the groups, doctors, other health professionals, public health authorities, health insurance funds, and family and friends were evaluated as the most trustworthy (see Table 2). Doctors, in particular, were reported to be the most trustworthy source for frequent seekers ($M = 4.23$, $SD = 0.89$), medium seekers ($M = 4.14$, $SD = 0.89$), and nonseekers ($M = 3.98$, $SD = 1.11$).

Focusing on the levels of trust, our findings consistently showed that nonseekers reported the lowest levels of trust among 10 out of 11 sources and differed significantly, albeit weakly from medium and frequent seekers (see Table 3). Nonseekers perceived Covid-19-related information from doctors, newspapers, other health professionals, the Internet, books, public health authorities, and nonprofit organizations as less trustworthy than medium and frequent seekers (see Table 2). Only regarding trust in health information from family and friends, nonseekers scored slightly higher ($M = 3.15$, $SD = 1.20$) than medium seekers ($M = 3.08$, $SD = 1.02$), but still lower than frequent-seekers ($M = 3.21$, $SD = 1.03$). Considering the corrected α-levels, the difference was not significant (F (2, 2567) = 3.67, $p = 0.026$, $\alpha_{\text{corr}} = 0.013$, $\eta^2 = 0.003$).

Frequent seekers showed the highest scores regarding trust in health information from newspapers ($M = 2.88$, $SD = 1.07$), the Internet ($M = 2.73$, $SD = 1.12$), and TV ($M = 3.09$, $SD = 1.07$), compared to the other two groups (see Table 2). Medium seekers showed the highest trust scores in information from health professionals besides doctors ($M = 3.85$, $SD = 0.91$), books ($M = 3.21$, $SD = 1.18$), and nonprofit organizations ($M = 3.16$, $SD = 0.97$), compared to the other two groups (see Table 2). Both medium seekers ($M = 3.79$, $SD = 1.12$) and frequent seekers ($M = 3.79$, $SD = 1.11$) reported equally high levels of trust in health information from public health authorities, while nonseekers expressed lower trust levels ($M = 3.28$, $SD = 1.41$).

Regarding satisfaction with the available information about Covid-19, we found small, but significant differences among the three groups (F (2, 2,551) = 5.48, $p = 0.004$, $\eta^2 = 0.004$). The post hoc test showed that frequent seekers, who showed the highest satisfaction with the available information about Covid-19 ($M = 3.69$, $SD = 1.14$), significantly differed from nonseekers ($M = 3.53$, $SD = 1.25$) and medium seekers ($M = 3.53$, $SD = 1.02$).

DISCUSSION

Based on the assumption that information seeking plays a critical role not only in coping with health risks and uncertainties and health promotion (Brashers, 2001; Ramanadhan & Viswanath, 2006) but also in combating health crises like the Covid-19 pandemic (Garfin et al., 2020; Liu, 2020), the objective of this study was to examine information-seeking behaviors during the Covid-19 pandemic. We paid particular attention to identifying and characterizing groups differing in their frequency of actively seeking information about Covid-19. We compared non-, medium, and frequent seekers, which is crucial as they differ in their level of attention to information and emerging challenges such as information overload and knowledge deficits relevant for combating health crises such as the Covid-19 pandemic (Skarpa & Garoufallou, 2021; Soroya et al., 2021).

Our first research question (RQ1) sought to ascertain how prevalent frequent-, medium-, and noninformation-seeking about Covid-19 were in Germany. Supplementing the current state of knowledge by first representative German findings (COSMO, 2021; Link et al., 2021), our analysis revealed that 23.3% of the respondents did not actively seek information about Covid-19 at all, while 34.3% intensively monitored information about the pandemic. Compared to the COSMO study conducted via an online-access panel (COSMO, 2021), our scores suggest that previous studies overestimated the proportion of seekers and underestimated the proportion of nonseekers during the Covid-19 pandemic. Rather, the proportions of nonseekers are comparable to findings on general HISB (Link, 2021a). However, more than one-fifth not seeking information during a health crisis can be evaluated as a relatively high share of the population, considering that the Covid-19 outbreak is a global emergency posing potentially life-threatening risks to everybody. Not keeping abreast of information on the topic can increase the risk of missing important news and information related to the pandemic, of biased processing of information one receives incidentally, as a result of biased risk assessment (Crowley et al., 2021; Siebenhaar et al., 2020; Soroya et al., 2021). However, it is not only non-seeking that should be critically reflected upon but it is also essential to question whether a very frequent engagement and monitoring of information can negatively impact individuals coping with the pandemic. The share of 34.3% who monitored information about the pandemic several times a day are more at risk for a decrease in well-being, sensing information overload or information anxiety, impeding successful coping and functional decision making (Roussi & Miller, 2014; Tull et al., 2020).

RQ2 focused on information seekers and sought the preferred source of information about Covid-19 among medium and frequent seekers. We found similar preference patterns in both groups. Consistent with previous German studies (van Eimeren et al., 2020), public broadcasting was the preferred source of information about Covid-19, but its role was more dominant in the group of frequent seekers, which should be interpreted against the background that the use of public broadcasting was found to be associated with higher information overload (Mohammed et al., 2021). In contrast, the medium seekers more often preferred traditional media on social media, the Internet, and information from administrations, research facilities, politicians, and scientists. The difference may be explained by a greater affinity for online sources associated with the 10 years age difference between the two groups. Another explanation is the source characteristics (Rains & Ruppel, 2016). In particular, the Internet provides the medium seekers with an opportunity to search for information in a very targeted and goal-oriented way and provides access to expertise (Rains & Ruppel, 2016). In contrast, the frequent seekers may acquire information that is less goal-oriented, but may concentrate on a few sources they routinely access several times a day, offering continuous monitoring and surveillance.

To answer the third research question (RQ3) about profiles of non-, medium, and frequent seekers, we aim to interpret our findings in the broader context of health and social inequalities associated with informational inequalities (Ramanadhan & Viswanath, 2006; Viswanath & Kreuter, 2007). We identified some factors associated with less frequent information seeking about Covid-19. Compared to the other two groups, nonseekers were characterized by a lower SES, lower affective risk responses, lower perceived information-related self-efficacy, and lower trust in information sources, which is in line with previous findings (Ramanadhan & Viswanath, 2006).

Concerning individuals' SES and information-related self-efficacy, differences between nonseekers and frequent seekers highlight the importance of perceived capabilities and resources to complete communication tasks (Afifi & Weiner, 2004; Viswanath & Kreuter, 2007). The lack of resources and capacities is a known barrier to becoming empowered and taking an active role in one's health prevention and care (Viswanath & Kreuter, 2007).

The role of affective risk response reveals that medium and frequent seeker are more concerned about Covid-19 than nonseekers. This finding suggests that being more or less concerned about Covid-19 could be either the cause or the consequence of frequent or non-seeking, and this could initiate reinforcing spirals that may lead to consequences such as information overload or knowledge deficits (Gallotti et al., 2020; Garrett, 2020; Lambert et al., 2009; Siebenhaar et al., 2020).

We also found that nonseekers perceived information sources as generally less trustworthy—the difference was most evident by comparing non- and frequent seekers and relevant to journalistic outlets as well as experts or health authorities. This result supports the former findings of Ramanadhan and Viswanath (2006) but contradicts the assumption that distrust can serve as a cause to turn to multiple sources associated with more frequent HISB. However, one exception to this tendency of skepticism towards sources among nonseekers seems noteworthy: Nonseekers did not trust less in their family and friends than medium and frequent seekers. These findings highlight the relevance of social support and the mediating role of social networks in distributing information and reaching nonseekers. Engaging peers may be an avenue to reach nonseekers and support their knowledge gain.

Limitations and resulting tasks for future research

Some possible limitations of the current study need to be considered. First, during health crises like the Covid-19 pandemic characterized by the vast amount of information and the fast spread of misinformation, it is not only relevant to examine the frequency of HISB and the preferred sources but also which information is selected, processed, and which conclusions people draw from them. The current study cannot depict the consequences of more or less frequent information seeking such as information overload, knowledge deficits, or compliance with self-protective behaviors at all. Longitudinal study designs might particularly help analyze the thin line between the positive and negative consequences of seeking and non-seeking behaviors and parse causal relationships.

Second, the distinction between medium and frequent seekers was made on an empirical basis only, whereas a theoretically derived criterion justifying a classification is missing.

Third, we were interested only in purposeful information seeking but did not consider that in times of high ubiquity of available information (Tandoc & Lee, 2020) receiving incidental information and information scanning might be very prevalent, provide nonseekers with a sufficient amount of knowledge, and enable them to adapt to the situation.

Fourth, the relatively small effect sizes of the single determinants under study stress the need to consider more relevant factors to distinguish between non-, medium, and frequent seekers and explore the barriers of information distribution more broadly. According to models of HISB (e.g., Afifi & Weiner, 2004; Griffin et al., 1999), sociocultural factors like social norms, outcome expectancies, or a more differentiated view on self-efficacies and competencies could be considered to better understand non- and frequent-seeking behaviors.

Main conclusion and practical implications

The findings of the present study extend the evidence base on Covid-19-related information seeking, by describing the prevalence of non-seeking to frequent seeking in the general public and shedding light on the profiles of non-, medium, and frequent seekers. Our approach highlights differences among these groups, providing indications for strategic health communication approaches and information dissemination, and may guide initiatives to fight informational inequalities caused by inattention to health information or information overload. We consider nonseekers paying no attention to health information as a challenging target group for interventions aimed at enhancing awareness and knowledge gain, attitude and behavior change relevant for combating health crises, and health promotion, prevention, and informed decision making in general. Against the background of the potentially negative consequences of non-seeking like lower health knowledge, increased information inequalities, and lower levels of empowerment for informed decision making (Viswanath & Emmons, 2009), our findings guide us to identify particularly vulnerable target groups, such as individuals with lower socioeconomic status, lower affective risk responses, lower information-related self-efficacy, and lower trust scores in information sources. This points to the need for (digital) health literacy interventions which help to improve the people's knowledge, motivation, and competencies to access, understand, appraise, and apply health information from different sources (Sørensen et al., 2012).

Health literacy interventions can also be a countermeasure to prevent information overload and information and health anxiety that might be a result of the overexposure to information about the Covid-19 pandemic (Qu et al., 2021; Tull et al., 2020) as well as the exposure to information of questionable quality (Eysenbach, 2020). Against the background of potential negative outcomes of overexposure to Covid-19 news, health institutions should increase the awareness of symptoms of information overload and provide the general public with strategies to handle health information (Mohammed et al., 2021).

To sum up, our findings act as a guide to overcoming barriers to health information provision and thereby enhance health promotion. Planners of informational interventions, health communicators as well as health professionals need to be aware of the profiles of nonseekers as well as frequent seekers to find adequate strategies to overcome barriers and design adequate supportive information (Lambert et al., 2009), and in doing so, potentially reduce negative consequences of non-seeking, such as information inequalities, and frequent seeking, such as increased negative beliefs and emotions (Roussi & Miller, 2014). Our findings suggest that it could be promising to design communication campaigns using social network diffusion strategies and initiating interpersonal communication to foster adequate risk perception and affective risk responses relevant to triggering "positive engagement" with information. Further, health interventions should address abilities like information-related self-efficacy or health literacy, focusing on individuals with low socioeconomic status.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

ETHICS STATEMENT

Our type of data collection operates in accordance with the German General Data Protection Regulation (GDPR) and the Declaration of Helsinki. Informed consent is guaranteed, only unidentifiable data of the participants are provided, and the participants are free to cancel participation or refuse to answer questions. All data of HINTS Germany will be accessible free of charge to researchers; while data of the first wave are already open access (www.hints-germany.de), data of the second wave are announced to be accessible by the end of 2021.

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ORIGINAL ARTICLE

A profile of the health information seeker in Chile: Introducing the Chilean health information environments (EIS) survey

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Abstract

In recent years, many countries have sought to assess health information acquisition among their populations. The Health Information Environments (Entornos de Información de Salud; EIS) survey is the first systematic and representative study that addresses access and use of health information in Chile. Modeled after the National Cancer Institute's Health Information National Trends Survey (HINTS), the survey included measures of general health information acquisition, source trust, and health behaviors, with a special focus on physical activity, fruit and vegetable consumption, and smoking cessation. The EIS survey was applied face-to-face in Santiago, the capital of Chile, between December 2020 and February 2021 in a sample of 1411 individuals older than 24 years. In this paper, we present the main sections of the EIS questionnaire, the application procedure, response rates, and sample characteristics. Additionally, we used EIS data to present a profile of health information seekers in Chile.

KEYWORDS

consumer health information, health communication, healthy lifestyle, information seeking behavior

Key points

- The EIS survey is the first population-based study in Chile addressing health information access.
- The internet and the health care center are the two main sources of health information for the Chilean population. The third most used source for health information seeking were health care providers.
- Health information seeking was more common among women, the younger individuals, and the more educated ones. These segments were more likely to use

the internet as the first sources, whereas the older and less educated individuals who sought said they did so in the health care centers.

INTRODUCTION

The SARS-CoV-2 pandemic has underscored the importance of health information in our daily life (Ratzan et al., 2020; The Lancet Infectious Diseases, 2020). In the context of this global public health crisis the flow of information has increased, finding individuals who are eager to receive new data to understand this ever-changing reality, but at the same time, others who prefer to stay away from almost any new development because the reality is just too much to take.

But even before the pandemic, health information was proven to be central to individuals' health decision-making and a constitutive part of how they understand what it is to be healthy and how to achieve that goal (De Jesus, 2013). For that reason, important steps have been taken in the last decades, and particularly in the last years, to understand individuals' health information acquisition patterns. In the United States, a key effort has been the Health Information National Trends Survey (HINTS), developed by the National Cancer Institute in 2002 and collected periodically with the purpose of assessing the trends in health and cancer information acquisition in the general population (Nelson et al., 2004). The information gathered through HINTS has allowed researchers to explore shifts in health and cancer communication patterns over the years and how technological changes have impacted the process of acquiring and using health information (Finney-Rutten et al., 2011). HINTS data have been used by hundreds of researchers from public health as well as behavioral and social sciences to produce knowledge regarding health and cancer information access and use. HINTS has also guided health communication practitioners in creating effective communication strategies across different populations.

More recently, efforts have been undertaken outside of the United States to replicate the HINTS model and collect national data regarding health information acquisition and use. Efforts of this sort are currently in place in China, Colombia, Israel, Japan, the Netherlands, Singapore, and Switzerland (Kreps, 2020). Through these surveys, researchers have been able to understand how people access and use health information for themselves and for their close people across different cultures, how they perceive cancer risk and how much they know about prevention. Also, profiles of health information seekers from different cultures have been put forward using data from these surveys (e.g., Zhao et al., 2015). In this paper, we present the Chilean Health Information Environments (Entornos de Información de Salud; EIS) survey, a study inspired by HINTS that aims to capture health information acquisition in the Chilean population with a special focus on health preventive behaviors. Additionally, we use EIS data to profile health information seekers based on sociodemographic and psychological variables.

Health and health information in Chile

Chile is a high-income country of 18.9 million inhabitants in the southern portion of South America (The World Bank, 2021a); its GDP per capita for the year 2020 was 24,505 USD, considerably below the mean of other OECD countries (44,545), but higher than the other Latin American country members of the organization, such as Argentina, Brazil, Colombia, and Mexico (OECD, 2021b). Chile's health statistics are for the most part remarkable; for instance, life expectancy at birth is currently 80.2 years (The World Bank, 2021c), which is higher than the United States (78.8) and any other country in Latin America, with the sole exception of Costa Rica (80.3). Other health statistics are also very favorable in Chile, for example, maternal mortality rate is 13 per 100,000 living births (The World Bank, 2021d) and it has consistently declined since the year 2000. Similarly, infant mortality rate is six per 1000 live births, which is the lowest among Latin American countries.

Until the COVID-19 pandemic, the causes of deaths in Chile were mostly non-communicable diseases related to lifestyle factors and preventable conditions. The main causes of death were ischemic heart disease (56.4 deaths per 100,000 population), stroke (51.3), and kidney disease (21.4; World Health Organization, 2021). In the year 2020, however, the main cause of death in the country was COVID-19 (Departamento de Estadísticas e Información de Salud DEIS Ministerio de Salud, 2021). One of Chile's main health challenges is dealing with the high prevalence of chronic conditions, such as diabetes and high blood pressure. According to the most recent National Health survey (Departamento de Epidemiología Ministerio de Salud, 2017), 27.6% of the population older than 15 years has high blood pressure, and 12.3% has diabetes mellitus. Both conditions are also considerably more prevalent among the less educated segments of the population (Departamento de Epidemiología Ministerio de Salud, 2017).

The most recent National Heath survey also revealed that risk factors for severe chronic conditions in Chile were high, while protective factors were low. It is estimated that 35.4% of the Chilean population older than 15 years is obese, and 39.8% is overweight. In turn, the adoption of protective behaviors such as physical activity and fruit and vegetable consumption is low, particularly, 86.7% of the Chilean population is sedentary as they report less than three days of physical activity per week in the last month, and only 15% comply with the five portions per day of fruit and vegetable recommendation (Departamento de Epidemiología Ministerio de Salud, 2017). Another lifestyle statistic of concern in the country is the smoking prevalence, which is 33.3% of the population older than 15 years (Departamento de Epidemiología Ministerio de Salud, 2017). Considering that Chile's fertility rate has significantly declined since the early 2000s (The World Bank, 2021b), it is safe to say that the Chilean population is growing older and that, consequently, in the following decades the country will see greater public health challenges associated with the prevalence of non-communicable disease and lifestyle factors.

In that context, it is fundamental to increase research attention not only on monitoring the trends of risk and protective factors for chronic conditions, but also to study their determinants. In the field of health communication, and particularly in the Global North, considerable attention has been paid to the association between health information acquisition and the adoption and maintenance of health-protective behaviors, such as lifestyle habits and screening behaviors. Information seeking has been widely studied in the context of cancer communication, primarily because of the relevance that HINTS has in the field. Studies have shown that information seeking is a positive predictor of health preventive behaviors, such as consumption of fruits and vegetables and exercising (Kelly et al., 2010; Ramanadhan & Viswanath, 2006); and screening behaviors, such as getting a colonoscopy (Kelly et al., 2010; Shim et al., 2006). Longitudinally, seeking has been found to be associated with the behavioral performance of dieting, exercising, and fruit and vegetable consumption (Ramírez et al., 2013).

In Chile, no systematic effort has been made to study health information acquisition among the general population. Even though recent studies have attempted to address the practices of information seeking and scanning among the Chilean population, they have been limited since they have not used representative samples, and therefore, their findings are not generalizable to the larger population (Halpern et al., 2015; Peña-y-Lillo, 2016). To fill this gap, we put forward the EIS survey, which is part of the International Studies to Investigate Global Health Information Trends (INSIGHTS; Kreps, 2020) research consortium's agenda. The overarching research question that the EIS survey addresses is what the current patterns of health information acquisition among individuals in Chile are. In addition, this survey aims to determine the individual factors that explain information acquisition, and the associations between information acquisition and the performance of health behaviors, as well as known predictors of those health behaviors according to established behavioral change models, such as the theory of planned behavior (Conner et al., 2017; Fishbein, 2008).

The EIS survey was part of a larger study aiming to explore information acquisition of adults in Chile. The study's focus was on health information in general, but also on health-protective behaviors which are associated with chronic disease prevention, specifically fruit and vegetable consumption, physical activity, and smoking cessation. Since one key goal of the project was to determine whether educational attainment influenced health information acquisition practices and the degree to which health information influenced health behaviors practices, the population the survey aimed to represent was people 25 years and older, as it was assumed that at that age most individuals had completed their formal education or were very close to completing it. In the following sections we provide a detailed description of the EIS questionnaire, and the data collection procedure followed by the rationale for profiling health information seekers 25 and older in Chile.

METHODS

Questionnaire development and structure

The EIS survey questionnaire was developed based on the Spanish version of HINTS 5 cycles, 1 (2017) and 2 (2018; National Cancer Institute, 2021). Even though the items were already in Spanish, the language did not match the Chilean tone, therefore, a cultural adaptation was performed by a linguistics specialist before testing the survey. Afterwards, cognitive interviews with a sample of 10 individuals older than 24 years were conducted to test for potential difficulties when responding to the survey. No complications were found. In addition to the cognitive testing, a qualitative study was conducted among 36 respondents to explore other issues associated with health information acquisition that were worth exploring, specifically for refining a measure for fruit and vegetable consumption and physical activity information acquisition. From that study, it was decided to include a block of questions regarding information about the benefits, the negative aspects, and practical matters regarding fruit and vegetable consumption and physical activity.

The EIS questionnaire comprised seven modules. Module A was devoted to information seeking and it was modeled after the HINTS questionnaire module "Looking for Health Information". In the EIS questionnaire, questions about health information-seeking behaviors, the source of the last health information-seeking experience, the confidence on one's information-seeking ability, and source trust were included.

Module B of the EIS survey was devoted to the specific content of messages about physical activity, fruit and vegetable consumption, and smoking cessation. These measures included the practices of information seeking and scanning (Niederdeppe et al., 2007), and were developed based on the findings of the qualitative study described above. The purpose of these measures was to explore different patterns of exposure considering messages that highlighted the positive aspects of the behavior, messages about the negative aspects of the behavior, and messages with practical information regarding the behavior.

Module C was devoted specifically to physical activity. It included measures of frequency of information scanning by source (television, internet, social media, and close relationships), information seeking about physical activity in the last 30 days, the source of the last instance of information seeking, attitudes towards physical activity, perceived norms, and self-efficacy regarding physical activity, as well as intentions. These measures were adapted from surveys previously validated by other authors (Conner et al., 2017). Module D, in turn, had the same structure as Module C, but regarding physical activity. Both, Modules C and D, included behavioral measures taken from the original HINTS survey; in the case of physical activity, we assessed frequency of cardiovascular and weightlifting activities, and for fruit and vegetable consumption we measured the self-reported number of fruits and vegetables cups.

Module E addressed tobacco consumption and used HINTS items from the 2017 version. Module F included items from the HINTS module “Your Overall Health,” such as self-reported height, weight, previous chronic conditions, and health consciousness. Finally, Module G included sociodemographic variables such as work status, income, health insurance status, and educational attainment. The complete EIS questionnaire will be available on the project's website (eischile.cl) in Spanish and English by the end of 2021.

Procedure

The population for this survey was restricted to those living in urban areas of Chile's Metropolitan Region of Santiago, which comprises 40.1% of the national population (Subsecretaría de Desarrollo Regional y Administrativo, 2021). A pilot study with 20 cases was conducted before the application of the EIS survey, revealing no problems in the survey procedure. Application time was, on average, 31.2 min.

The sampling frame for the survey was obtained from the 2017 National Census, and it was stratified by municipalities with a random selection of geographic areas and/or blocks. In each block, the home located at the north-west corner was selected for survey recruitment, then the two following homes were skipped, and then the fourth home was selected to make contact and recruit. If the expected number of cases per block was not reached, then the next block was selected, and so on. Within the home, the selection of the person to be interviewed was systematically done using a Kish table among all residents older than 24 years that were present.

Between December 2020 and February 2021, a total of 6572 homes were visited. Contacts with potential participants were made in 3020 homes; out of those, 1474 refused to participate and 135 did not meet the inclusion criteria (e.g., they were younger than 25, or health care workers). The final sample was 1411 cases. The cooperation rate (49%), response rate (22%), refusal rate (23%), and contact rate (45%) were calculated using the formulae of the American Association for Public Opinion Research (2021). The sample was designed for a confidence level of 95% and a margin of error of ±2.7. The method of application was face-to-face, and interviewers used tablets to record the participants' responses, which allowed for recording the exact geographical location where the interview took place as well as the start and end time. The study procedure and questionnaire were approved by the ethics committee of the university responsible for the study and before responding to the survey, participants signed an informed consent form. In compliance with the sanitary restrictions in place due to the pandemic, interviewers wore personal protective equipment and conducted the surveys in well-ventilated spaces and maintaining social distance. Interviewers were trained in one session in which the main characteristics of the study were covered including the procedure for obtaining the informed consent, the survey application process, and the survey questions. An audiovisual handbook was also made available for interviewers to consult at their discretion during the fieldwork period.

Measures for profiling the health information seeker

In this paper, in addition to presenting the EIS survey, we aim to provide a first look at health information seeking patterns in Chile with the goal of determining how prevalent this behavior is, what sources are the most used for that purpose, and what individual characteristics are associated with health information seeking among individuals 25 or older. To answer these inquiries, we took variables from Modules A, C, D, F, and G from the EIS survey and analyzed them using descriptive and multivariate statistics. In this section, we present the survey items involved in these analyses in more detail.

To determine how prevalent general health information seeking was and the most recurrent sources, we followed the HINTS structure and asked participants: "Have you ever sought information about health or medicine?", with response options "yes" and "no." Those who responded "yes" were further asked what source they used for health information seeking the last time they sought information. Response options were "social media," "the Ministry of Health's website," "their health care center," "family," "friends or coworkers," "doctor or other health professional," "internet (Google)," "a health telephone number," "alternative medicine practitioners," "social organizations," and "others." With respect to the original HINTS instrument (National Cancer Institute, 2021), we did not include, among the list of sources, books, brochures or pamphlets, library, magazines, and newspapers, because those sources were not mentioned at all in the qualitative study conducted before the survey application informing its design. Instead, we included social media as a source, because it appeared in the participants' recall of health information seeking instances. Since we were looking at health information in general and not specifically cancer information as the HINTS survey does, we did not ask for cancer organizations, but we included other organizational sources that were mentioned by participants in our qualitative work, such as the Ministry of Health, social organizations, and health care centers.

To profile health information seekers 25 and older in Chile, we considered the following sociodemographic variables: age, gender, work status, number of people living in the same home, educational attainment, and health insurance status. For work status, participants were asked whether they were currently "only studying," "only working," "working and studying," "neither working nor studying," "retired and not working," or "retired and working." All the categories that involved working were grouped together to create an index that allowed us to make the distinction between those who were currently working and those who were not. Additionally, participants were presented with an open-ended question asking how many people lived in their home permanently. To measure educational attainment, participants were asked their current educational level through ten categories from "without formal education" to "postgraduate (postgraduate education such as a certificate, master's, doctorate)." To simplify the data interpretation, the original categories were grouped into four: Less than secondary education, secondary education completed, technical education completed, or college education not completed, and college education completed or more. For health insurance, participants were asked which insurance system they were affiliated to. In Chile, two main insurance systems exist, one that is public, which covers almost 80% of the population, and one that is private, which covers most of the other 20%. This variable was coded as having public insurance or having some other type of insurance, including in this latter category those covered by the armed forces insurance (1.2%) and those who were uninsured (2.6%). In addition to sociodemographic variables, health consciousness was considered in the models and measured with three items with responses in a Likert-type scale from 1 = "strongly disagree" to 4 = "strongly agree." Participants had to respond whether they agreed with the following statements: "I think a lot about my health," "I try to make things to stay healthy," and "my health is important to me."

RESULTS

Characteristics of the sample and the data set

Table 1 presents the characterization of the EIS 2021 sample. Overall, the sample overrepresented women (63.6% of the sample was women, compared to 52% of the regional population according to the National Census). Similarly, the sample had a greater proportion of individuals from the age group 65 or more (23.9%) compared to the national population (17%). The distribution of the other age group was very similar to the national estimates.

Regarding missing data, Module A had an average of 1.89% of missing data, the most recent source of health information being the item with the greatest number of missing values ($N = 81$, 5.7%). Module B had less than 0.19% of missing data; Modules C and D had

TABLE 1 Descriptive statistics of the sample

	N	%
Sex		
Males	514	36.4
Females	897	63.6
Age		
25–34	304	21.5
35–49	330	23.4
50–64	439	31.1
65 or older	337	23.9
Health insurance		
Public	1.090	77.3
Other	309	21.9
Educational attainment		
Incomplete high school education or less	480	34
Complete high school education	398	28.2
Incomplete technical or college education	351	24.9
Complete college education or more	180	12.8
Chronic diseases		
Diabetes	253	17.9
Hypertension	458	32.5
Information seeking	1077	76.3
Internet as first source	452	32.0
Health center as first source	425	30.1
Doctor as first source	297	21.0

an average of 0.68% and 0.90% of missing data, respectively. For both Modules C and D, the items with the highest rates of missing data were those addressing social norms regarding physical activity (item C5: "The majority of people who are the most important to me think I should practice physical activity in the next 3 months," $N = 35$, 2.45%) and fruit and vegetable consumption (item D5: "Most people who are important to me will consume 5 or more portions of fruit and vegetables a day in the next 3 months," $N = 41$, 2.91%), respectively. Module E's average missing data rate was 0.98% and Module F's average was 0.53%. In this latter module, the item with the most missing cases was whether a doctor had diagnosed depression ($N = 41$, 2.91%). Finally, Module G's average of missing cases was 4.35%. It is important to mention that in this module the item with the greatest missing data rate was income, where 324 (22.9%) participants did not provide a response.

Information seeker profile

With respect to the patterns of information seeking revealed by the EIS data, more than three-fourths of the sample, comprised by individuals 25 and older, declared to have sought health information in the past (76.3%). The most recurrent sources were the internet (Google, 32.0%), health care centers (30.1%), and doctors or other health professionals (21.0%). Other online sources, such as social media (3.3%) and the Ministry of Health's official website (0.9%) were less important, although together with the search engine option make the online sources the most salient. To profile the health information seekers, we fitted logistic regression models with having sought in each of the three most recurrent sources as the dependent variables, and the sociodemographic variables as well as health consciousness as the independent variables.

Table 2 summarizes the regression models used to explore the correlates of health information seeking in general and for using the three most common sources of health information, namely the internet (Google), health care centers, and doctors or other health care professionals as the first source of information when seeking. With respect to information seeking in general, females were more likely to be seekers than males, but age was not significantly associated with seeking. Having public insurance was negatively associated with health information seeking, whereas educational attainment was positively related to health information-seeking behaviors. Specifically, individuals who completed a high school education, as well as those with a college or technical education, were more likely information seekers compared to individuals with less than a high school education. Health consciousness was positively associated with health information seeking. No association was found for having a job and number of people in the household.

When examining the associations between the independent variables and having the internet (Google) as the most recent source for information seeking, we found that females were more likely than males to use the internet as the first source for information seeking and that age was negatively associated with this behavior. Being a worker, as opposed to not having a job, was positively associated to using the internet as the first source for health information seeking. The same trend was found for the number of people living at home. Educational attainment was positively associated with health information seeking on the internet as a first source, specifically, individuals with high school education complete as well as those with a college or technical education were more likely than individuals with less than a high school education to have used the internet as the most recent source of health information seeking. No association was found for having public insurance or health consciousness.

Information seeking in health care centers as the first source was positively associated with age and having public insurance, as well as more common for males compared to

TABLE 2 Regression estimates for models predicting information seeking, and the use of the internet, health care centers, and doctors as first sources of health information

	Health information seeking			**Internet as first source**			**Health care Centers as first source**			**Doctors as first source**		
	OR	**95%**	**CI**	**OR**	**95%**	**CI**	**OR**	**95%**	**CI**	**OR**	**95%**	**CI**
		LL	**UL**		**LL**	**UL**		**LL**	**UL**		**LL**	**UL**
Gender (female)	1.93***	1.47	2.53	1.44**	1.10	1.89	0.72*	0.54	0.95	1.00	0.75	1.34
Age	1.00	0.99	1.01	0.97***	0.96	0.98	1.03***	1.02	1.04	1.00	0.99	1.01
Worker	0.94	0.70	1.27	1.35*	1.02	1.80	0.75	0.56	1.01	0.94	0.69	1.28
Number of people at home	1.04	0.96	1.14	1.19***	1.10	1.29	0.96	0.88	1.05	0.91	0.83	1.01
Public insurance	0.64*	0.44	0.93	0.76	0.56	1.05	3.14***	2.06	4.08	0.56**	0.41	0.78
Complete high school education	1.65**	1.18	2.31	2.80***	1.99	3.93	0.48***	0.35	0.66	0.56**	0.37	0.85
Technical education or more	1.60*	1.11	2.21	1.85**	1.28	2.67	0.38***	0.26	0.54	1.65**	1.13	2.39
College education or more	2.25**	1.31	3.87	1.85**	1.16	2.94	0.25***	0.13	0.46	1.66*	1.04	2.65
Health consciouness	1.85***	1.45	2.37	0.96	0.76	1.22	0.59***	0.46	0.75	1.55**	1.19	2.02

Abbreviations: CI, confidence intervals; LL, lower limit; OR, odds ratio; UL, upper limit.

***$p < .001$,; **$p < .01$,; *$p < .05$;

females. People in the least educated segment were more likely than individuals in all the other education groups to have sought information in a health care center. Health consciousness, in turn, was negatively associated with seeking in this source, whereas no association was found for having a job and the number of people living in the household.

Finally, neither age nor gender were significantly associated with having gone to the doctor or other health care professional as the first source of health information. Similarly, having a job was not associated with the behavior. Individuals with public insurance were less likely to report having gone to a doctor or other health professional as the first source in their last information-seeking experience. With respect to educational attainment, the segments with more education (technical education and college education or more) reported greater odds of using doctors or other health professionals as the first source of health information in comparison with the lowest educational attainment group; however, individuals with complete high school reported attending the doctor to a lesser extent compared to individuals with incomplete high school education. Health consciousness, in turn, was positively associated with having the doctor as the first source for seeking.

DISCUSSION

The EIS 2021 survey is the first attempt to systematically measure health information acquisition in a Chilean sample using a representative survey in the general population. The survey meets the most rigorous sampling and application standards. Even though the EIS response rate is lower than the ones obtained historically by HINTS in the United States (Blake et al., 2016), one cannot ignore that the data collection took place in the middle of a pandemic and that might have severely affected participants' willingness to take part in a research study that used a face-to-face methodology. The EIS survey not only addresses pressing matters for the Chilean public health field, such as the practice of healthy lifestyle behaviors, but also issues important to health psychology, health communication, and health education. In that vein, the EIS survey provides a significant contribution to a diverse range of disciplines.

The EIS data allowed for a first exploration of health information-seeking practices in the Chilean population 25 and older. This exploration revealed that health information seeking is a widespread practice among Chilean adults. Our data show that the levels of general health information seeking are similar to those data reported by US samples over time (Fareed et al., 2021). Furthermore, that online sources, health care centers, and doctors or other health care professionals were the most recurrent sources, which is also consistent with international evidence (Baumann et al., 2020; Nguyen et al., 2017). However, in comparison with findings in the United States, where the internet is by far the most common source of health information and that position has increased over time (Huerta et al., 2016; Jacobs et al., 2017), the EIS data show that even though the internet is the most important source, the difference with health care centers as the main source is relatively small. This finding could be explained by the fact that the EIS sample leaves out individuals between 18 and 24 years old, which are probably more likely to go online than to attend a health care center to get health information.

Considering the centrality of the internet for health information seeking, recent research has expanded the types of digital media accounted for in their instruments with the purpose of including other digital channels to give a full account of how digital sources are used in the process of health information acquisition (Zhang et al., 2020). Chile has a high penetration of digital technologies (OECD, 2021a), and therefore, it was expected that the internet played a key role in health information seeking. In this paper, we explored the use of search engines (Google), social media, and the Ministry of Health's website. Future versions of the EIS survey could expand the range of online sources asked about when assessing health information seeking practices, to include, for example, mobile applications and other online platforms.

Even though online search engine use for health information seeking was common, age was a negative predictor for using this source. To explore the striking differences in having an online search engine as the first source of information between the different age groups we recoded age into four groups: 34 and younger, 35–49, 50–64, and 65 and older. Whereas in the youngest age group 49.1% declared having used the internet (Google) as the first health information source when seeking, only 10.2% of older adults (65 and older) said the internet (Google) was their first source (see Figure 1). The age gap in information-seeking through the internet is consistent with national data regarding access and use of digital technologies among older adults (Sunkel & Ullmann, 2019) and with international evidence regarding this matter (Prestin et al., 2015).

Age, however, was positively associated with seeking information in health care centers as the first source. A simple comparison of the proportions of individuals who responded that a health care center was their primary source of health information revealed that only 15.8% of the youngest segment used this as the primary source, compared to 55.6% of the oldest segment (see Figure 1). This finding is very reasonable considering how the Chilean health care system is organized. The public health care system has three levels, the primary level, which is decentralized and administered by the municipalities (Gideon, 2001), provides primary care, and older adults are a key audience (Marín & Wallace, 2002; Thumala et al., 2017). This structural factor can also explain why public insurance users were more likely to report health care centers as the first source for health information, because those decentralized providers are publicly funded and targeted to public health insurance users.

Our data also reveal that females are more likely to be information seekers and to use the internet (Google) as the first source for health information compared to males, while males were more likely than females to attend to heath care centers, and no gender differences were found for using doctors or other health care professionals as the first source. Previous research in different international contexts have shown women to be more likely online health information seekers, even though the gender differences were not as striking as individual surveys had shown when several samples were examined together (Hallyburton & Evarts, 2014).

In a similar fashion and consistent with international evidence, EIS data show that more educated individuals are more likely to seek health information (Fareed et al., 2021) and to use the internet and doctors or other health care professionals as their first source of information. Whereas 44.2% of the segment with college education or more declared to have used and internet search engine as the first source of health information, only 17.2% of the group with less

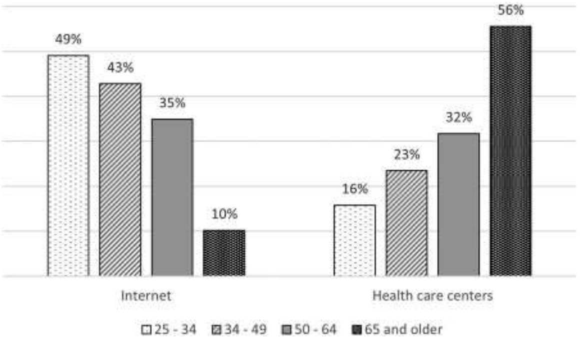

FIGURE 1 The internet and health care centers as the first source of health information seeking by age group

than high school education said they used this source. Gaps in access to the internet and in the skills and abilities needed to successfully find health information online might drive the striking differences in online information seeking by educational attainment.

When looking at health care centers, however, lower educational attainment is associated with a greater likelihood of using these as the first source of health information (53.4% in the lowest educational attainment segment compared to 8.7% in the highest), which can be considered a strength of the Chilean primary health care system in terms of reaching the lowest socioeconomic status groups. If lower educational attainment participants are less likely to be able to judge the quality of the information obtained on the internet (Tennant et al., 2015), then the fact that those individuals prefer to attend a health care center as the first source of health information could prevent them from making decisions based on information of dubious quality they could find online.

Publicly insured individuals, as opposed to individuals with private insurance, are more likely to use the health care center, while less likely than their counterparts to have attended to a doctor or other health care professional as the first source for seeking. This finding could be related to the organization of the health care system in Chile as described above; whereas publicly insured individuals are expected to attend to their local health care center and establish relationship with the center, privately insured individuals make appointments with individual providers, which limit their ability to connect with the health care center as an information source. This feature might be also behind the finding regarding the greater likelihood of privately insured individuals, in comparison to publicly insured ones, to have doctors or other health care professionals as their first source of health information. All in all, whereas the publicly insured goes to the health care centers, the privately insured attends the individual doctor or other health care professional.

In sum, the EIS survey data shows that information seeking is prevalent among Chilean adults 25 and older, and that the internet and the health care centers are the main sources of information. Whereas the internet information seeker via search engines is mostly female, young, has a job, lives with more people at home and has high school education or more, the health care center seeker is more commonly male, of older age, publicly insured, with less than high school education, and less health conscious.

Despite the contributions of the EIS survey in allowing for the exploration of health information acquisition in a Chilean representative sample, it has some shortcomings that are worth mentioning. The main limitation of the EIS 2021 survey is that, mainly due to budget constraints, it was restricted to one geographic region in Chile. Even though the Metropolitan Region of Santiago comprises over 40% of the population, it also has a more educated and affluent population compared with other parts of the country. It would be desirable to obtain a more diverse sample to explore, for example, how information acquisition patterns vary among geographical regions, considering that Chilean geography and climates are very diverse, as are each region's main economic activities, and their health outcomes. In that vein, it would be expected that preventive health behaviors vary from one region to the other, and probably the health information needs of their populations as well. Additionally, and given that the EIS survey was conducted in the context of a larger project that was designed with age constraints, it did not include adults between the ages of 18 and 24 years. Thus, a reasonable future direction is to apply the EIS survey to a larger sample representative of the different geographical regions in Chile and include individuals 18 and older. Additionally, future versions of the EIS survey may reconsider some decisions made in this first version, for example, excluding some sources rarely mentioned in the qualitative work that preceded the study such as books, brochures or pamphlets, library, magazines, and newspapers to empirically test whether these sources are relevant for information seeking in the Chilean population.

Conclusion and policy implications

As the first survey attempting to assess health information acquisition in a representative sample of the general population in Chile, the EIS survey can make several contributions to policy. The survey will allow us to determine the health information needs of the Chilean population, and what differences between socioeconomic, age, and gender segments, among others, exist. This information will help improve the targeting and tailoring of health communication interventions carried out by the government as well as any other organization interested in that sort of communicative efforts. As mentioned above, the EIS 2021 survey addressed information regarding health preventive behaviors such as physical activity and fruit and vegetable consumption in greater depth, as well as other key behavioral change variables associated with those practices, such as attitudes, social norms, and self-efficacy as well as self-reported behavior. Those measures would be helpful to inform efforts oriented towards tackling one of the most important challenges for Chilean public health authorities, which is to increase the practice of these behaviors in the population to prevent health problems that are associated with lifestyle factors. Furthermore, the EIS data will be of interest to doctors and other health care professionals as the survey shows their relevance as a source of health information as well as the other sources of information against which their recommendations compete in individuals' information environment.

Even though the EIS 2021 survey is a one-time study, the purpose of the project is, as the US HINTS survey and other international surveys modeled after it, to collect data periodically to explore trends and changes in health information acquisition patterns across time. This information is crucial for adequately responding to the fluctuations of population needs in this area of inquiry. Finally, it is important to note that, following in the spirit of HINTS, the EIS data, as well as the survey instrument in English and Spanish, will be made publicly available on the project's website (eischile.cl) by the end of 2021.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

This study complies with all research ethics regulations in place in Chile, where data collection took place. Its procedure and instruments were revised and approved by the ethics committee at Universidad Diego Portales, Chile (project 020-2018, approval date November 22nd, 2018). Participants of this project signed a two-page consent form and received a copy of it with the principal investigator's contact information. The researcher keeps a signed copy of each consent form.

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ORIGINAL ARTICLE

"Don't drop the patient:" Health information in a postpandemic world

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Abstract

Building on technological advances and existing currents of a healthcare system in flux, the COVID-19 pandemic has brought about perhaps the most rapid transformation in human health and healthcare seen in our times. Even as new opportunities such as telemedicine, remote care, and rapid precision health practices are poised to improve access and care for populations, the increasing sophistication of this transformation has brought with it new levels of complexity, fragmentation, and silos. The singular outcome of this system is the vast number of novel ways for miscommunication, loss of information in transition, and breakdowns in the cognitive continuity of care. We refer to these failure modes as "dropping the patient" and adopt a mantra of "don't drop the patient" which examines our emerging health system in the context of patient-centered continuity. In this light, we investigate bright spots and pitfalls, and we offer insights from Human Factors Engineering, Human Centered Design, and Human System Integration, which provide tools and methods to codesign and codevelop continuous and resilient services that are inclusive, sustainable, and effective.

KEYWORDS

connected care, health information technology, telehealth

INTRODUCTION

One aspect of health care that is often overlooked within the crisis of the moment is the criticality of human-centered communication systems to allow for unbroken and supportive care. Human factors studies have been replete with examples of how miscommunicated information during the confusion of, say, a visit to an emergency room (ER) can lead to

Key points

- Technological advances, along with global pressures on health care from events such as the COVID-19 pandemic, have created an information environment in healthcare that is in flux.
- On the positive side, a widespread adoption of electronic health information systems can transcend barriers to access by moving care to patients through telemedical consults, remote patient monitoring, online self-management, appointment management, treatment tracking, and population health monitoring. On the negative side, overlaying complex information technologies on healthcare networks that may already be fragmented may increase risks for communication errors.
- Strengthening communication systems in health care will require an application of human-centered design principles not just at the level of individual technologies but at the systems level in which technologies, medical protocols, professional training, and patient experiences interact.
- A key focus of design efforts at the human-system level is to create a fault-tolerant sociotechnical environment that minimizes discontinuity in care; that is, to create a new biomedical ethos of "not dropping the patient" as the standard in global health care.

disastrous consequences down the line (Kohn et al., 2000; Leonard et al., 2004; Zapka et al., 2004). A misread prescription can result in an adverse pharmaceutical reaction; or a poorly communicated history or physical examination could lead to an avoidable cascade of complications from pre-existing conditions. To prevent such errors from occurring in the heat of the moment, high functioning emergency and surgical departments have focused on safety protocols that (a) encourage two-way communications so that no information collected from across the care team is lost (Pun et al., 2015); (b) that are coordinated with high degrees of reliability through checklists, charts, and other informational tools (Gawande, 2010); and (c) that are universally respectful of patients' values and needs (Kreps, 2010). It is not uncommon within high-functioning care teams to hear a mantra akin to *don't drop the patient,* both as a reminder to support the patient physically from one station to the next but more importantly to support the patient *figuratively* through unbroken, reliable communication across all handoffs.

The purpose of this paper is to offer a conceptual overview of a human-centered design approach geared toward improving the resilience of health and healthcare communication systems in the wake of the global, COVID-19 pandemic. The perspectives presented in this paper can be attributed to research and publications generated by the LAUNCH collaborative: a public/private partnership between the U.S. government (National Institutes of Health, Federal Communications Commission), academic institutions (the University of California San Diego Design Laboratory, the University of Kentucky Medical Center), and the private sector (Amgen and Phillips Healthcare). We begin by providing an historical perspective on why the goal of strengthening communication systems in health and healthcare has become a global priority, with a special emphasis in enumerating the common human factors challenges that must be addressed in achieving this goal. We then articulate a postpandemic agenda, taking advantage of extant scientific knowledge as well as projected trends to offer policymakers, researchers, clinicians, and patients with a starting point for improving communication systems locally and globally.

A GLOBAL PRIORITY TO STRENGTHEN COMMUNICATION SYSTEMS

Although much progress has been made in supporting the reliability of communication processes within localized environments (such as the ER and surgical suite), work remains to be done to address the broader set of communication gaps that continue to plague health care in other contexts. Data from the Joint Commission for Healthcare Accreditation in the United States (US) continue to place "communication errors" at the top of their list of preventable medical errors (The Joint Commission, 2014). In fact, data collected through the Harvard-based CRICO Strategies Comparative Benchmarking System suggested that communication failures were at the heart of 30% of malpractice suits recorded between 2009 and 2013 in the United States (Hoffman et al., 2015). From a Human Factors perspective, these missteps may constitute errors of *commission*, as when a pharmacist erroneously transcribes dosage amounts on a prescribed medication (Kohn et al., 2000); or, more insidiously, errors of *omission* as when a patient is flagged for follow-up after a positive test result but is then lost through the cracks of a fragmented system (Kohn et al., 2000; Mazor et al., 2012; Zapka et al., 2004). Efforts to strengthen communication systems must focus not only on preventing avoidable mistakes, curtailing errors of commission, but they should also strive to "close the loop" on errors of omission (Hesse et al., 2016; Liu et al., 2016).

A global strategy in eHealth

In 2005, the World Health Assembly adopted resolution WHA58.28 as a way of shoring up health communication systems worldwide (World Health Organization, 2005). Framers of the resolution recognized that leveraging a new ecosystem of interoperable communication tools in health (collectively included under the rubric of eHealth at the time) could help solve some of the problems associated with errors of commission and omission across the multiple interfaces of care. The 2005 resolution encouraged member states "to consider drawing up a long-term strategic plan for developing and implementing eHealth services … to develop the infrastructure for information and communication technologies for health, to promote equitable, affordable and universal access to their benefits." The Assembly added further emphasis to their statement in 2013 by adopting resolution WHA66.24 as an encouragement for Member States "to consider developing policies and legislative mechanisms linked to an overall national eHealth strategy" (World Health Organization, 2020).

Progress in achieving eHealth strategic goals has been slow and spotty as member states move toward tactics that will improve communication throughout their care environments (Adler-Milstein et al., 2014). Australia was one of the first countries to adopt national Health IT goals. In the late 1990s and early 2000s the Australian government used federal incentives to support the adoption of Electronic Health Records (EHRs), and in 2005 it established the National E-Health Transition Authority to coordinate construction of a national health information system. Denmark was also early, with national encouragement for the adoption of Health IT in the 1990s and federal requirements for adoption of EHR's instituted in 2004 and 2006. Canada and the United Kingdom have been involved in efforts to adopt EHRs as the backbone of their national health services. The U.S. established an Office of the National Coordinator for Health Information Technology in 2004, followed by the passage of a multibillion-dollar incentive program to promote the "meaningful use" of Health IT in 2009. As a consequence, EHR adoption in the U.S. grew from 12% of all hospitals in 2009 to 89% by 2020, a growth rate that has helped give lift to the overall Health IT marketplace worldwide. By 2018, estimates placed the global EHR market at around

$31.5 billion—with caveats that future market growth would depend on overcoming problems in interoperability and usability (Landi, 2019). Predictions suggest that the broader market of connected health and wellness devices could expand up to $612 billion globally by 2024 (Landi, 2021).

Common challenges

Although individual experiences differed as countries began implementing their strategic eHealth/communication plans around the world, there are some notably common challenges (Adler-Milstein et al., 2014). In particular, it is worth describing challenges associated with improving person-technology fit, care coordination, channel redundancy, and translational scaling.

Person-technology fit

Healthcare systems are inherently sociotechnical systems; that is, they are made up of people, technologies, and organizational protocols that must work together harmoniously to achieve desired goals (Coiera, 2004). Deploying information technologies into a functioning healthcare system without fully considering the sociotechnical contexts into which they will be embedded can lead to pervasive disruptions in workflow, decreased levels of efficiency, feelings of confusion and resentment, and increases in medical error (Hesse & Shneiderman, 2007). This is exactly what happened as EHRs were adopted globally "at the dawn of the digital age in medicine," according to medical author Howard Wachter (Wachter, 2017). The early EHR systems were unusable, he observed, leading to perceptions of more pain and disruption than they were worth. Global efforts have since been underway to improve the person-technology fit of these systems following the principles of human-centered design, which we discuss later. The goal of these efforts is to empower individuals and teams to design health-related products, services, systems, and experiences that address the core needs of the medical staff and patients they serve (Norman, 2013; Shneiderman et al., 2017). Put another way, the goal in applying human-centered design to information systems in healthcare is to create cognitively supportive architectures that will enhance decision-making and communication between patients, their caregivers, and their clinical care teams (Hesse, 2016; Stead & Lin, 2009).

Care coordination

At its core, the purpose of improving digitally enhanced communication systems in health and healthcare is to ensure that the right information reaches the right person(s) at the right time to make a difference in health outcomes and quality of life. In a fragmented healthcare system—and all systems have some degree of fragmentation (Adler-Milstein et al., 2014)—an interoperable EHR architecture serves as a bridge across the complex interfaces of care (Hesse et al., 2010). Healthcare delivery research contributes to that capacity, by crafting the workflow designs and electronic coordination tools that can channel information effectively and equitably across systems to improve health outcomes. As an illustration of this principle, many healthcare organizations have created triggering mechanisms built into their EHR interfaces that will send a message both to patients and office staff when an indicated test or screening is indicated. The message can serve as a prompt for patients to go into their provider's appointment system to schedule a test. If a test is not scheduled, a carefully constructed tracking system can prompt office staff to communicate through other channels. Data dashboards can then be used for population health management, prompting outreach to communities where adherence may have dropped.

Channel redundancy

Safety engineers understand the importance of redundancy in system design: when one circuit unexpectedly shuts down, a backup circuit is put in place to carry the load and to avert system failure (Vicente, 2003). The issue of redundancy is an equally important challenge when considering ways of strengthening a health system's communication infrastructure. We know that the industrial age model of moving patients to “factories” of care (clinics and hospitals) had many limitations, not the least of which was an inherent barrier to access for individuals living far away from a local hospital (Ambroggi et al., 2015; Berwick et al., 2018). Electronic communication channels have been used with some success in bridging those gaps, though progress has been hampered by difficult-to-use technologies, resistance to change, unexpected costs, or a lack of experience (Scott Kruse et al., 2018). In 2020–2021, as lockdowns and socially distancing norms became prevalent, the pendulum swung dramatically in the other direction. Healthcare systems worldwide began adopting virtual consultations as a standard operating procedure to maintain at least a minimal degree of contact with patients who would otherwise be neglected. Coming out of the pandemic, the pendulum should swing to the middle. Ideally, this would leave patients and their care teams with an abundancy of options when communicating with each other.

Translational scaling

Many governments and philanthropic organizations have invested in the high-risk research needed to explore the conditions through which fortifications in communication systems can improve health outcomes. Meta-analyses of individually funded interventions have demonstrated that a strategic use of communication technology can: (a) reduce costs associated with in-person visits (Chen et al., 2009); (b) can improve efficiencies and effectiveness of care (Buntin et al., 2011); (c) can improve outcomes through remote patient monitoring (Lee et al., 2018; Peterson et al., 2013); (d) can improve screening for early signs of mental distress (Place et al., 2020); and (e) can boost adherence to preventive measures equitably across populations (Wu et al., 2019). Typically, however, these benefits are demonstrated within a narrow sphere of application (Adler-Milstein et al., 2014). A shared challenge in the communication technology space is to improve the scalability of these interventions across health conditions and healthcare systems (Dearing & Kreuter, 2010). Doing so will likely require a change in methods, with a greater emphasis on combining both basic and applied scientific perspectives (Shneiderman, 2016) in a collaborative environment reinforced by principled cooperation between civic and private sector partners (World Health Organization, 2020).

A POSTPANDEMIC AGENDA

A sense of resilience

In spite of serious threats to the status quo in health care during the COVID-19 pandemic, data collected from almost 3000 healthcare leaders across 14 countries in the *Future Health Index 2021* survey (Philips Inc., 2021) suggested a sense of optimism and resilience in preparing for what might otherwise be considered an uncertain future. Perhaps one of the reasons for this sense of resiliency was the rapidity with which many healthcare systems were able to move in adapting their systems to the exigencies of the moment. In the United States, the Centers for Medicare and Medicaid Services quickly modified its reimbursement policy to accommodate telemedicine in the face of lockdown orders. The change allowed innovative healthcare organizations to move quickly in converting from in-person to virtual visits, a trend exemplified by the Cleveland Clinic as it moved from a 10% rate of virtual visits at the beginning of the pandemic to an 80% rate in just 2 months (American Medical Association, 2021). The same occurred internationally. On average, 60% of leaders surveyed in the *Future Health Index* reported investing in communication infrastructures as a result of the pandemic with as much as 89% of leadership setting a priority for virtual care in the United States, followed by 83% in the Netherlands, and 81% in Saudi Arabia (Philips Inc., 2021).

Other points of historical intransigence yielded to urgent necessity as well. In Brazil, the country had stalled in its efforts to build a national eHealth infrastructure until the pandemic required them to establish a national repository of patient data (Donida et al., 2021). In other countries, disconnected public health data systems were finally joined together to provide accurate statistics on case counts, hospital capacity, vaccination rates, and mortality—an accomplishment that vastly improved the situational awareness of physicians, policymakers, and patients nationally and internationally (Budd et al., 2020). Health communication specialists were employed routinely and often to help interpret these statistics for the public, formulating evidence-based strategies to help individuals' move beyond fear to adopt the behaviors needed for mitigating risk (Finset et al., 2020). Tracking systems were necessarily reengineered and improved to support COVID-19 testing, to facilitate contact tracing, and to oversee massive vaccination supply chains (Donida et al., 2021). Data dashboards and advanced analytic methods were deployed to convert data into action for policymakers, healthcare workers, and the public (Arora et al., 2021; Barbazza et al., 2021). Digital apps were downloaded by millions of individuals around the world to track and prevent exposure to facilitate verification of testing or vaccination status (Dowthwaite et al., 2021).

A need to rebuild

Make no mistake about it, the costs leading to these innovations were unprecedented and substantial. In September 2020, global health modelers publishing in the Lancet estimated healthcare costs from COVID-19 in low- and middle-income countries would amount to U.S. $52 billion every 4 weeks (Lancet Global Health, 2021). Disruptions in the healthcare environment led to an inordinate amount of stress on healthcare workers with an ongoing toll visible through news coverage and personal stories (Benfante et al., 2020). Screening and preventive care were often placed on hold as patients refrained from engaging with their primary care doctors (Sharpless, 2020), while timely care for acute and chronic conditions was often killed either out of necessity or fear (Czeisler et al., 2021). An evaluation of mortality statistics laid bare the costs of healthcare disparities in a way that was tangible and disheartening (Miyawaki et al., 2021).

There is much to rebuild. Nevertheless, there is reason to believe that our unified efforts to combat the pandemic may have helped us identify some of the weaknesses in our information infrastructures that needed repair. Now, with substantial investments made to enable virtualized care behind us, we may be in a position to create a new normal in medicine after the pandemic subsides. That new normal should allow us to utilize health information as the lifeblood of a connected system striving to treat all patients with equal access and effectiveness.

Taking advantage of the ecosystem of care

When building back after the pandemic, healthcare delivery researchers will have an entirely new configuration of options, services, and attitudes available to them than they would have had before. Before the pandemic, taking part in a synchronous telemedicine call through a privacy-compliant platform such as Zoom® would have been the exception and not the rule. During the pandemic, the reverse became true. As clinical providers consider ways in which they can deliver on the "quadruple aim" (Bodenheimer & Sinsky, 2014) of healthcare (i.e., improved patient experience, improved health outcomes, reduced stress on providers, and better population health), they will now be able to draw on the enhanced capacities of telehealth services to improve timeliness of care.

Medical professional societies have begun to recognize this change (Bearnes et al., 2021). In practice standards issued by the American Society of Clinical Oncology in 2021, there was no longer an unstated uncertainty about *whether* telemedicine approaches in oncology were viable. It is now clear that they are. Rather, the practice guidelines revolved more directly around the question of *when* and *under what conditions* these new approaches in connected care might be suitable or optimal, with explicit exhortations to use telehealth as a tool for easing burden whenever feasible and when preferred by patients (Jiang et al., 2020; Zon et al., 2021). The same professional society issued a plea to policymakers and accrediting agencies to sustain support for telehealth services well after the pandemic has run its course (American Society of Clinical Oncology, 2020).

There are other advances made during the pandemic that may be utilized after the crisis to build a better delivery system. Consider the common challenge of utilizing eHealth to coordinate care as mentioned earlier in this paper. Before the pandemic, fragmentation in the provision of care stood in the way of linking together services for the patient as a whole person (Adler & Page, 2008). This was especially true in the case of delivering mental health services. Depression, psychological distress, and risk of suicide are common—but often undetected—comorbidities accompanying the diagnosis of many diseases, with COVID-19 among them. Around the time of the pandemic, informatics pioneers had begun creating automated systems for monitoring early levels of distress among their patients (Hsu et al., 2020; Place et al., 2020). When detected, these technology-enabled coordinating systems could then be used to connect patients through a telemedical consult to a mental health professional. In Australia, where such a system had been established during the pandemic, healthcare researchers engaged in a local systems dynamic modeling exercise to evaluate potential return on investment across models of care after the pandemic waned. Models included (a) business as usual; (b) an increase in the service capacity growth rate by 20%, (c) standard telehealth, and (d) technology-enabled care coordination. Using parameters extracted from actual care, the researchers predicted that technology-enabled care coordination would offer the greatest return on investment with a reduction in self-harm hospitalizations and suicide deaths of 6.71% over other alternatives (Iorfino et al., 2021).

Or consider the "reset" that the pandemic might provide for the status quo of industrial age systems that have historically widened gaps in health disparities. Even before the pandemic, data suggested that technology-enabled coordination systems could help eliminate systemic disparities in health care by enforcing rules for equitable inclusion in screening and treatment programs (President's Cancer Panel, 2016). Add to that finding an ability to overcome logistical access barriers through telehealth, and the chances are good that a new system of care may be built to move the needle on universal access (cf. World Health Organization, 2016). Of course, not every individual was able to benefit equally from telehealth services during the pandemic. Some experienced obstacles due to lack of broadband internet access, lack of experience with technology, or limitations in literacy (Miyawaki et al., 2021; Qian et al., 2021; Rush et al., 2021). Governments have indeed been working hard during the pandemic to improve citizens' access to broadband in an effort to overcome a digital divide. In the meanwhile, others have found workarounds to the access issue by making provisions for assistance from local community health workers (Shah et al., 2021). This latter approach has the added benefit of expanding local ties within the community to help overcome cultural, literacy, and language barriers. It is an example of using the human factors concept of channel redundancy to build community resilience.

Enabling action through human-centered design

If there is one overarching lesson to be learned from the COVID-19 pandemic, it was the importance of designing systems to support human cognition and behavior. Early on, COVID-19 exposure apps were deployed in countries such as the People's Republic of China, South Korea, and Taiwan to provide citizens with timely information on when to self-isolate and when to seek diagnostic confirmation from testing facilities. Data feeds from the apps were also designed to ease the burden on contact tracing personnel, who were, in turn, asked to perform an overwhelmingly difficult task were it not for the assistance of information technologies. In Australia, Victoria's Gippsland Primary Health Network offered general practices in the region as well as the Gippsland Contact Tracing Unit the opportunity to remotely monitor patients with suspected cases of COVID-19 in their homes, using the Lifeguard Health Network mobile health app and platform (McDonald, K, Gipsland PHN supporting remote monitoring platform for COVID-19 patients, Pulse+IT, September 2, 2020). Among scientists, collaborative open-science architectures facilitated data sharing in an unprecedented way leading to an unparalleled drive toward an effective vaccination strategy (Hesse et al., 2021). Once the vaccines began rolling out, publicly facing certification systems facilitated travel, confirmed immunization status for employment, and provided entrance into restricted venues—all of which would serve as a psychological incentive to drive further participation in vaccination programs. What was common among these systems was a collective effort to create technologically enabled architectures for real-time decision-making based on users' expressed needs. These systems were created with one express purpose in mind: to support action.

To create systems that are optimized for action, we concur with recommendations from the World Health Organization (World Health Organization, 2016, 2019, 2020) to employ a strategy of *human-centered design*. Quite simply, human-centered design is both a set of practices and an overarching philosophy that seeks to improve person-technology fit in ways that augment human capacity and reinforce shared values. From our perspective, the process begins with a deep understanding of a problem, gained from empathy with the individuals who must come together to solve that problem. In our own work, we have customarily built this understanding through unobtrusive observation, stakeholder interviews, and by engaging in participatory codesign events (McComsey et al., 2020). We have then turned toward translating our understanding into functional designs through research, ideation, and prototype development, after which we follow an iterative, self-correcting cycle of refinement, implementation, and testing (Aronoff-Spencer et al., 2022). In medicine, systems built following human-centered design principles produce fewer errors, are safer, are more easily learned, more easily used, are more time efficient, and do a better job of reducing clinician burnout when compared to systems built through more top-down, technology-centric approaches (Carayon, 2012; Leonard et al., 2004; National Academies of Science, Engineering, and Medicine, 2019; Vicente, 2003).

Many may be familiar with the concept of human-centered design (sometimes referred to as usability engineering) as applied to individual products. “Easy-to-use” smartphones and computer screens likely evolved because of design decisions informed by an ergonomic understanding of how these products will perform in real-world use (Norman, 2013). Communication “systems” are more than the sum of their parts. To improve health and healthcare communication systems, we must elevate our perspective beyond the individual product to the broader level of the healthcare ecosystem. This level of perspective is often referred to as an emphasis on *human-system integration.* It recognizes that a complex system, whether a jet aircraft or an operating room, is only as strong as its weakest link. It is at this level that redundancies in communication channels, fault-tolerance in system design, ease of use for individual interfaces, readability of written instructions, and even incentives for use all come into play.

In Figure 1, we offer an illustration of an action-enabling system currently under development to coordinate care for oncology patients living in a predominantly rural state within the United States. The system was developed following principles of human-centered design at the system level, or in other words following precepts of “human system integration.” Note the use of multiple communication devices, from smartphones running video conferencing apps in support of telemedical consultations, to the use of remote monitoring devices for registering patient-reported outcomes and even to record physiological “vital signs.” These are multiple communication channels with redundancies built-in to ensure that all patients, regardless of socioeconomic status or comfort with individual technologies, are served equitably. Also note the use of a technology-enabled coordination system with an accompanying dashboard, to help an assigned care manager keep track of a patient's indicated referrals to medical and support services. When integrated into a revised system of care, dashboards can help ensure that no patient is left behind by

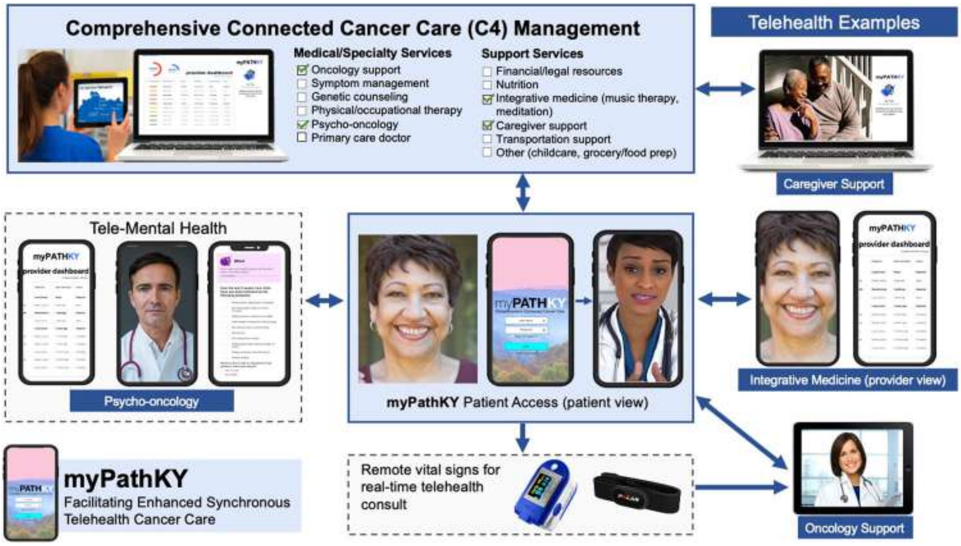

FIGURE 1 A fault-tolerant communication system under development in a rural cancer network within the United States. The system was designed to monitor and address patient distress during treatment in oncology using feedback gained directly from patients, providers, and other stakeholders during system codesign. (Figure is attached).

creating a checklist for tracking services with accountability across patients and populations. By orienting to the broader ecosystem of care, we hope to overcome the common challenges typically experienced in eHealth implementation; that is, of individual technologies that may work well on their own but create downstream logjams or system-level disruption when not designed in concert with other attributes of a rapidly changing healthcare system (Wachter, 2017).

CONCLUSION

In this paper, we have considered the role of health information in a postpandemic world with a special emphasis on its role in preventing discontinuities in care. We adopted the mantra of “don't drop the patient” to instantiate our commitment in delivering a reliable and supportive experience for patients through an unbroken safety net of reliable communication systems. Strengthening communication systems through digital technologies, as emphasized by the World Health Organization, is a global goal. It is a necessary first step in breaking down the physical barriers that often prevent access for many patients to care, and by doing so it is a step toward achieving the societal goal of providing universal access to life-saving medical knowledge. Ironically, that goal seemed more difficult to achieve before the pandemic. Now, as healthcare providers have had to engage by necessity in concrete plans for telemedical care, we share a sense of optimism with other healthcare leaders that it may be possible to accelerate our progress in using digital communication technologies to strengthen healthcare systems worldwide.

Strengthening communication systems will require us to take a human-centered approach to healthcare design, and not just at the level of the individual device or the content of a written instruction. It will require us to take a human-centered approach at the systems level; to embrace a higher-level perspective of human-system integration. In doing so, we recognize that none of us need be alone in our endeavors. We concur with recommendations from human factors experts that usability data should be shared across proprietary contexts so that others will benefit from knowledge gained in the use of communication technologies to save lives and improve health (Ratwani et al., 2015). In this sense, we endorse a spirit commonly expressed during the pandemic: that, ultimately, we are stronger together.

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ETHICS STATEMENT

This commentary is not based on research with human participants, and therefore did not require approval from an institutional review board.

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David K. Ahern, PhD—I've focused my 40-year career on behavioral medicine, studying the intersection of behavioral and psychosocial factors with medical illness. Early on I recognized the importance of emerging digital technologies in health and health care, serving as the National Program Director of the Health e-Technologies Initiative, a 7-year, $10.3 million national program of the Robert Wood Johnson Foundation (RWJF). The Initiative concluded its work in April 2009. Immediately following, I was appointed the Director of the Health Information Technology Resource Center of Aligning Forces for Quality (another RWJF national program), which provided Health Information Technology-related technical assistance to 16 communities, encompassing 11% of the U.S. population. In 2013, I was appointed as a Special Advisor on health information technology to the National Cancer Institute, working closely with Dr. Brad Hesse who was Chief of the Health Communication and Informatics Research Branch within the Division of Cancer Control and Population Sciences. With Dr. Hesse and Dr. Ellen Beckjord, I served as coeditor of the text, Oncology Informatics, published by Elsevier, which received the PROSE Award for Clinical Medicine in 2016. I also served as cofacilitator of the President's Cancer Panel workshop series on Connected Health from 2014 to 2016. In 2017, I was appointed as Special Advisor to the Connect2HealthFCC Task Force within the Federal Communications Commission.

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ORIGINAL ARTICLE

Evaluating South African and Namibian governments' use of digital media during Covid-19

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Abstract

Governments during the Covid-19 pandemic in response to the challenge of reaching as many of their citizens as quickly as possible have relied on the use of digital media communication. Various stakeholders, however, have questioned whether strategic use of digital communication by governments has been effective during the Covid-19 health crisis. We thematically analyzed a public online bi-country webinar and conducted a netnographic analysis of South African Health Minister Dr. Zweli Mkhize and Namibian Ministry of Health and Social Services Twitter accounts to evaluate the effectiveness of government digital communication during the Covid-19 pandemic. Stakeholders and social media analysis highlight that government digital communication has lacked engagement, falling short in assisting citizens to understand the effects of the Covid-19 pandemic. We highlight the shortcomings of governments simply transmitting information on channels built for dialogue, the digital divide limiting reach, as well as how limited engagement opens up opportunities for misinformation.

KEYWORDS

Covid-19 health crisis, digital media communication, stakeholder engagement

Highlights

- Many governments, including the South African and Namibian governments, have relied on the use of digital media to disseminate as much information as possible.

- Various stakeholders have questioned the effectiveness of using digital media as a strategy in reaching citizens across parts of Southern Africa.
- Stakeholders acknowledged that the use of digital media by governments, particularly South Africa and Namibia started as a good initial reaction to the Covid-19 pandemic.
- However, these governments were mostly reactive in their online communication with limited engagement that fueled misinformation online and citizens looking to other nongovernment sources for information.
- Some of these alternative sources of information became health-care professionals and other helpful citizens that were online, taking on the communication burden.
- The governments were perceived as not being humanistic in their digital communication and part of the challenge was digital inequality that highlighted the need for traditional communication in media convergence.
- Inefficient use of digital and social media erodes trust and quality of the relationship between government and their key stakeholders, that is, citizens, reversing any gains made in this case, in the fight against the Covid-19 pandemic.

INTRODUCTION

The Covid-19 pandemic has challenged governments to look for ways of reaching their citizens, as key stakeholders, as swiftly as possible to enable their publics to engage in containment behavior. The power of digital and social media lies in the opportunity for real-time engagement between government officials and citizens for public health, especially during a crisis (Currie, 2009). The very nature of the Covid-19 virus is that it spreads through close human contact, and thus timely information delivery has been critical in fighting this pandemic. Many governments, including the South African and Namibian governments, have relied on the use of digital media to disseminate as much information as possible. South Africa has been one of the hardest-hit African countries by the Covid-19 pandemic (Msomi et al., 2021) along with its Southern African neighbors like Namibia. The two countries South Africa and Namibia's government responses to the coronavirus pandemic have been similar, with the various infection waves following similar patterns. As key members of the Southern African Development Community (SADC), the 1997 SADC Health Programme that includes a Health Policy Framework and Protocol on Health (SADC, n.d.) informs the coordination of the response to the Covid-19 pandemic by South Africa and Namibia.

Digital media use by governments has been hailed as a step toward greater transparency toward citizens. Communication is crucial during a pandemic crisis (de Rosa et al., 2021) because communication shapes and informs our reality (Falkheimer & Heide, 2018). Increasingly, digital communication channels are used in health communication (Kreps, 2017). The digital media communication used by the South African (and Namibian) government has included short messaging service (SMS), social media, video streaming, instant messaging platforms, and an official dedicated Covid-19 government website (Sitto & Lubinga, 2020). While other traditional media have been included in the Southern African governments' communication mix, emphasis particularly in South Africa has been placed on digital platforms. Social media is useful to interact efficiently with numerous stakeholders; however, the user-generated content and exchange create a fertile breeding ground for communication risks (Cheng, 2018).

Various stakeholders have questioned the effectiveness of using digital media as a strategy in reaching citizens across parts of Southern Africa. The main question we explore is whether strategic use of digital communication by Southern African, specifically South African and Namibian governments, has been effective during the Covid-19 pandemic. The article reviews the literature on stakeholder theory and engagement, focusing on Covid-19 communication strategies, as well as critical factors for effective digital communication strategies. Thematically analyzing a public online webinar evaluating government use of digital media during the Covid-19 pandemic and netnographic analysis of a Twitter thread from former South African Health Minister Dr. Zweli Mkhize on the new variant and the Namibian Ministry of Health and Social Services Twitter account, we aim to explore the above question.

LITERATURE REVIEW

Stakeholder engagement and good faith

The definition of a stakeholder as originally defined by Freeman (1984) is one of the groups or people affected by or affecting an organization. However, over time, the definition of a stakeholder as a concept has changed as demonstrated by one of the more recent definitions of stakeholders as groups or individuals *vital* to the survival and success of an organization (Freeman et al., 2004). The evolution of the definition demonstrates the shift of focus away from the organization leaning more toward stakeholders, where such groups and individuals are considered vital for the survival of organizations. Governments function as organizations and are expected to deal with their citizens as their stakeholders based on good faith.

Good faith in stakeholder theory encourages engagement while preserving the individual autonomy of stakeholders to pursue self-interest and helps to balance power inequalities (Dawkins, 2014). The concept of good faith stakeholder engagement thus relies on dialogue, negotiation, transparency, and totality of conduct (Dawkins, 2014). Communication solutions can be different in dealing with stakeholders and are not equally available to various stakeholders because stakeholders have power inequality among themselves (Fontaine et al., 2006). This is true for the diverse stakeholders that governments need to engage with throughout the Covid-19 pandemic. Communication encompasses communicative transactions meant to achieve mutual interpretation of message meaning. Recognizing the importance of communication is not enough nor is it a guarantee that communicative practices correspond to outspoken ideals (Falkheimer et al., 2017), especially during a global health crisis.

Covid-19 government communication strategies

The global Covid-19 pandemic has introduced significant uncertainty for government leaders, outside their normal practice. The Covid-19 pandemic poses a clear health crisis, an external shock that has put a strain on governments globally due to the inability to control it fully. With fluctuating rates of infection and multiple waves of the virus, sharing information as quickly as possible has been critical to governments' efforts to curb the rates of infection among their citizens. The South African government's response, as with others globally, has included imposing lockdowns and travel bans, limiting entry and exit at borders, and instituting additionally localized measures such as substance bans (Hagemeister et al., 2020; Labuschaigne, 2020).

The Covid-19 pandemic, primarily a health crisis, has triggered other crises. The wider impact of the virus and governments' measures in response to it, however, continues to be felt around the globe at the socioeconomic level by citizens. South Africa is a country of many contrasts and deep structural social inequalities (Finn & Kobayashi, 2020) which are linked to socioeconomic status, urban/rural divide, and race (Lubinga et al., 2021). These socioeconomic inequalities make it difficult for the poorest citizens to access health-care services (Lubinga et al., 2021). The more vulnerable groups, such as those living in rural areas and townships in South Africa, reliant on the public health-care system, have been hardest hit by infections and rates of death from Covid-19-related complications (Rogerson & Rogerson, 2020).

The Covid-19 pandemic has forced all governments to consider those affected, primarily their citizens and those within their borders as well as the different levels of impact, socially, economically, physically, psychologically, and emotionally. When the first patient presenting with Covid-19 symptoms was diagnosed, the South African government put in place the Disaster Management Act, enabling the implementation of a hard lockdown (Egbe & Ngobese, 2020). The hard national lockdown effectively shut the country down, with the government intending to use the period to prepare national health systems to cope with the impending wave of cases (South African Government, 2020). The former South African minister of health became responsible for the communication of monitoring and evaluation of all health systems nationally, collating statistics about overall tests conducted, overall positive cases, total recoveries, total deaths, daily deaths, and new cases both nationally and provincially. Creating public awareness involved spending millions of rands on multiplatform communication (Sitto & Lubinga, 2020).

Countries globally have chosen specific communication strategies to disseminate information and communicate about the Covid-19 pandemic. Digital communication has been central to their disseminating of information, in light of the need to engage in social distancing as part of pandemic containment measures to be adhered to by all (Mukumbang et al., 2020). “Digital communication channels have the unique capacity to combine mass and interpersonal forms of communication through media convergence by disseminating messages to broad audiences, while also engaging users in interpersonal interactions” (Kreps, 2017, p. 519). Regular briefings by presidents and their ministers as well as other key stakeholders such as the World Health Organisation have become commonplace as the global population attempts to keep abreast of dynamic developments during this crisis. In an effort by officials to fight infodemics, frequent official transmission of information has been done. An infodemic is an epidemic of misinformation about the virus, its spread, and risk avoidance strategies (Zarocostas, 2020). In between the national addresses and ministerial committee briefings, various government departments in South Africa have increasingly made use of social media, primarily Twitter and Facebook to keep citizens on those platforms updated daily.

Communication strategies by the South African and Namibian governments have included converged use of mass media, digital and social media. The combined use of mass and interpersonal communication such as social media has proven valuable for information sharing, engagement, and collaborative decision-making; all critical communication processes for achieving health promotion outcomes such as education and behavior change (Kreps, 2017). Of particular strength for the South African government has been the use of social networking sites and related interpersonal communication technologies, such as Facebook, Twitter, and WhatsApp to communicate about Covid-19. Interactive communication technologies featuring both mass as well as interpersonal processes of communication include social networking sites (SNS) (Walther & Valkenburg, 2017, p. 416) such as Twitter and Facebook. Social networking has influenced social life as the development of ICT has given rise to the network society (Basuki et al., 2015), with people continually connected to their online communities of choice as part of their daily realities.

The advancements in communication technologies have allowed governments globally to learn from observing one another's communication strategies online in response to the Covid-19 global pandemic. The Internet helps foster global communication between people through various channels, profoundly affecting interpersonal social interactions between people (Matusitz, 2014). Digital online communication, however, lacks social cues, requiring communication that is more mindful and active engagement due to the asynchronous nature of most computer-mediated communication, that is, more time to plan and edit messages (McQuillen, 2003). Engagement is a critical factor to the successful use of digital and social media technologies to build common understanding and strengthen feelings of closeness within online communities.

While digital media have been hailed as a saviour for reaching more people that are geographically spread during the Covid-19 pandemic, in a society like South Africa, with deep inequality and gaps in access to digital services, this may not be the primary solution in the converged media mix. Kreps (2017) identifies seven key strategic communication factors for converged health communication. Kreps' (2017, pp. 522–525) seven strategic communication factors for designing digital health information systems are:

1. tailored to users;
2. easy and convenient;
3. provide relevant and clear information;
4. provide feedback and interaction;
5. responsive to user needs and feelings;
6. interesting and immediate;
7. connect to trusted social networks.

These seven factors according to Kreps (2017) are important for ensuring the effectiveness of strategic communication for health. There are also several obstacles when digital media is used for stakeholder engagement, mainly linked to control, channel choice, time invested, listening to feedback, and quality of engagement (Navarro et al., 2017). The seven key strategic communication factors outlined by Kreps (2017) enjoy overlap with the obstacles identified by Navarro et al. (2017) on the use of digital media.

Converged media health communication and digital inequality

The first key strategic communication factor of converged health communication involves ensuring that such systems are tailored to users (Kreps, 2017). In South Africa, digital communication needs to take into account the low levels of Internet access, as the country's Internet penetration remains at 57.5% (Internet World Stats, 2021). The Internet is accessed by 60% of households nationally through their mobile phones, which is expensive, with access concentrated in urban centers (Kahla, 2019; Statistics South Africa, 2018). This leaves a large segment of South Africans offline, and unable to access critical health information increasingly shared by the government online during the Covid-19 pandemic. A recent study on health disparities and the digital divide in South Africa supports this, with most of the participants confirming that they had relied primarily on mass media for Covid-19 information (Lubinga et al., 2021). Online access is one of the least used modes for information access in Namibia largely because of the cost of access and usage (Stork, 2009) and divided along lines of affordability in the urban/rural socioeconomic divide (Kadhila & Nyambe, 2021).

Online digital inaccessibility is counter to Kreps' (2017) second factor of ease and convenience of the use of online health information systems. One of the key obstacles to convenience in the use of digital media by governments during the Covid-19 pandemic is that they often fear losing control over information disseminated (Navarro et al., 2017), and this leads to them limiting the comments and people's access to the information shared online. At times, in the quest to control the information, governments share official statements as is, online. The practice of shovelware is when the same content is used on multiple digital media without being changed (Azionya & Sitto, 2018, p. 29), which numerous governments do to avoid distortion of their messages. While having authority over information to stem an infodemic, the selection of channels is also critical to the success of digital communication by governments. There are often difficulties involved in choosing the correct channels because of the diversity of stakeholders and differing levels of access inequality, balanced against finding the appropriate channels for the message (Navarro et al., 2017).

Clarity of information can be hampered by the use of professional jargon by health-care practitioners and experts in communication about the Covid-19 pandemic, resulting in confusion and ineffectiveness of the messages shared. The third and fourth key success factors for strategic health information systems are the provision of relevant and clear information, as well as providing feedback and interaction (Kreps, 2017). Chomsky (2006, p. 102) stated, “to have command of a language is to be able, in principle, to understand what is said.” Health, as with other areas of specialization, has its own language that can only be understood by health-care professionals and experts, such as doctors, epidemiologists, and nurses.

Provision of relevant, clear communication and interaction requires a significant investment of time by governments in engaging with their stakeholders, particularly during the Covid-19 pandemic with so many changes and regular information updates. Most organizations, however, including governments, underinvest in their engagement online and struggle to devote the time necessary to their communication management (Navarro et al., 2017).

The time investment in health information systems and digital communication strategy execution can prove invaluable for governments when used optimally. Governments can learn a lot from stakeholders by engaging with feedback, although this is often not done thoroughly or to improve relationships (Navarro et al., 2017). Hertlein and Ancheta (2014) identified three categories of reasons people use technology in relationships, which are to: (i) develop, (ii) manage and (iii) enhance their relationships. There has been a criticism of the South African government that they do not use digital optimally in their health communication strategy on Covid-19, and thus counter to Kreps' (2017) factors, they are not responsive to user needs and feelings, making their messages uninteresting and not immediate. The inefficient use of digital and social media is considered a contributing factor to the erosion of the relationship between government and its citizens during the Covid-19 pandemic. Proactive engagement is critical to digital media communication success as it can help avoid crisis and with the development of technologies, the measurements of online dialogue are continually improving (Navarro et al., 2017). Being connected to trusted digital social networks is a key strategic communication factor (Kreps, 2017) and can prove to be a valuable tool for influencing behavior change.

The former South African Health Minister's social status has been elevated with his increased use of Twitter as part of his department's converged communication strategy for information sharing about the state of the Covid-19 pandemic nationally. Dr. Mkhize was considered a beacon of hope during the Covid-19 pandemic and in December 2020 was named newsmaker of the year for his leadership role in the fight against the coronavirus pandemic (*Daily Vox*, 2021). Participating in online social networks can increase one's social capital and psychological well-being (Malinen, 2015). As key stakeholders, there are questions as to whether all citizens are being reached with digital communication, the quality of the online engagements, especially given the significant financial investment that has gone into strategic communication using digital media. The level of trust the South African citizens had in former Minister Mkhize was so immense that his involvement in a matter of a multimillion rand irregular tender with a digital communications supplier (IOL, 2021) has undermined the gains made in the digital Covid-19 communication strategy by the government with citizens.

METHODOLOGY

The virtual panel discussion titled *Evaluating government use of digital media during Covid-19* was held on April 21, 2021, from 15:00 to 17:00 through the University of Johannesburg Library on Zoom and Facebook Live. The goal of the virtual panel was to evaluate the use of digital communication technologies by governments, primarily South African and Namibian governments since the start of the Covid-19 pandemic. This panel discussion formed part of an NRF-funded project that aims at exploring, among other issues, how governments use digital media to curb infodemics that arise during pandemics. The panel consisted of a mixed group of five experts, namely a leading health journalist, a senior health-care professional, a senior communication academic, a journalist, and a digital communication specialist. The session was publicly held and is accessible via the University of Johannesburg Library Facebook page. A third party was contracted to transcribe the webinar's 2-h-long webinar video, which we analyzed thematically. We also included a word cloud to observe the most frequently used terms during the session.

As a secondary analytical process, we analyzed the Twitter accounts of the former Minister of Health, Dr. Mkhize's Twitter account, and that of the Namibian Ministry of Health and Social Services, a popular tool for disseminating daily Covid-19 information. The aim of analyzing the two data sets from the webinar and Twitter accounts is to provide balance to the webinar panel discussion data by also evaluating the public's response online to government Covid-19 communication. The Namibian Ministry of Health account has just over 1900 followers, with the account only having been opened in March 2020. Upon examination, the account had little engagement, and the tweets from the account consisted mostly of the daily Covid-19 statistics. The former South African Minister of Health's account has been active since March 2017, and he has nearly 600,000 followers. All the tweets from April 2020 to January 2021 examined were for their original tweet content and follower engagement. The selected tweet thread from the former minister's account was one of the key media briefings during the second wave, which was the discovery of a variant in the strain found in South Africa, that is, mutation of the Covid-19 virus, labeled 501Y.V2. The original thread of tweets, 14 in total, were combined into a single document and the text was formatted to prepare the content for netnographic analysis. Netnography, that is, ethnography on the Internet, a rigorous methodology suited for studying the uniqueness of online communities (Kozinets, 2002, p. 62; 2015) was used for analysis. The analysis was done on over 300 responses to the former minister of health's thread. All the responses analyzed and reported on excluded the usernames, that is, handles of the respondents.

Kozinets developed 12 methodological steps that are iterative and interact throughout the process of analysis during netnography (Kozinets, 2015). Kozinets' (2015, p. 98) 12 steps as outlined below were used in a nonlinear fashion for the purposes of netnographic analysis of the tweets replying to Dr. Zweli Mkhize's thread about the new variant of the Covid-19 (501Y.V2) virus:

1. Introspection—a reflection of the role of research in approaching how the data would help achieve the research aims and objectives of the study. This included reflection on the official government online discourses about Covid-19 and the purposive selection of online government activity on the topic.
2. Investigation—the search for official government accounts communicating about Covid-19 online on social media, checking common platforms for analysis which was Twitter for South Africa and Namibia from March 2020 to December 2020.
3. Information—ethical considerations involved accessing only publicly available conversations on Twitter from official accounts as communicated in the bios, including building anonymity in the interpretation of the data collected by excluding the handles of user responses.
4. Interview—the sites to be inspected were Twitter accounts of the then South African Minister of Health and the Department of Health in Namibia, although there was more volume on the South African Twitter account, and the high volume conversations were included for analysis.
5. Inspection—this involved a thorough analysis and data collection of each accounts' (South African and Namibia) Covid-19 daily updates and resultant conversations.
6. Interaction—the entrée strategy was through a public search on Twitter, which allowed for these updates and conversations to be identified.
7. Immersion—the authors had to immerse themselves in the conversations, including reading comments and retweets, shared links, memes, videos, as well as collecting the original tweets and replies on Covid-19 from both official accounts.
8. Indexing—this phase was about weighting the data collected concerning the Covid-19 updates, the importance of the conversations to the context of the coronavirus infection rates and waves, selecting more high-quality and meaningful data from the conversations.
9. Interpretation—interpretive analysis, which is termed interpenetration; that is an analysis-seeking depth of understanding. The interpretation was done using the stakeholder theory and converged health communication framework to code the tweets from the selected conversation in an attempt to understand them without distorting them through interpretation.
10. Iteration—there were phases within these phases for this netnographic analysis, including thematic analysis from coding to the development of themes and arrangement on tweets across different themes.
11. Instantiation—the most appropriate analysis approach was humanist, given the sensitivity and novelty of the Covid-19 pandemic especially during the period analyzed and the schismatic nature of the conversations.
12. Integration—the data analyzed were integrated with the research objectives to develop insights from the netnographic analysis conducted, forming part of the overall findings and interpretation discussion.

One of the benefits of netnography is the near-automatic transcription of the contents downloaded, and the ease with which the data were obtained (Kozinets, 2002). Netnography helps provide insights into individuals' experiences (Xun & Reynolds, 2010), especially for such a novel pandemic of the Covid-19 virus and the uncertainty people are experiencing in an emergent context. Netnography "provides a window into the cultural realities" (Kozinets, 2006, p. 282) such as those of South Africans in response to communication about the Covid-19 virus and arising themes. Only publicly accessible tweets were used, and none were selected from any private conversations or direct messages, to which we had no access.

Governments have identified digital communication as the go-to solution for reaching the masses during the Covid-19 pandemic, with the requirement for limited in-person social interaction. One of the most popular mediums for daily updates was Twitter, with the Covid-19 statistics shared by both governments, making it the site of choice for data collection for the netnography due to the similarity of use and information shared by the South African and Namibian governments. The connectivity challenges are similar concerning cost, Internet penetration (52% Namibia and 57% South Africa per Internet World Stats, 2021), and mobile-first access. We then compare the Twitter engagement by the former Health Minister Dr. Zweli Mkhize and that of the Namibian Ministry of Health, in light of the discussion by the various stakeholder representatives that participated in the webinar panel. The comparative analysis aims to evaluate whether the digital communication strategies for Covid-19 of the governments addressed issues of the digital divide, poor quality health information and whether they engaged stakeholders to ensure common understanding.

RESULTS

The use of digital media by governments, particularly the South African and Namibian governments, has been acknowledged by participant stakeholders in the webinar panel as a good initial reaction to the Covid-19 pandemic. The webinar discussion was analyzed through the stakeholder theory frame, specifically the characteristics of good faith, namely dialogue, negotiation, transparency, and totality of conduct (Dawkins, 2014, p. 283); particularly the participants' perceptions as government stakeholders of the Covid-19 public health digital communication. Several themes were identified from the webinar discussion evaluating government use of digital media during the Covid-19 pandemic. During the thematic data analysis, the transcribed text from the webinar was evaluated based on the context in the video-recorded discussion, and not simply by the words in the transcription document. The initial codes generated during the thematic data analysis centered on the constructs from the webinar discussion, such as government activity, public engagement, and their professional experiences as stakeholders of the official Covid-19 digital communication government activities in their respective countries. Manual coding of the webinar data was critical to the process, as the context needed to be preserved to apply human interpretation. The codes were then organized into seven themes (see Table 1) based on the similarity of the codes.

TABLE 1 Webinar data analysis themes

Theme number	Theme
1	Reactive government communication
2	Lack of engagement online
3	Misinformation online
4	Citizens looking to other nongovernment sources for information
5	Healthcare professionals taking on communication burden
6	Missing human touch
7	Need for traditional communication in media convergence

The governments, from the themes generated from the data analysis, were seen as reactive, with limited engagement online, all of which were seen as driving misinformation and citizens looking for other nongovernmental sources of Covid-19 information. The themes are discussed below in more detail, including excerpts from the discussion to support each theme.

Reactive government communication

A key theme highlighted from the discussion was that the governments simply copied what governments in other parts of the world did, without tailoring it for the local contexts. As pointed out by the panelists, the communication about the pandemic was centralized, with regular updates from the respective governments online through social media, with Twitter becoming a platform of choice. The governments were seen as being reactive in their digital communication of the pandemic (Table 2).

Lack of engagement online

In addition to limited localization of the content used in the communication, the webinar panel of stakeholders observed that governments did not make optimal use of digital media. There was limited engagement based on stakeholder observations, particularly in government answering clarity-seeking questions asked by citizens online. The theme of digital communication on social media as lacking engagement was a recurring matter in the discussion, pointing out the drawbacks of misuse of digital platforms for communication. In some instances, short mobile service (SMS) messages were used, and a panelist questioned the effectiveness of such digital communication (Table 3).

Misinformation risks online

The dangers of limited digital engagement by governments during the Covid-19 pandemic highlighted in the discussion were limited understanding by citizens of the implication of the information. This opened up a space for misinformation and misinterpretation of the

TABLE 2 Theme 1: Reactive government communication

Reactive government communication	• I think they should be proactive, not reactive, but sad thing this has always been the case throughout, it is not a COVID thing is has always been like this when the department of health communicate, I find it very sad that lesson has not learnt and taken forward in covid and in all respects. • It felt like we were hoping is not going to come to our country and we were watching what America, what America was doing and everywhere else and necessary thinking of what if, what if that was the sense I was getting on social media. • As already said our government were very reactive at some point they were very confused • We are very reactive, we started hearing about COVID in 2019, towards late 2019 right, I feel like as a country, people at higher level should have started assessing, I mean we live in such a globalised space in such a globalised world, we shouldn't have waited until that moment to take decisions

TABLE 3 Theme 2: Lack of online engagement

Lack of engagement online	• The problems are that these platforms are not interactive…I have rarely or have never seen the health minister account answering questions, there are so many questions from our people • Government used social media and online media last week when it launched registration system and it explained very well how to register, but when there were questions there was just no answers • Those questions and answers are full on social media and yet there is no answer coming forward • Namibia still haven't exploited maximally and optimally to try and deal with the questions and the disinformation that people are facing on social media • But it was just one-way communication which is not the best way to use social media it has to be a two-way communication, so many things, so many questions we had a nation

TABLE 4 Theme 3: Misinformation

Misinformation online	• Public Health authorities, as well as the local media, weren't stepping into this space to try and deal with the disinformation that was flooding across social media, and that people were engaging with • Not just through their legacy platforms, but making full use of social media, which Namibia still haven't exploited maximally and optimally to try and deal with the questions and the disinformation that people are facing on social media • There was an opportunity for our politicians those who hold positions to relook the usage of social media, because, on the other hand you have Zweli Nzi, the minister of health saying one thing and on the other hand you have politicians you seem to be like us, you know confused like us, or having fun like us and it creates a confusion • So, all those moments fuel the myths and all the things people were saying, the fake news around these things, about why you should get it and why you shouldn't get it and you really needed to know the facts

information shared by governments, as well as contradictions in matters reported about the Covid-19 pandemic. This as people sought to demystify the information communicated by government health authorities about the Covid-19 pandemic (Table 4).

Looking to other nongovernment sources for information

The panelists highlighted that some citizens and stakeholders, in their desperation to get information, looked to other nongovernment sources for help. The limited engagement by governments was discussed having become a breeding ground for further mistrust of government communication, as well as fuelling infodemics. The misleading and harmful information spread more easily due to the engagement vacuum, building resistance toward government communication as observed by the panelists (Table 5).

Healthcare professionals taking on communication burden

The discussion, led by the health-care practitioner panelist highlighted the personal involvement of health-care professionals in becoming sources of information during the Covid-19 pandemic that were considered credible because of their professional profiles. The panelists noted the rise in the number of doctors, epidemiologists, virologists, and other

TABLE 5 Theme 4: Seeking alternative information sources

Citizens looking to other nongovernment sources for information	• I also seen it in the work that we do there is a lot of questions we wish to give to the health department and come to Bhekisisa Twitter account because people feel they are not getting the answers • We have seen actually in the past two years our traditional healers using social media, an increase in use of social media to share information to share how they do certain things. One of the pillars that was centred around was steaming, the herbs and a lot of traditional healers came out and said do not overdo this you will mess up with your kidneys. We did not see this partnership with our government and that was such a missed opportunity because like we saw people coming with cues from everywhere

TABLE 6 Theme 5: Healthcare professionals' online communication

Healthcare professionals taking on communication burden	• After the vaccination health professional were directed to a space to take pictures while on the site and you have to post the on your social media to show that you have been vaccinated. So health professionals were used to drive positive messages, but the question is at what cost? • We saw on social media, Twitter for instance, there were lot of doctors from various fields, a lot of epidemiologists of course share their own information, but that was over and above government communication. So you can see health professional took an extra burden upon themselves to share information than the public could not get from the government • So one of the prominent doctors on social media did a whole thread on how the J&J vaccine is a trial run • Prominent doctors who have built their brands on social media and I feel like that was an important time to bring our doctors on board in order to have consistence messaging • Other people took advantage of that gap started populating some of these social media platform for an example we saw doctors opening twitter account and become the kind of go to people to find credible information, and something we never saw people becoming influencers driving the narrative

health specialists blurring their personal and professional online profiles to offer information and simplified explanations of complex Covid-19 health messages. However, in using their own personal initiative, health-care professionals' well-being was not regarded by unengaged governments with respect to the effects of the pandemic and having to fight online misinformation voluntarily (Table 6).

Government communication missing the human touch

The government information shared online of Covid-19 included a number of statistics on the daily infection, recovery, and death rates. Panelists observed that the daily updates of this information led to citizens experiencing disconnect that these numbers were human beings and lost the human touch of empathy. This lack of human touch extended to the analysis of how governments shared information with limited engagement and developed

TABLE 7 Theme 6: Missing the human touch

Missing human touch	• I want to highlight about digital usage and it is very scientific…we forgot the human aspect of what this has done to our country and what this has done to people and South Africa missed that opportunity. • Things have changed this is not normal times you cannot just focus on number forget that you are speaking about people • We forget the human side of it and this is where I feel like is such or something that our government could do better, because there are people right, there is the mental aspect • The human part of these things, respond in a respectful way don't be defensive, our government was very defensive in dealing with these things they like "we deal with everybody the same" but there were pictures and videos that showed something different • The humanness, the compassionate and the empathy that this particular pandemic which required us to do was a missing link • Let us not forget the human behind the challenges we have. There is actually a human with emotions with psychosocial issues that need to be attended to, so whatever we do let's remember there is a human with issues that need to be taken care of

TABLE 8 Theme 7: Inclusion of traditional media

Need for traditional communication in media convergence	• We can't completely write off traditional media, we can't completely write off the posters • But also social media literacy, how you use social media, how you educate and the likes • I totally agree that social media and online media are not the only way to communicate with people • That became a priority to us as a health media organization is to make time for radio and TV because that is the only way to can communicate information to people who cannot access social media

regulations that left limited room for people to understand how to continue in human nature but limiting their potential exposure to the virus (Table 7).

The combination of these themes painted a bleak picture of government use of digital media during the Covid-19 pandemic going forward. All panelists agreed that governments needed to become less reactive and more proactive, come down to the level of the layperson, engage in answering questions and make use of local knowledge. Some panelists highlighted the lack of inclusion of traditional medicine and health care in all communications as a missed opportunity for convergence, even with the growth of traditional medicine's presence online, especially on social media.

Need for traditional communication in media convergence

All the panellists agreed that solely relying on digital communication for Covid-19 communication by governments would be detrimental to making gains during the Covid-19 pandemic, given the low Internet penetration numbers as well as relatively low social media participation of citizens. Thus, the importance of traditional media in the converged media mix needed to be recognized, according to the panellists, as it has a critical role to play to ensure mass access to information (Table 8).

Twitter engagement analysis of main government accounts

The analysis of the Namibian Ministry of Health and Social Services (@MhssNamibia) Twitter account reflected key observations the panelists had mentioned. The account had a low number of followers, relative to the population of the country, with just shy of 2000 followers as of June 2021. The content shared daily consisted of images of official news releases and PowerPoint slides from briefings of information about Covid-19. There was little engagement with the content, and few replies to the content since the account was opened in March 2020, at the start of the Covid-19 pandemic in Southern Africa. The bulk of the content was shovelware, with almost no content uniquely designed for the Twitter account. This made it challenging to compare it with the former South African Minister of Health Dr. Mkhize's Twitter account.

The former South African Minister of Health's tweets from April 2020 to January 2021 were analyzed, focusing on the period during which the country was placed under alert level 1, from September 21, 2020. With daily tweets getting significant attention from followers, we selected a tweet thread from the former minister's account was one of the key media briefings during the second wave, which was the discovery of a variant in the strain found in South Africa, that is, mutation of the Covid-19 virus, labeled 501Y.V2. There were 14 tweets in the original thread, with over 300 responses to the thread analyzed netnographically. The themes of the netnographically indexed tweets in reply to the former minister's thread could be categorized into the following main themes:

- Lack of understanding of the announcement and its implications because of jargon—people asking what the former minister means and asking him to simplify the language used.
- Linking the announcement to metaphors—trying to understand the announcement in familiar terms.
- Citizens trying to be helpful—engaging with the questions from fellow Twitter users asking the former minister's account for clarity, to try and explain the announcement more simply.
- Questioning vaccine efficacy—responses asking about the effectiveness of the vaccine against the new strain.

The discussion of the webinar by the various stakeholders of government's use of digital media to communicate about the virus was affirmed by the Twitter netnographic analysis done on the two main government social media accounts used for Covid-19 daily updates. There was limited online engagement; information was not easy for citizens to understand, making it difficult to have effective Covid-19 government digital communication.

RECOMMENDATIONS

Quick information sharing remains critical to the fight by governments to stem the fluctuating waves of infection and death among citizens during the Covid-19 pandemic. While governments recognize the need for communication, as Falkheimer et al. (2017) emphasize this recognition alone is not enough. Analysis of a panel evaluating two governments' use of digital media raises serious matters that need attention for successful health communication to happen particularly during the Covid-19 pandemic.

One of the most critical themes from the data is that of building understanding for ordinary citizens, by ensuring that their questions are answered and that digital and social media are used optimally through frequent engagement. The concept of good faith in dealing with stakeholders relies on dialogue and autonomy (Dawkins, 2014) which both the South African and Namibian governments are not perceived as carrying out during their Covid-19 digital communication. The transmission of information without the solicitation and engagement with public views can undermine their efforts in stemming the rate of infections. The inefficient use of social media can erode the trust and relationship between government and their citizens, reversing any gains made in the fight against the Covid-19 pandemic.

Digital communication systems rely on users for relevance and content. Ensuring that converged health communication systems are tailored to users is the first key strategic communication factor outlined by Kreps (2017). Digital media is critical for reaching people as quickly as possible; however, governments need to ensure engagement is done using multiple mediums and increasing reliance on traditional media to reach a diverse range of stakeholders with Covid-19 messages. Ease and convenience for converged health communication systems is a key factor (Kreps, 2017) which the governments under review have been criticized for not getting right concerning public access to Covid-19 information that is easy to understand. While centralized government communication has been critical for the verification of information, for it to be successful it requires a more multi-stakeholder approach to ensure that it is accurate, consistent, and accessible for ordinary citizens to understand the implications of the health messages. Kreps' (2017, pp. 522–525) strategic communication factors three, four, and five outline the importance of relevant and clear information, feedback, and interaction, as well as responsiveness to user needs and feelings. All these are key strategic communication factors for ensuring successful converged health communication systems.

It is not good enough for governments simply to transmit information on channels built for dialogue, as their lack of response opens up opportunities for misinformation. Navarro et al. (2017) highlight that organizations underinvest in their online engagement, struggling to invest the requisite time in their communication management. Since the start of the Covid-19 pandemic, low online engagement by the South African and Namibian governments has opened up space for others to be considered as credible sources of information. Health-care professionals, for example, have taken it on themselves to share information online through social media and other digital channels, possibly at the risk of their professional profiles, but to assist citizens to understand better. While governments can learn from these engagements, it is critical for them to become more proactive, as Navarro et al. (2017) highlight a key benefit thereof is avoiding crisis and continually improving dialogue. The involvement of other stakeholder voices in South Africa and Namibia may help build better trust in health communication about the Covid-19 pandemic by the government.

The South African and Namibian governments have been called to question concerning their approach to health information during the Covid-19 pandemic. The panel of stakeholders highlighted that the governments' reliance on mostly western medicine has excluded traditional medicine as active stakeholders in the fight against Covid-19. The result of this exclusion has been seen as leading to divergent communication activities particularly for traditional health practitioners, even though they are working toward the same health communication goal. Stakeholders have power inequality among themselves as Fontaine et al. (2006) point out and thus communication solutions in dealing with diverse stakeholders are not always equally available to them. Governments during the Covid-19 global health crisis need to be cognizant of the stakeholder power inequalities address them and make an effort to engage with them in good faith to help balance those power inequalities. Above all else, government communication needs to humanize the pandemic for all by developing health communication with the ease of understanding of people at the forefront to take requisite action.

CONCLUSION

The power of digital media as a medium for communication is unquestionable, despite some of the psychological drawbacks. Particularly during a crisis, digital media provides an efficient way of sharing information quickly and providing support, if used appropriately.

Transmission of information without engagement, however, particularly online, leaves messages open to distortion and misinterpretation. Misinterpretation and anxiety are amplified by the ability of user-generated content to overtake official information, leading to possible misinformation and infodemics. During a pandemic like the Covid-19 health crisis, the risks of misunderstanding have far-reaching consequences, including undermining of authorities, mistrust, and rejection of messages. Citizens will continue to engage among themselves if digital media use by governments remains one-way communication transmission, with adverse outcomes for responses to stemming the spread of Covid-19 from key stakeholders, the ordinary citizens.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

ETHICS STATEMENT

The authors of this article have adhered to ethical research standards. All funding has been declared. The data used are publicly available. We have adhered to all institutional research ethics policies and the project has received ethical clearance from the lead institution, the University of Johannesburg.

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ORIGINAL ARTICLE

Reproductive health information-seeking: Predictors and perceived barriers among young Peruvian women

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Abstract

This cross-sectional study examined the main predictors and perceived barriers to reproductive health information seeking by young Peruvian women. Using an online survey, young Peruvian women aged 18–26 years old were invited to participate voluntarily in this study. The Comprehensive Model of Information seeking from Johnson and Meischke (1993) was tested. This model indicates that demographics, direct experience, salience, and beliefs predict utility of information sources. The model also suggests that information-carrier characteristics (perceived trust and perceived utility) could influence health information seeking. Hypotheses related to these variables were tested. An important addition to the model was perceived barriers, which are considered critical factors in the Peruvian context because of the taboo related to sexual and reproductive health. Path analysis with manifest variables was used to test the best fit between the data and the hypothesized model. Data analysis showed mixed results, drawing attention to the direct effects of personal factors on health information seeking.

KEYWORDS

cultural beliefs, health information seeking, Peru, reproductive health, unplanned pregnancy, young women

Highlights

- The present study aimed to determine the main predictors and perceived barriers of reproductive (modern contraception) health information-seeking behavior of young Peruvian women.
- The study drew attention to the direct effects of personal factors on health information seeking among young women and the role perceived barriers in

perceived utility of different information sources in the Peruvian context. It is important to highlight the traditional context where young women seek reproductive health information deserves a special explanation.

- Studies about sexual and reproductive health information seeking have shown that it is not uncommon for young women to face several barriers to access reproductive health information and services. These barriers should be considered within the CMIS, especially when it comes to a sensitive topic such as reproductive health in traditional societies as the Peruvian society. Social scientists should consider these barriers when trying to explain or predict health information seeking.

BACKGROUND

Access to accurate reproductive health information is critical to young women worldwide, especially in developing countries. Peru is a country in the American Region that presents grim statistics related to women's reproductive health services, gender-based violence, access to family planning messages, among other challenges. Expanding knowledge about how young Peruvian women seek reproductive health information and the barriers they encounter can help mitigate the health challenges women experience.

According to a report by the Pan American Health Organization/World Health Organization (PAHO/WHO), United Nations Population Fund (UNFPA), and United Nations Children's Fund (UNICEF) (2017), the adolescent pregnancy rate in the Latin American and Caribbean region remains high, the second highest in the world, surpassed only by sub-Saharan Africa. In the Americas, adolescent pregnancy is estimated to be 66.5 births per 1000 girls 15–19 years old for 2010–2015, compared to 46 births per 1000 girls in the same age group worldwide. These numbers are striking, compared to North American data indicating that the adolescent pregnancy rate is 28.3 births per 1000 girls 15–19 years old for 2010–2015.

Adolescent pregnancy is a critical problem in Peru where the rate for 2010-2015 was 52.1 births per 1000 girls (Pan American Health Organization, United Nations Population Fund & United Nations Children's Fund, 2017). These unplanned teen pregnancy rates have remained constant over the last two decades. Besides these statistics, access to family planning messages in Peru remains low (National Institute of Statistics and Informatics, 2018a). Currently, 61.1% of Peruvian women aged 20–24 have not received any family planning messages from mass media (National Institute of Statistics and Informatics, 2018a). Additionally, the access to modern contraception is still low among Peruvian women when compared to their Latin American counterparts (National Institute of Statistics and Informatics, 2018a); and this has worsened during the pandemic (UNFPA, 2021). The Pan-American Health Organization reports that there is still an unmet need for contraception among Peruvian women (PAHO, 2013), the current use of modern contraceptive methods by women aged 20–24 years old is 37.9% and women aged 25–29 years old is 49.8% (National Institute of Statistics and Informatics, 2018a). Sexual education in Peru is also low, as noted by Motta et al. (2017) who affirmed in their report that only 9% of Peruvian high school students receive comprehensive sexual education.

Gender-based violence is also a serious problem in Peru. In 2021, the Peruvian Judiciary Chair reported that the Peruvian entity receives 450,000 reports of violence against women every year (Andina Agencia Peruana de Noticias, 2021). According to the National Institute of Statistics and Informatics (2018b) 30.7% of Peruvian women affirmed they had experience physical violence by their husbands or partners in 2018. The Multi-country Study on Women's Health and Domestic Violence against Women, sponsored by the World Health Organization (2005), conducted between 2000 and 2003, found that the prevalence of gender-based violence was very high in Peru. For example, 49% of ever-partnered women in Lima (Peru's capital) reported physical violence by a partner at some time in their life, and 23% of women reported experiencing sexual violence from a partner. This is corroborated by a more recent report by Research from Mujica (2011) which found that Peru holds the highest rate of sexual rape reports (22.40% per 100,000) in South America.

Peruvian women are influenced by traditional gender roles and strong patriarchal beliefs in Peruvian society. According to the 2015 National Survey on Social Relationships, 30.1% of respondents affirmed that women are responsible to fulfill all household chores and 55.7% affirmed that women should satisfy their roles as mothers and housewives before achieving their own personal dreams. Moreover, 45.5% of respondents affirmed that if a woman does not look after her husband, it is fine that her husband reprimands her (National Institute of Statistics and Informatics, 2015).

ACCESS TO REPRODUCTIVE INFORMATION AND REPRODUCTIVE HEALTH INFORMATION SEEKING

Besides the challenges explained above, Peruvian women also face challenges regarding exposure to relevant health information about contraception. According to the National Institute of Informatics and Statistics (2018a), in 2018 61% of Peruvian women aged 20–24 years old had not heard any family planning messages through traditional media. Overall, the number of women who do not have access to family planning messages using traditional media in Peru is high among different age cohorts, which demonstrates that health messages about contraception are not reaching the most needed groups. Motta et al. (2017) found in their study among school-age teenagers in Peru that most of them (88%) gain information about sexuality through the Internet, television, and other mass media sources (Motta et al., 2017). In terms of beliefs toward contraception use, Motta et al. (2017) found in their sample that most of the adolescents in Peru agree on the use of some form of contraception to avoid pregnancy (77%). However, there are some contradictions because 38% of the adolescents in this study stated that having available contraception will encourage them to be more sexually active and 23% stated that using condoms means that you don't trust your partner (Mota et al., 2017). These findings are problematic because they show there are strong barriers such as cultural beliefs and gender roles that are preventing men and women from using modern contraception to prevent unplanned pregnancies.

In terms of knowledge about contraceptives, there are also important gaps to bridge. For example, work by Velasque and Sihui (2019) found that teenage girls in Lima have only some knowledge about contraception and low levels of knowledge about actual contraception use. There are a few studies that have documented that young people in the American Region lack accurate information about family planning (World Health Organization, 2019). For example, a study by Uribe et al. (2010) in Colombia found that young students usually lack adequate knowledge about HIV prevention. Moreover, the study by Rodriguez-De Ávila and colleagues (2017) found that in Colombia young students had mixed opinions about contraception use. There were negative perceptions about the use of the intrauterine device (IUD) and implants, however, there were positive perceptions regarding the use of condoms and contraceptive pills. Thus, it is not uncommon for young people in Latin America to have inadequate levels of knowledge about sexual and reproductive topics.

Sexual and reproductive health information-seeking behavior among young women is complex. Women can be particularly vulnerable to health risks concerning sexual and reproductive health based on specific context. The study by Liu (2012), which gives us important insights into the behavior of how Chinese young women communicate regarding sexual topics found that young participants acknowledged that culture plays an important role in the Chinese society, and that the traditional Chinese value system does not let them speak openly about sex. Moreover, Chang (2014) found in her study that participants would likely seek sexual health information from interpersonal sources (e.g., best friends). This is confirmed by Rittenour and Booth-Butterfield (2006) who found in their study that college-aged students usually discuss sexual health topics with their peers and feel comfortable about it. Moreover, Zimmerman (2018) found in her study with low-income women that they tend to obtain their reproductive information from informal sources. So, it is not uncommon from women from different age cohorts to seek this type of information from their peers. Siebold (2011) found that adolescent women trust their mothers and peers as trusted sources of sexual health information. Also, Whitfield et al. (2013) found that adolescents find informal sources such as best friends and mothers as the most useful sources of information for sexual topics.

Gambetti (2003) shows that cultural factors are contributors to sexual risk-taking behavior in Mexican-origin adolescents in the United States. Her research on young women's sexual health and migration shows that variables such as migration, family socioeconomic status, and education could contribute to young women's risky sexual behaviors (such as not using contraceptives, adolescent pregnancy, and childbearing).

The findings of these studies focused on the behaviors of young adults and women shed light on the importance of understanding how the health information seeking process unveils important barriers and predictors of health information seeking. Identifying these predictors and barriers will guide the current study to include the most critical variables into the proposed hypotheses.

Finally, having relevant and adequate information regarding women's reproductive health information seeking is critical to public initiatives and health communication programs that aim to mitigate the lack of information these women encounter.

Aim of the study

This study focused on how young Peruvian women seek reproductive health information to identify predictors and perceived barriers that are associated with health information-seeking behaviors. These are critical factors in the Peruvian context considering the information discussed in the background section related to the challenges Peruvian women experience.

To guide this study the Comprehensive Model of Information Seeking (CMIS) (Johnson & Meischke, 1993) was used to examine health information seeking in the Peruvian context. The significance of this study is twofold. It will be useful to test the CMIS theoretical framework in this context. Also, data gathered in this study will be useful to shed light about the perceived barriers Peruvian women face when seeking reproductive health information.

CMIS

This study is based on the CMIS (Johnson & Meischke, 1993; Johnson et al., 1995) which aims to explain how health-related factors or antecedent factors (demographics, direct experience, salience, and beliefs) determine how individuals perceive characteristics and utilities of information carriers which also determine information-seeking actions.

The CMIS draws its main variables from two theories, the Health Belief Model (HBM) (I. M. Rosenstock, 1974; I. Rosenstock, 2000) and the Theory of Uses and Gratification

(Blumler, 1979). The HBM proposes that if individuals feel susceptible to have a disease, and if they would feel the severity of the diseases on their lives, they will take preventive actions to overcome barriers (I. M. Rosenstock, 1974). The Uses and Gratification Theory explained how individuals consume media to fulfill a need they might have. This theory posits the notion that individuals select media, and that this selection is goal-oriented. Blumler (1979) explained that the Uses and Gratification Theory emerged as an attempt to determine the effect of mass communication on people.

The CMIS borrows constructs from these theories to explain how health information seeking occurs. The CMIS posits that health information-seeking actions are influenced by two kinds of variables, health-related factors (Johnson & Meischke, 1993) or antecedent factors (Johnson et al., 1995) and information carrier characteristics.

The health-related (antecedent) factors are demographics, direct experience, salience, and beliefs. In the CMIS, the variable direct experience refers to the individual's degree of experience (Johnson et al., 1995) with the disease or when someone in their personal network experiences them (Johnson & Meischke, 1993) or a specific health situation (DeLorme et al., 2011).

The salience element of the model “refers to the personal significance of health information to the individual” (Johnson & Case, 2012, p. 57). For Johnson and Case (2012), salience refers to how significant or relevant health information is for an individual; this is the underlying force that triggers information seeking. Salience is linked to the individual's underlying motives to seek specific health information (Johnson & Meischke, 1993) and can drive certain levels of information seeking in different contexts (Johnson et al., 1995).

Beliefs are key variables within the CMIS. In the model, beliefs could be measured through the self-efficacy construct, which is related to the perception an individual that he or she is competent to perform a specific task and fulfill an objective. This is a stronger predictor of behavior change and people who feel they are efficacious while seeking health information are more likely to seek health information (Rakovski et al., 2012; Rimal & Real, 2003).

Information carrier characteristics refer to message-content attributes such as editorial tone (perceived credibility) and communication potential (style) (Johnson & Meischke, 1993). In the study by Johnson et al. (1995), characteristics were measured as perceived characteristics of the specific source, its accuracy and difficulty to be understood. The role of information carrier characteristics is critical within the model since it influences how individuals seek health information. Information carrier characteristics might influence health information-seeking actions through utility.

Utility refers to how the information provided by the source meets the needs of the seekers (Johnson & Meischke, 1993). If individuals perceive the information is relevant and useful, the perceived utility will be higher. Seekers aim to match their information needs with the information provided by the source (Case et al., 2005).

The last variable in the CMIS is health information-seeking actions. These include all activities that are related to the information-seeking behavior. Information seeking can be understood as an intentional acquisition of information from specific communication channels (Johnson & Case, 2012). According to Ikoja-Odongo and Ocholla (2003), information seeking is a process in which an individual looks for information and it is considered a complementary process to information need.

Consistent with the conceptual model (Johnson & Meischke, 1993) and previous empirical results (Basnyat et al., 2018; DeLorme et al., 2011; Hartoonian et al., 2014; Van Stee & Yang, 2018), the following research questions and hypotheses were proposed: (RQ1) What is the association of personal background characteristics (direct experience, salience, and beliefs) to the perceived utility of the information source?

The antecedent factors—direct experience, efficacy beliefs, and perceived risk—are positively associated with perceived utility (H1–H3). In extending the CMIS framework, it is expected that perceived barriers (social disapproval and psychosocial) would be negatively associated with perceived utility (H4 and H5).

(RQ2) What is the association of perceived source trust to perceived utility; the association of perceived trust with information seeking and the association of perceived utility with information seeking?

Based on the CMIS (Johnson & Meischke, 1993), concerning information-carriers characteristics, trust would be positively associated with perceived utility (H6). And that perceived trust would be positively associated with health information seeking (H7), and that perceived utility would be positively associated with health information seeking (H8).

Figure 1 shows the hypothesized model

The CMIS is a relevant model for the present study because different studies on sexual and reproductive health of adolescents and young adults have used HBM variables (perceived susceptibility and perceived seriousness) to predict healthy sexual behaviors (Laraque et al.,1997). Overall, perceived personal risk has been positively associated with information-seeking overall (Shakeri et al., 2018). Additionally, since the CMIS is based on the Theory of Uses and Gratification (Blumler, 1979), it includes variables related to source characteristics which can shed light into how trust and utility of the source play a role in information seeking. Finally, this is a comprehensive model because it includes critical variables: personal factors and source factors as predictors of health information seeking.

METHODS

This cross-sectional study was conducted in Lima and Huancavelica, Peru during November, and December 2019. Female students aged from 18 to 26 years old were recruited to participate in the study. The population of this study was female college students in Peru.

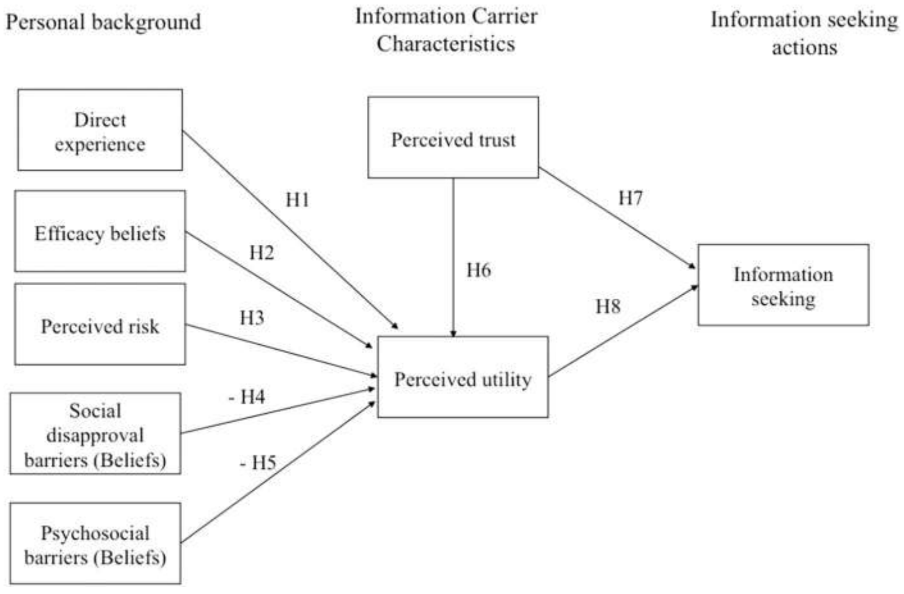

FIGURE 1 Hypothesized model

A nonprobability convenience sample was used so female college students could be reached through the universities' list serves. A purposive convenience sample was an appropriate fit for this study because participants with specific characteristic were needed; young female students aged 18–26 years old were required to complete the survey. Three colleges were selected as part of the project. Female students were invited to participate in filling out an anonymous online survey. The survey consisted of 35 questions related to their health information-seeking behavior on modern contraception.

The survey was available online and was written in Spanish. The survey was pre-tested with Spanish-speaking young women to determine its accuracy and understanding in Spanish. The first page of the survey included the Consent Form, so participants were able to agree on the research procedures before completing the survey. IRB approval was obtained before collecting data.

MEASURES

Family income: this variable was measured through a question about the family income. (1) How much does your family make each month?

Place of residence & language: this variable was measured through asking participants to answer in which region of Peru they currently live. The language question would be (1) What was the first language you learned to speak at home? (Spanish/Quechua/Other).

Highest education level of parents: this variable was measured by asking participants to answer the educational attainment of both of their parents.

Direct experience: this variable measured young women's use of modern contraception. The item will be (1) Have you ever used any modern contraception to avoid pregnancy? Yes/No (2) Do you currently use any modern contraception to avoid pregnancy? Yes/No. Modern contraception is condoms, birth control pills, IUDs, injections.

Efficacy beliefs: This construct was measured through the modified scale proposed by Go and You (2018) for cancer information. "Overall, how confident are you that you could get advice or information about reproductive health (contraception) and "Overall, how confident are you about your ability to take good care of your reproductive health". The values for the original scale were ($M = 3.82$, $SD = 0.76$, $r = 0.29$). One item was added "Overall, how confident are you about your ability to prevent an unwanted pregnancy."

Social disapproval barriers (beliefs): Items from Bersamin et al. (2017) were modified. In their study about barriers to reproductive health services among college students in California, USA, they created a subscale of barriers called "social disapproval" made up of 4 items: disapproval by friends, disapproval by parents, embarrassment, and concerns about privacy ($\alpha = 0.78$). Response options ranged from 0 (Not at all difficult) to 3 (Very difficult). These subscale options were modified to 5-item Likert scale (1 = Strongly Agree, 5 = Strongly Disagree). Items concerning partner's disapproval was added (I don't seek reproductive health information because my partner would disapprove it). The item "I am worried about confidentiality and privacy issues" was dropped from this subscale because it was related to information carrier characteristics.

Psychosocial barriers (Beliefs): Items from Nikiema et al. (2012) were also included in the study as psychosocial barriers. This overall scale had an adequate internal consistency. Cronbach's α was estimated at 0.75. The index included 7 items about the difficulties women face when accessing healthcare. They were asked if the item represented "a big problem or not a big problem," using a 5-item Likert scale (1 = Strongly Agree, 5 = Strongly Disagree).

Perceived risk: This variable was measured using unintended pregnancy because this is clearly related to health information seeking about contraception. To measure perceived risk, the scale proposed by Chang (2014) was used. It had a good fit with a 0.88 average α

score. The original scale had three statements because it asked the perceived vulnerability of unwanted pregnancy, HIV/AIDS, and STIs. In this study, perceived risk was measured through the following statement (1) Compared to other women your age, how likely are you to deal with unwanted pregnancy? Responses ranged from “much less likely” to “much more likely”. To include one more statement to measure the variable, the question used in the studies by Smith et al. (1997) was used since these authors measured the absolute perceptions of vulnerability and comparative perceptions of risk. Authors suggested that both constructs are not redundant, so it is relevant to use both to measure perceived susceptibility. The statement was “How likely is that you will have an unplanned pregnancy in the next year?”

Perceived trust: for perceived characteristics of the information source, perceived source trust was measured. Following the similar questions about source trust proposed by Ruppel (2016) was used. (1) “In general, how much would you trust information about contraception from each of the following sources” Possible responses ranged from (4 = a lot of trust) to (1 = not at all). Sources were Internet, doctor, family, and friends.

Perceived utility: Perceived usefulness was measured using a series of 5-point scale with two items. “The information I found using (information carrier) was” (1 = not at all useful, 5 = very useful). Sources were Internet, doctor, family, and friends.

HEALTH INFORMATION-SEEKING ACTIONS

In this study, health information-seeking actions were measured with the frequency of search. Modified items from Chang (2014) were included in the study. The original items were measured on a 5-point scale with 1 representing 'never' and 5 ‘very often’ (Cronbach's $\alpha = 0.78$, $M = 1.79$, SD = 0.72). The statement was the following: “During the past six months, how often have you sought information about contraception from any source?” Responses (5 = Very frequently to 1 = Never).

RELIABILITY

Measures

Perceived risk: The two items of perceived risk were scored together. Before doing that, a reliability test was performed, and the Cronbach was 0.793. The items were related to the likelihood of young women to have an unplanned pregnancy.

Direct experience: These items were dummy coded since this was a categorical variable. The two items related to direct experience were also scored together. Before doing that, a reliability test was performed, and the Cronbach was 0.740. These items were related to present and past experience using contraceptives.

Efficacy belief: Only one item was kept for the analysis, this was the item that measured confidence in obtaining contraception advice/information if needed.

Social disapproval barriers: For the present study, the social disapproval scale had a Cronbach of 0.862. The four items were kept for the data analysis, and these consisted of disapproval by friends, disapproval by parents, disapproval by partner and fear and embarrassment to seek contraception information.

Psychosocial barriers: For the current study the Cronbach's α was low for three items at 0.394. When dropping the items “Knowing where to go to get contraception information,” the Cronbach's α was at 0.758 so this item was dropped.

Perceived trust in the source: one item that measured how much trust respondents had to the five information sources listed.

Perceived utility of the source: one item that measured how useful respondents thought the five information sources was.

Information seeking: one item was used to measure this variable.

As Cole and Preacher (2014) recommended, one way to improve model parsimony was parceling and averaging subsets of indicators. This was conducted to average the following constructs: direct experience (two items), social disapproval barriers (4 items), psychosocial barriers (3 items), and perceived risk (two items). Before averaging the score, a reliability test was conducted, and the results were appropriate.

RESULTS

The mean age of the sample was 21 years (SD = 2.3). Most of the respondents in the sample lived in Lima (*n* = 436, 69%) and the rest of the respondents resided in Huancavelica (*n* = 199, 31%). The SPSS program was used to obtain frequencies and descriptive statistics of the sample. Details of the main demographic variables can be found in Table 1. Table 2 shows means and standard deviation of the main variables of the study.

Concerning what information source participants used when they first want to obtain contraception information, 48% of the sample affirmed they used the Internet (*N* = 456), 27% affirmed they used physicians (*N* = 259), 9.4% used family (*N* = 89), 6% used friends (*N* = 52), and 3% other sources (*N* = 90).

DATA ANALYSIS

All variables in the model were regressed by demographics (income, mother language, and parents' education) and the residuals were used for the analysis. Most studies on information seeking used demographics as control variables. These demographics are usually related to socioeconomic status. In the present study, the main socioeconomic status variables were used (income and parents' education). The demographic variable of mother language was added because the sample was diverse in terms of mother language (Spanish vs. Quechua). Marital status was not included because only a small part of the sample was married (1.4%). It is also important to highlight that “Direct experience” (which was a categorical variable) was dummy coded in SPSS before including it in the data analysis.

For the data analysis, path analysis with manifest variable was conducted. Mplus 8 was used for the analysis and 623 observations were included into the path analysis. Missing data was coded as −999 in SPSS and in the Mplus syntax this information was indicated so the software will not consider the missing data when analyzing the results. Mplus is excellent at dealing with missing cases because it uses ML as estimator (Geiser, 2013). Thus, cases that had missing data were excluded from the path analysis.

Path with manifest variables is a type of multivariate regression analysis. This was selected as the most appropriate test because it simultaneously considers multiple independent variables. Additionally, path analysis is considered a powerful tool to measure correlation data (Hatcher, 2013). Also, this test was selected because the main goal of this study is to measure associations of cross-sectional data and path analysis was an effective tool to achieve this goal.

Before conducting path analysis, correlations were obtained from the sample. Table 3 shows the correlation among variables in the study.

TABLE 1 Demographics

Variable	*N*	%
Age (years old)		
18	105	16.5
19	90	14.2
20	97	15.3
21	94	14.8
22	81	12.8
23	63	9.9
24	49	7.7
25	27	4.3
26	29	3.6
Place of residence		
Rural	199	31.3
Urban	436	68.7
Mother language		
Quechua	80	12.7
Spanish	548	87.3
Family income		
Less than 1000 soles	223	35.7
Between 1000 and 1500	84	13.5
Between 1501 and 2000	76	12.2
Between 2001 and 2500	57	9.1
More than 2501	184	29.5
Mother's education		
Some school	194	30.5
Completed high school	118	18.6
Some college	88	13.9
Completed college	105	16.6
Master's degree	40	6.3
Technical degree	89	14.0
Father's education		
Some school	150	23.8
Completed high school	168	26.7
Some college	48	7.6
Completed college	122	19.4

TABLE 1 (Continued)

Variable	*N*	%
Master's degree	57	9.0
Technical degree	85	13.5
Civil status		
Living together	24	3.8
Separated	7	1.1
Single without a partner	363	58.2
Single with partner	217	34.8
Married	13	2.1

TABLE 2 Main variables

Variable name	Minimum	Maximum	Mean	SD	*N*
Direct experience	0.00	1.00	1.69	0.79	947
Efficacy beliefs	1.00	5.00	3.64	1.09	946
Social disapproval barriers	1.00	5.00	2.03	1.09	694
Psychosocial barriers	1.00	5.00	3.22	1.22	677
Perceived risk	1.00	5.00	1.69	0.79	947
Perceived source trust-Internet	1.00	4.00	2.38	0.69	944
Perceived source trust-Doctor	1.00	4.00	3.37	0.80	944
Perceived source trust-Friends	1.00	4.00	2.20	0.74	944
Perceived source trust-Family	1.00	4.00	2.73	0.82	944
Perceived usefulness-Internet	1.00	5.00	3.45	1.04	829
Perceived usefulness-Doctor	1.00	5.00	4.34	1.00	829
Perceived usefulness-Friends	1.00	5.00	3.14	1.03	829
Perceived usefulness-Family	1.00	5.00	3.63	0.99	829
Information seeking	1.00	5.00	2.12	0.85	946

GLOBAL FIT INDICES

To analyze the model's fit, the indexes that were used to assess this were the Chi-Square Test of Model Fit, RMSEA (Root Mean Square Error of Approximation), SRMR (Standardized Root Mean Square Residual), and the CFI (Comparative fit index).

Internet

Concerning the use of Internet, the model provided only a marginal fit to the data (see Figure 2). Modifications indices indicated that improvements on the model were possible if direct experience

TABLE 3 Intercorrelations among variables

		1	2	3	4	5	6	7	8	9	10	11	12
1	Language												
2	Income	0.36**											
3	Education	0.37**	0.60**										
4	Direct experience	0.21**	0.25**	0.25**									
5	Efficacy beliefs	0.26**	0.27**	0.23**	0.28**								
6	Social disapproval barriers	−0.27**	−0.36**	−0.30**	−0.18**	−0.27**							
7	Psychosocial barriers	−0.03	−0.07	−0.06	−0.11**	−0.16**	0.38**						
8	Risk	−0.06	−0.16**	−0.15**	0.11**	−0.06	0.22**	0.12**					
9	Trust internet	0.19**	0.21**	0.19**	0.15**	0.23**	−0.18**	−0.01	0				
10	Trust doctor	0.32**	0.42**	0.36**	0.23**	0.37**	−0.41**	−0.09*	−0.11**	0.29**			
11	Trust family	−0.03	−0.02	−0.07	−0.06	0.07*	−0.09*	−0.07	−0.06	0	0.15**		
12	Trust friends	0.14**	0.21**	0.18**	0.14**	0.14**	−0.13**	−0.03	0.02	0.27**	0.24**	0.30**	
13	Use internet	0.17**	0.21**	0.16**	0.15**	0.19**	−0.25**	−0.04	0.01	0.51**	0.28**	0.01	0.24**
14	Use doctor	0.29**	0.36**	0.31**	0.18**	0.29**	−0.47**	−0.11**	−0.14**	0.19**	0.61**	0.10**	0.16**
15	Use family	0.09*	0.11**	0.11**	0.05	0.15**	−0.23**	−0.09*	−0.10**	0.06	0.25**	0.46**	0.20**
16	Use friend	0.12**	0.22**	0.18**	0.15**	0.16**	−0.20**	−0.10**	−0.05	0.24**	0.26**	0.17**	0.52**
17	Info seeking	0.12**	0.11**	0.07	0.35**	0.18**	−0.07	−0.04	0.15**	0.14**	0.12**	−0.02	0.10**

		13	14	15	16	17
1	Language					
2	Income					
3	Education					

TABLE 3 (Continued)

		13	14	15	16	17
4	Direct experience					
5	Efficacy beliefs					
6	Social disapproval barriers					
7	Psychosocial barriers					
8	Risk					
9	Trust internet					
10	Trust doctor					
11	Trust family					
12	Trust friends					
13	Use internet					
14	Use doctor	0.41**				
15	Use family	0.26**	0.41**			
16	Use friend	0.42**	0.33**	0.50**		
17	Info seeking	0.12**	0.06	0	0.07	

$^{*}p < 0.05$.

$^{**}p < 0.01$.

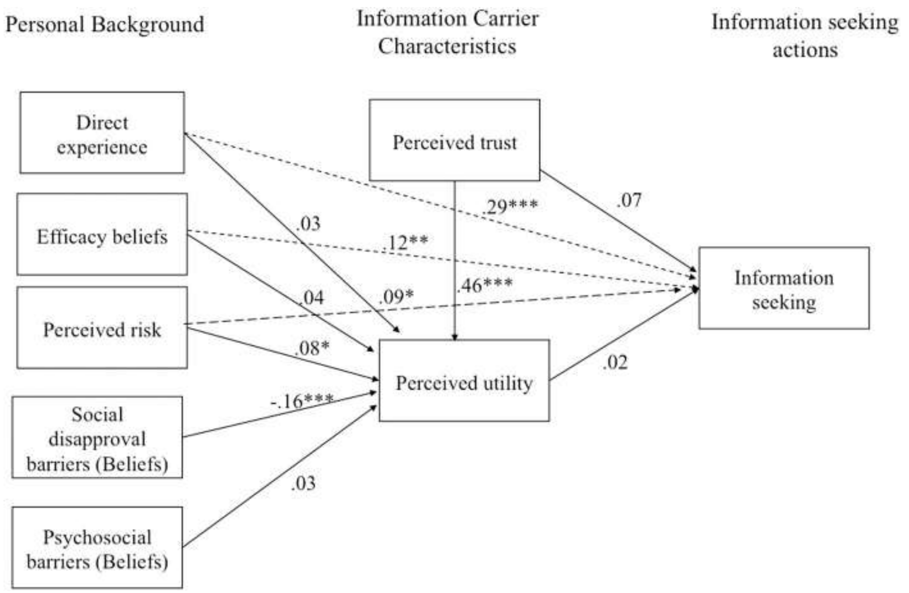

FIGURE 2 Final model for Internet with estimated path coefficients. $x^2 = 83.439$, $df = 5$, $p = 0.00$, CFI = 0.718, RMSEA = 0.159 (90% confidence interval = 0.130–0.189) and SRMR = 0.092. Model 1 was the hypotheses model consisting of solid-line arrows in the Figure, Model 2 (dash lines) was identical to Model 1, except that Model 2 included a direct path from direct experience to health information seeking. And Model 3 (square dot) was identical to Model 2, except that Model 3 included an additional direct path from efficacy beliefs to health information seeking and Model 4 (long dash) was identical to Model 3, except that it included a direct path from risk to health information seeking. Pathways set to $*p < 0.05$ $**p < 0.01$ $***p < 0.001$. R^2 statistics for the two main endogenous variables under Models 1, 2, 3, and 4 accounted for 27% of the variance in utility of internet and Model 1 accounted for 2% of the variance in health information seeking. Model 2 accounted for 0.12 in health information seeking, Model 3 accounted for 12%, and Model 4 accounted for 14%

had a direct effect on information seeking $x^2 = 14.584$, $df = 4$, $p = 0.0056$, CFI = 0.962, RMSEA = 0.065 (90% confidence interval [CI] = 0.031, 0.103) and SRMR = 0.032. If adding another direct path from efficacy beliefs on health information seeking, indices improved as well. The model results $x^2 = 6.275$, $df = 3$, $p = 0.0990$, CFI = 0.988, RMSEA = 0.042 (90% CI = 0.000–0.088), and SRMR = 0.024. Another path was added to the model from perceived risk to health information seeking obtaining good results, $x^2 = 1.344$, $df = 2$, $p = 0.5107$, CFI = 1.00, RMSEA = 0.000 (90% CI = 0.000 to −0.071), and SRMR = 0.010.

The final model of associations among antecedent factors, information carrier characteristics, and information-seeking actions fit the data well. The antecedent variables of direct experience ($\beta = 0.29$, $p < 0.000$), efficacy beliefs ($\beta = 0.12$, $p = 0.002$), and risk ($\beta = 0.09$, $p = 0.026$) had a direct effect on information seeking, suggesting that information seeking is not mediated by the utility of the information source, but it is directly predicted by individual's personal background factors such as direct experience, efficacy beliefs, and perceived risk. Figure 2 includes the final model for Internet with estimated path coefficients and Table 4 presents R^2 for the four models, being compared in the study.

Physicians

Concerning the use of physicians as information source, the model fit the data marginally (Figure 3). Modification indices were conducted and a path from direct experience to information seeking was added improving the model $x^2 = 18.739$, $df = 4$, $p = 0.00$,

TABLE 4 Path analysis results for Internet: R^2 statistics for endogenous variables under Models 1, 2, 3, and 4

Model	R^2 statistics Utility of Internet	Information seeking
Model 1	0.27	0.2
Model 2	0.27	0.12
Model 3	0.27	0.12
Model 4	0.27	0.14

Note: R^2 statistics for the two main endogenous variables under Models 1, 2, 3, and 4 accounted for 27% of the variance in utility of Internet, and Model 1 accounted for 2% of the variance in health information seeking. Model 2 accounted for 0.12 in health information seeking, Model 3 accounted for 12% and Model 4 accounted for 14%.

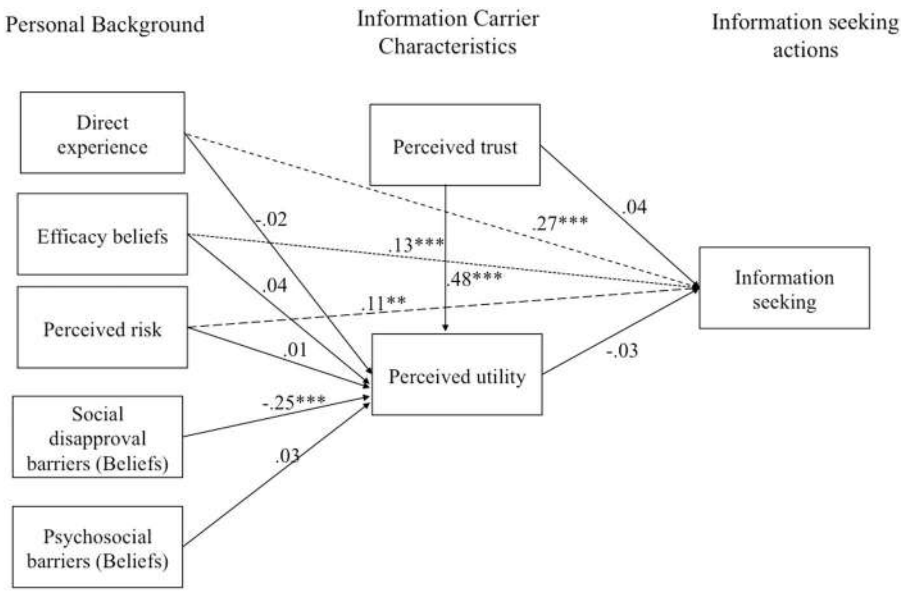

FIGURE 3 Final model for doctor with estimated path coefficients. Pathways set to *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$. $x^2 = 77.981$, $df = 5$, $p = 0.00$, CFI = 0.794, RMSEA = 0.153 (90% CI = 0.124–0.184) and SRMR = 0.089

CFI = 0.958, RMSEA = 0.077 (90% CI = 0.044–0.114) and SRMR = 0.037. Adding another direct path from efficacy beliefs to information seeking improved the model as well $x^2 = 8.552$, $df = 3$, $p = 0.04$, CFI = 0.984, RMSEA = 0.055 (90% CI = 0.012–0.099) and SRMR = 0.028. Adding a direct path from perceived risk to information seeking improved the model as well $x^2 = 0.393$, $df = 2$, $p = 0.82$, RMSEA = 0.000 (90% CI = 0.000–0.047), CFI = 1.00 and SRMR = 0.005. These results suggest that information seeking is not mediated by utility of physicians, but it is directly influenced by personal background factors such as direct experience, efficacy beliefs and perceived risk. Table 5 presents R^2 Statistics for the four models, being compared in the study.

Friends

Concerning the use of friends as an information source, the model fit the data marginally (Figure 4). Modification indices were conducted and a direct path from direct experience to

TABLE 5 Path analysis results for doctor: R^2 statistics for endogenous variables under Models 1, 2, 3, and 4

Model	R^2 statistics	
	Utility of doctor	Information seeking
Model 1	0.37	0.0
Model 2	0.37	0.10
Model 3	0.37	0.10
Model 4	0.37	0.12

Note: R^2 statistics for the two main endogenous variables under Model 1 accounted for 37% of the variance in utility of doctors and 0% of the variance in health information seeking. Model 2 accounted for 37% of the variance in utility of doctors and 10% of the variance in health information seeking. Model 3 accounted for 37% of the variance in utility of doctor and 11% in health information seeking and Model 4 accounted for 37% of the variance in utility of doctors and 12% of the variance in health information seeking.

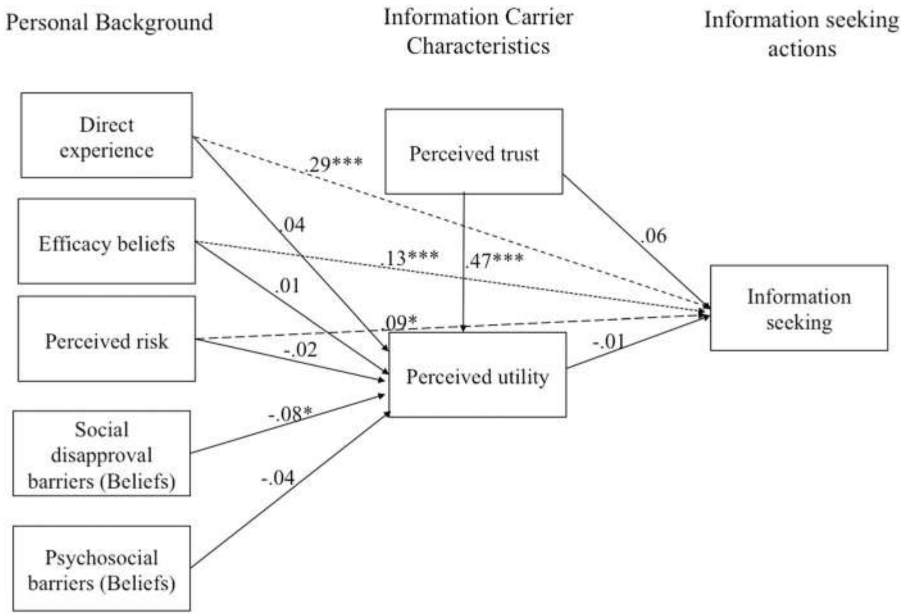

FIGURE 4 Final model for friends with estimated path coefficients. Pathways set to $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. *Note*: $x^2 = 86.513$, $df = 5$, $p = 0.00$, CFI = 0.682, RMSEA = 0.162 (90% confidence interval = 0.133–0.193), SRMR = 0.95

information seeking was added. The results improved the model's fitness $x^2 = 15.986$, $df = 4$, $p < 0.000$, RMSEA = 0.069 (90% CI = 0.036–0.106), CFI = 0.953, SRMR = 0.034. Adding a direct path from efficacy beliefs to information seeking also improved the fitness $x^2 = 6.004$, $df = 3$, $p = 0.11$, CFI = 0.988, RMSEA = 0.040 (90% CI = 0.000–0.087), SRMR = 0.024. Additionally, adding a direct path from perceived risk to information seeking improved the model's fitness $x^2 = 0.766$, $df = 2$, $p = 0.68$, RMSEA = 0.000 (90% CI = 0.000–0.60), CFI = 1.00, SRMR = 0.008. Figure 4 includes the final model for friends with estimated path coefficients, and Table 6 presents R^2 statistics for the four models, being compared in the study.

Family

Concerning the use of family as information source, the model fit the data marginally (Figure 5). Adding a direct path from direct experience to information seeking improved the fitness $x^2 = 16.940$, $df = 4$, $p < 0.01$, RMSEA = 0.072 (90% CI = 0.039–0.109), CFI = 0.948, SRMR = 0.035. Adding another direct path from efficacy beliefs to information seeking improved the fitness as well $x^2 = 6.421$, $df = 3$, $p = 0.092$, RMSEA = 0.043 (90% CI = 0.000–0.089), CFI = 0.986, SRMR = 0.024. Finally, adding another direct path from perceived risk to information seeking improved the fitness $x^2 = 0.772$, $df = 2$, $p = 0.68$, RMSEA = 0.000 (90% CI = 0.000–0.060), CFI = 1.00, SRMR = 0.008. Figure 5 includes the final model for family with estimated path coefficients and Table 7 presents R^2 statistics for the four models, being compared in the study.

TABLE 6 Path analysis results for friends: R^2 statistics for endogenous variables under Models 1, 2, 3, and 4

	R^2 statistics	
Model	**Utility of friends**	**Information seeking**
Model 1	0.25	0.1
Model 2	0.25	0.12
Model 3	0.25	0.13
Model 4	0.25	0.14

Note: R^2 statistics for the two main endogenous variables under Models 1, 2, 3, and 4 accounted for 25% of the variance in utility of friends. Model 1 accounted for 1% of the variance in health information seeking, Model 2 accounted for 12% the variance in health information seeking, Model 3 accounted for 13% of the variance in health information seeking, and Model 4 accounted 14% of the variance in health information seeking.

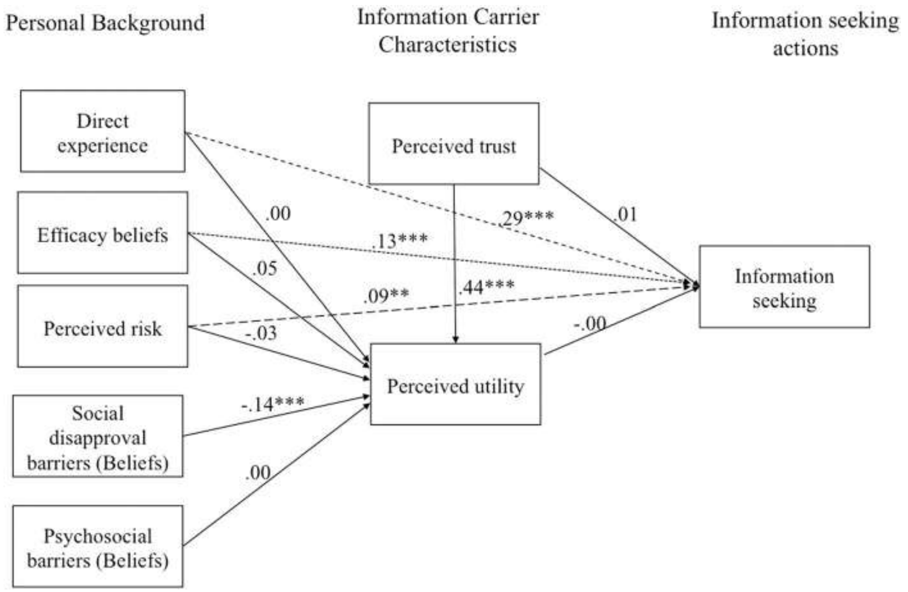

FIGURE 5 Final model for family with estimated path coefficients. Pathways set to $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. *Note*: $x^2 = 90.001$, $df = 5$, $p = 0.00$, RMSEA = 0.165 (90% confidence interval = 0.136–0.196), CFI = 0.656, SRMR = 0.098

TABLE 7 Path analysis results for family: R^2 statistics for endogenous variables under Models 1, 2, 3, and 4

Model	R^2 statistics	
	Utility of family	Information seeking
Model 1	0.24	0.0
Model 2	0.24	0.11
Model 3	0.24	0.13
Model 4	0.24	0.13

Note: R^2 statistics for the two main endogenous variables under Models 1, 2, 3, and 4 accounted for 24% of the variance in utility of family. Model 1 accounted for 0% of the variance in health information seeking, Model 2 accounted for 11% of the variance in health information seeking, Model 3 accounted 13% of the variance in health information seeking, and Model 4 accounted 13% of the variance in health information seeking as well.

PATH COEFFICIENTS IN THE FINAL PREFERRED MODEL AND HYPOTHESIZED TESTING

The RQ1 aimed to determine to what is the association between antecedent factors (direct experience [H1], efficacy beliefs [H2], perceived risk [H3], social disapproval barrier beliefs [H4], and psychosocial barriers beliefs [H5]) and perceived utility of the specific information source. All these variables were entered into model to test if they were significant predictors of perceived utility of each source (Internet, doctors, family, and friends).

For the Internet model, the only significant association found was the one between social disapproval beliefs and perceived utility, and perceived risk and perceived utility. Perceived risk exerted a positive association on perceived utility of the Internet ($\beta = 0.08$, $p = 0.032$). Higher levels of social disapproval barriers beliefs predicted lower perceived utility of the Internet ($\beta = -0.16$, $p < 0.000$). Thus hypotheses 1, 2, and 5 were rejected but hypotheses 3 and 4 were supported. The additional paths that were added to improve the model fit were the ones from direct experience, efficacy beliefs, and perceived risk toward information seeking. Direct experience was positively associated with information seeking ($\beta = 0.29$, $p < .000$) as well as efficacy beliefs ($\beta = 0.12$, $p = 0.002$) and perceived risk ($\beta = 0.08$, $p = 0.026$). For physicians, the only significant relationship was found between the variable social disapproval beliefs and perceived utility of physicians. Social disapproval beliefs had a negative association on perceived utility of doctors ($\beta = -0.25$, $p < 0.000$). Thus hypotheses 1, 2, 3, and 5 were rejected and hypotheses 4 was supported. Additional paths to the model indicated that direct experience ($\beta = 0.27$, $p < 0.000$), efficacy beliefs ($\beta = 0.13$, $p = 0.001$) and perceived risk ($\beta = 0.11$, $p = 0.004$) had a positive association on information seeking. For family, the only significant relationship was found between social disapproval beliefs and perceived utility of family as contraceptive information. Social disapproval beliefs were negatively associated with perceived utility of family ($\beta = -0.14$, $p < 0.000$). Thus, hypotheses 1, 2, 3, and 5 were rejected and hypotheses 4 was supported. Additional paths indicated that direct experience ($\beta = 0.29$, $p < 0.000$), efficacy beliefs ($\beta = 0.13$, $p = 0.001$) and perceived risk ($\beta = 0.09$, $p = 0.017$) were positively associated with information seeking. For friends, the only significant predictor was social disapproval beliefs. These beliefs were negatively associated ($\beta = -0.08$, $p = 0.034$) with the perceived utility of friends as an information source. Thus, hypotheses 1, 2, 3, and 5 were not supported and hypotheses 4 was supported. Additional paths indicated that direct experience ($\beta = 0.29$, $p < 0.000$), efficacy beliefs ($\beta = 0.13$, $p = 0.001$) and perceived risk ($\beta = 0.09$, $p = 0.022$) were positively associated with information seeking. Concerning RQ2, what is the association between trust and perceived utility (H6) and perceived trust and health information seeking (H7), and what is the association between perceived utility and health information seeking (H8) using a specific source, the findings are the following:

For Internet, trust in Internet ($\beta = 0.46$, $p < 0.000$) was positively associated with perceived utility of Internet; however, there was no significant association between perceived trust and information seeking and perceived utility and information seeking. Thus, hypotheses 6 was supported but hypotheses 7 and 8 were rejected. For physicians, the only significant relationship was the one between trust and utility. Trust in physicians was positively associated with utility of physicians ($\beta = 0.48$, $p < .000$) as an information source. Thus, hypotheses 6 was supported and hypotheses 7 and 8 were not supported. For family, trust on family was positively associated with perceived utility of family as an information source ($\beta = 0.44$, $p < 0.000$). Thus, hypotheses 6 was supported and hypotheses 7 and 8 were not supported. For friends, trust on friends was positively associated with perceived utility of friends ($\beta = 0.47$, $p < 0.000$). Thus hypotheses 6 was supported and hypotheses 7 and 8 were not supported.

DISCUSSION

Taken as a whole, the results from the present study indicated that the CMIS offers a partial understanding of the information-seeking for the Peruvian context. This demonstrated that the original model does not work well with interpersonal sources and the Internet; however, when adding direct paths from the personal background variables toward information seeking, the model fit improved substantially.

From the five personal background characteristics included in the model, direct experience was a significant variable in determining perceived utility of Internet. Thus, women with higher direct experience using contraception were associated with higher perceptions of the usefulness of the Internet. This could be explained by the notion that Internet offered high levels of privacy and confidentiality so unmarried women who are sexually active might feel this communication channel is useful. Efficacy beliefs, the confidence to get contraception information in this study, were not associated to perceived utility of interpersonal sources and utility of Internet which could suggest that young women don't perceive they have the capacities or skills to communicate, find, and require reproductive health information from their families, physicians, and friends.

In the present study, personal background characteristics such as direct experience, beliefs, and risk perception are positively associated with information-seeking actions; however, the original CMIS does not include these direct paths. This can be explained by the uniqueness of this specific population: young unmarried Peruvian women. Their personal characteristics such as the experience they had using contraception, the beliefs they hold, and the barriers they perceive might be major factors that determine their information seeking. The role of direct experience was essential in understanding why and how these young Peruvian women seek reproductive health information. Adding an additional path from direct experience toward information-seeking actions improved the model fit in this study. This suggests that women who might have experience using contraception might be more likely to seek contraception information. Perceived risk was also a significant variable within the model. Highlighting the importance of perceived risk would also help guide how different information sources can tailor messages to young women. These three variables (direct experience, efficacy beliefs, and perceived risk) demonstrated direct associations with information-seeking actions. This means that women in this group might decide to look for specific reproductive health information considering their personal background characteristics such as previous personal experience, efficacy beliefs, and perceived risk.

These three variables played an important role in shaping these young women's reproductive health information seeking.

It is important to highlight the traditional context where young women seek reproductive health information deserves a special explanation. Studies about sexual and reproductive health information seeking have shown that young women face several barriers to access reproductive health information and services. These barriers should be considered within the CMIS, especially when it comes to a sensitive topic such as reproductive health in traditional societies. Social scientists should consider these barriers when trying to explain or predict health information seeking.

Findings from this study shows low level of variance of information carrier characteristics in information seeking. This suggest that source characteristics might not play a large role when seeking contraception information from interpersonal sources and the Internet. According to Johnson and Meischke (1993) the low level of variance could be explained by the traditional disparity between beliefs and behaviors. In their study, they found a low level of variance between the information carrier characteristics and information-seeking actions. Likewise, the associations between perceived trust and perceived utility, and information-seeking action were overall very small. This could be explained by different evaluations to specific information sources considering the purposes of the media (e.g., entertainment, information) (Johnson & Meischke, 1993).

Finally, results from this study showed that models using different information sources (Internet, physicians, family, and friends in this study) have similar associations among variables which suggest that the model is consistent across sources.

LIMITATIONS AND BIAS

This study has numerous limitations. One of them is the nature of the study. Since this is an exploratory cross-sectional study, it is not possible to infer causal relationships among the variables and not make inferences that apply to the general population; however, it is still important to establish a few associations among some of the variables.

Another limitation was the fact that many participants (close to 300) did not complete the whole questionnaire, which might suggest that non-responders may have had certain characteristics related to health information seeking that were not well examined in this study, potentially limiting the generalizability of the study to all young Peruvian women. Similarly, other groups of women were not included in the study sample but are likely to be an important population to study for future studies concerning reproductive health information seeking. For example, illiterate, not attending college, immigrants, refugees, and other disenfranchised groups should be included in future studies to better understand their information and communication needs so public health policies can better serve them.

Adding other variables that are relevant to information seeking would have been important to include in the present study; for example, levels of health literacy which plays an important role on accessing and evaluating health information could have been beneficial to the study.

Finally, the study design and theoretical model considered the use of one information source within model. It would have been interesting to test a model using multisources to shed light into how different sources interact among them and predict reproductive health information seeking. Likewise, other more specific communication sources, such as social media, could be included for future studies.

CONCLUSIONS AND POLICY IMPLICATIONS

This study demonstrated the vital role of personal characteristics in information seeking by this group. Individuals tend to seek information that is relevant to them considering their experience, evaluations of risk, and their own beliefs.

In the public health realm, the Ministry of Health could implement a health communication campaign that targets young Peruvian women and inform them how to access accurate reproductive health information, considering their personal characteristics. Placing relevant information and educational materials in health centers where young women attend to seek for reproductive services could be beneficial to them. One of the findings from this study was the one related to the negative association between social disapproval barriers and perceived utility of all sources. If young women have these perceptions, then it would be difficult that they reach out their physicians, friends, and family to seek reproductive health information. One suggestion would be to have peers that are trained in providing accurate reproductive health information can help ease these barriers. Physicians of young women need to be trained to be less judgmental when providing information about sexual and reproductive health.

Also, introduction of new educational policies will be beneficial, the Ministry of Education could include a course related to the importance of sexual and reproductive health information in the lives of young women so they would not feel embarrassed or ashamed to seek this type of information from any information source. Moreover, having a Parents' School can ease the barriers young women encounter when reaching out to their own families for reproductive health information. It is important that parents of tweens and teens are informed about their daughters' development so they would be less judgmental when their young daughters seek information from them.

As a final note, global health organization such as the World Health Organization and the Pan American Health Organization could use this study to inform their policies and programs for global health dissemination. For example, the Sustainable Development Goals (SDGs) are 17 goals agreed by UN Member States to achieve by year 2030 and sexual and reproductive health is part of SDG 5 which aims to achieve gender equality and empower all women and men. Accessing accurate sexual and reproductive health information is paramount to achieve this goal.

CONFLICT OF INTEREST

The author declares no conflict of interest.

ETHICS STATEMENT

The present study received approval from George Mason University IRB on 08/06/2019. The ID of the application is 1467326-2.

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Hilda Patricia Garcia Cosavalente holds a PhD in Health Communication from George Mason University. She has worked as a communication specialist for the Pan American Health Organization in Washington, DC and in the Ministry of Health of Peru. She has taught communication courses at the University of Lima, Peru, and George Mason University. She recently collaborated on the HealthyMe/MiSalud project at the Horowitz Center for Health Literacy at the University of Maryland. Her research interests are health information seeking behavior, women's health in the developing world, and health information needs of immigrants and other underserved populations.

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Dynamic governance of the first wave of Covid-19 in Tunisia: An interoperability analysis

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Abstract

This study proposes an interoperability index of the measures taken by the Tunisian government during the first wave of the coronavirus disease 2019 (COVID-19) pandemic. In the first part, we present the process of decision making as a revised and adjusted process in continuous upgrading, based on the dynamic governance process in times of crisis. In the second part, we estimate an index that records the strictness of government policies in each subperiod and the degree of interoperability between the Tunisian pandemic responses against COVID-19 using subperiod instantiations. Our empirical findings show that the pandemic management strategy in Tunisia during the first wave was adjusted by incorporating new pandemic policies and changing the stringency levels over time. After estimating the interoperability index, we found that the measures taken early in a subperiod interact directly with the next successive subperiod in the decision process, but they interact indirectly with other successive subperiods.

KEYWORDS

coronavirus COVID-19, interoperability index, pandemic policies, Tunisia

Highlights

- The pandemic management strategy in Tunisia during the first wave has been adjusted by incorporating new pandemic policies and changing the stringency levels over time.
- Tunisia has reached the highest level of the strictness of government policies, after 18 days of initial responses taken during the first wave in a stepwise manner.

- The measures taken early in a subperiod interact directly with the next successive subperiod in the decision-making process, but they interact indirectly with other successive subperiods.
- Pandemic crisis cannot be managed or defeated with a single measure or policy, even at the highest stringency level. Instead, it is managed with several policy responses that interreact together over time.
- The establishment of a dynamic and flexible decision-making process can be useful in managing a future health crisis in countries whose public health systems suffer from several shortcomings.

INTRODUCTION

Since 2019, the world has been gripped by a new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was later named coronavirus disease 2019 (COVID-19) (Qiu et al., 2020). After being detected in the city of Wuhan in the Hubei province of China, COVID-19 spread rapidly, resulting in global human tragedy and tremendous economic damage (see, e.g., Baldwin & Weder di Mauro, 2020; Capano et al., 2020; Elgin et al., 2020; Krafft et al., 2021).

After recoding 120,000 cases and more than 4000 deaths worldwide, the World Health Organization (WHO) officially declared a global pandemic on March 11, 2020, recommending a range of measures and policies to manage this crisis. However, the political responses of governments cannot be uniform and they are influenced by the economic, social, health, political, and cultural factors of each country and each region. In this regard, Greer et al. (2020) argue that there is no way to understand the different responses to COVID-19 and their effects without understanding the social policies that assist in crisis management and state capacity (control over health-care systems and public administration). Therefore, understanding how countries were able to manage the first wave of this pandemic in an uncertain and dynamic environment can provide policymakers with arguments for their decisions with which to manage the waves that follow.

In the European Union (EU), for instance, the crisis reaction modes evolved in a multilevel governance system in which political arenas are interconnected. In this regard, Schomaker et al. (2021) argued that the EU's reaction in the first wave of the COVID-19 pandemic was based on centralized and decentralized decisions, and it was characterized by formal initiatives and informal actions given the EU has not developed a transboundary crisis management capacity, so far (Townend et al., 2020). On the other hand, the spread of COVID-19 has not spared the countries of the Middle East and North Africa (MENA), all of which are, to varying degrees and according to their means, engaged in the fight against the new, common enemy (Talbot, 2020). The Gulf countries, according to a March 2020 WHO preparedness assessment, have a sustainable capacity to respond to the coronavirus crisis due to the substantial investments in infrastructure and personnel that they have undertaken over the past 25 years (OCDE, 2020).

Some other countries in the MENA region have reacted to reduce the burden on the health system and have adopted rapid, decisive, and/or innovative measures to contain the virus, such as the smooth crisis management developed by Jordan, ramping up domestic masks and test production in Morocco, or using lessons learned from the past experiences in the fight against viruses in Egypt, which previously had eliminated the C virus, a liver disease caused by the hepatitis C virus (El Akkawi, 2020).

In Tunisia, the public health system is grappling with several issues such as gravely inadequate capacity, crumbling infrastructure, and regular shortages of medications, a situation that has been further worsened by the rising outflow of trained doctors and medical staff over the last few years. At the start of the pandemic, Tunisia only had an estimated 700 beds in intensive care units (public and private institutions combined) for about 12 million inhabitants. Moreover, not all of these beds were functional and only a few beds could be allocated exclusively for COVID-19 treatment. Furthermore, all Tunisians do not have the same level of access to these facilities. The crisis has indeed highlighted the regional disparities in access to health care, with most medical services, and particularly intensive care units, concentrated in the capital and coastal regions, and 13 out of 24 governorates having no reanimation beds, which are considered essential for COVID-19 patients. Furthermore, laboratories authorized to conduct COVID-19 testing are concentrated in the capital and in the coastal regions.

For the above-mentioned reasons, Tunisia has employed various measures to prevent the entry of the virus into the country. Once the virus circulates in the country, authorities are forced to adjust their strategy by adding new measures or by making the application of more stringent measures to decrease the rate of transmission of COVID-19 and to reduce the burden on the health system.

Pandemics often occur in waves. Thus, the measures taken can significantly reduce infection rates. However, they are costly and tiring, and therefore, typically cannot be sustained over a sufficiently long period. If fewer and fewer people follow pandemic policies, the virus returns and a second wave will start (Plümper & Neumayer, 2020). Moreover, pandemics and crises cannot be managed or defeated with a single measure or policy, even at the highest stringency level. They are managed by several policy responses that operate together over time to achieve a fixed objective. Based on the concept of dynamic governance developed by Neo and Chen (2007) and interpreting as the government's ability to continuously adjust the process in the formulation and implementation of public policies and programs that have interests to be achieved, this study focuses on quantifying the interoperability of the measures taken by the Tunisian government to manage the health crisis of COVID-19.

The decision-making process is described as a revised and adjusted process in continuous upgrading and can be summarized into *three major types*. First, thinking ahead is the capability to understand and formulate a strategy. Second, it creates feedback between the initial situation of the process and the new observations that allow for strategy revision and adjustment. Third, thinking across the process is continuous learning where the previous experience helps the current system evolve by incorporating new ideas or concepts. The process of thinking again has proven effective in several countries such as South Korea in MERS treatment, adopted in the policy formulation process in handling COVID-19, where they were able to reduce disease spread and deaths by looking at the health protocol owned, accompanied by observation and analysis of the ownership of the latest data (Kim, 2020).

The remainder of this paper proceeds as follows: “Background information” provides an overview of the COVID-19 epidemiological situation during the first wave in Tunisia and reviews the pandemic policies taken over time; “Data and methodology” presents our data sources and provides a detailed description of our empirical strategy; ”Empirical results and discussion” discusses the main results; and “Conclusion and policy implication” concludes the paper.

BACKGROUND INFORMATION

The first wave of the COVID-19 outbreak in Tunisia lasted for almost three and a half months. It began with the discovery of the first case on March 2, 2020, and it extended until June 13, 2020, the date of total control of the health situation, where zero new confirmed cases were recorded during several successive days.

As shown in Figure 1, the cumulative number of confirmed cases has increased over time, reaching 1087 cases by June 5, 2020. Given the weak capacity of the public health system in Tunisia, the major concern of the authorities was to prevent an exponential increase in COVID-19 cases during this period. In this regard, Figure 1 shows a linear trend increase in the cumulative case curve over short periods. From June 6, the curve became constant as the number of new cases reduced to zero for several successive days. To achieve these objectives, several measures and policies have been adopted and applied dynamically. To prevent the entry of the virus into Tunisian territory, since January 22, 2020, the government implemented early preventive measures, including screening at the point of entry and systematic 14-day isolation of travelers returning from high-risk areas (Talmoudi et al., 2020).

Following the report of the first confirmed case, an international traveler from Italy on March 2, 2020, additional measures were announced, and other decisions were taken to control the circulation of the virus in the country. On March 22, a national lockdown was imposed on the whole country for 2 weeks, which was extended twice before the return to the targeted lockdown and a total deconfinement on June 7, 2020.

As presented in Table 1, the decisions changed with the evolution of the epidemiological situation in the country. Before the imposition of the total lockdown, which was conducted between March 4 and March 20, 2020, the measures concerned the cancellation of public events, restrictions on international travel, public information campaigns, testing policy contact tracing, as well as the shutdown of workplaces and schools. All these measures were implemented with different degrees of stringency or were targeted to a specific category of individuals. On March 13, 2020, Tunisia officially entered epidemiological phase 3. To manage the consequences of the pandemic in the best possible conditions and mitigate its effects, some measures have become mandatory. Additionally, other measures that were nonexistent before March 13 have been implemented.

On March 20, a lockdown was imposed in Tunisia. Other than the measures taken previously, new measures were added, such as restriction on gatherings, closure of public transport, stay-at-home obligations, restriction of internal movement, income support, and debt relief/contracts for households.

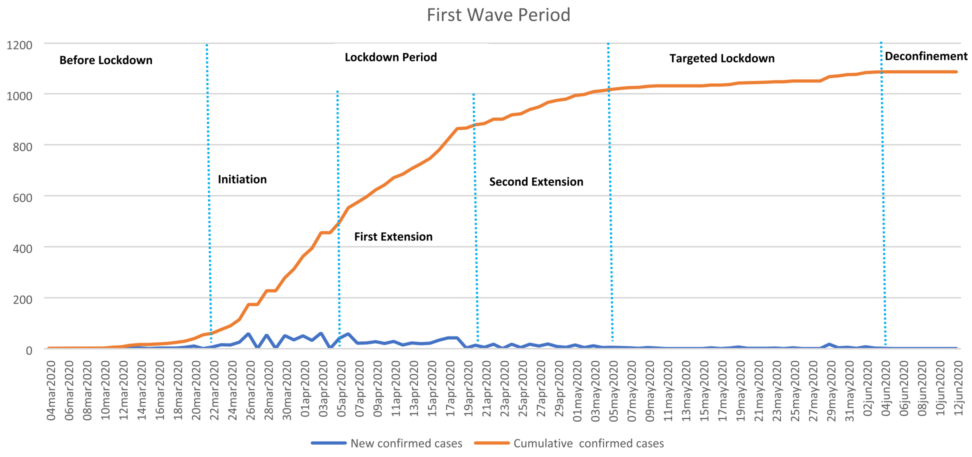

FIGURE 1 Evolution of cumulative confirmed COVID-19 cases and daily new confirmed cases during the first wave in Tunisia

TABLE 1 Policy responses during the first wave of the SARS-CoV-2 pandemic in Tunisia

Subperiods	Description	New policies and measures
P_1: [March 4, March 12]	Before lockdown	– Cancellation of public events – Restriction on international travel – Public information campaign – Testing policy – Contact tracing
P_2 [March 13, March 21]		– Workplace closing – School closing ⟹Change of stringency degree of P_1 measures
P_3 [March 22, April 4]	Lockdown	– Restriction on gatherings – Close public transport – Stay at home requirement – Restriction on internal movement – Income support – Debt contract ⟹Change of stringency degree of P_2 policies and measures
P_4 [April 5, April 19]	First extension lockdown	– No measures added – Nothing changed
P_5 [April 20, May 04]	Second extension lockdown	
P_6 [May 5, June 05]	Targeted lockdown	– No measures added ⟹Relaxing the stringency degree of P_3 policies and measures
P_7 [June 6, June 12]	Deconfinement	– No measures added ⟹Relaxing the stringency degree of P_6 policies and measures

Abbreviation: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

After the registration of 61 new COVID-19 cases on April 4, Tunisia extended the COVID-19 lockdown twice, the first lasting until April 19, and the second lasting for 2 weeks until May 4. Thereafter, the situation became more stable, and a targeted lockdown was announced from May 5 until June 6. This period was characterized by a change in the degree of stringency and the partial removal of certain measures. The deconfinement period in this study officially corresponds to the third phase of the targeted lockdown in Tunisia. This period is characterized by a zero number of new cases for several successive days and the end of most political measures taken in previous periods against the spread of the coronavirus.

DATA AND METHODOLOGY

Data

To construct a database of the policy measures taken by Tunisia in response to the COVID-19 pandemic during the first wave, we used information provided by the Oxford COVID-19 Government Response Tracker (OxCGRT) (Hale et al., 2020a, 2020b). The OxCGRT database systematically collects publicly available information on several common policies taken in response to the pandemic. The different policy responses are tracked since January 1, 2020, cover more than 180 countries and are coded into 23 indicators. This tool provides data and produced five indices that aggregate the data into a single number

(Overall government response index, Containment and health index, Stringency index, Economic support index, and Risk of openness index).

Policy responses are classified into three categories in the OxCGRT. The first category includes containment and closure policies, such as the shutdown of schools and workplaces, cancellation of public events, restrictions on gatherings, stay-at-home requirements, restrictions on internal movement, and international travel controls. The second category concerns economic policies such as income support for households, debt/contract relief for households, fiscal measures, and international support. However, health system policies are grouped into the third category, which provides information on public information campaigns, testing policies, contact tracing, emergency investment in health care, and investment in vaccines (Hale et al., 2020a, 2020b).

To improve the validity and timeline of this information, we cross-checked this information using the CoronaNet data set based on the daily bulletins of the National Observatory of New and Emerging Diseases (ONMNE) in Tunisia. The CoronaNet Research Project compiled a database of government responses to the coronavirus. The main focus of this project was to collect information about the various fine-grained actions that governments are taking to address the effects of the COVID-19 pandemic (Cheng et al., 2020).

The ONMNE is a public administrative establishment run by the Ministry of Health and it was established in 2005 to meet the need to strengthen the capacity of the national health monitoring apparatus with respect to early detection and early warning against new and emerging diseases and potentially endemic indigenous diseases. ONMNE collects data on new and emerging diseases to improve the decision-making process and monitors the international epidemiological situation concerning rapidly spreading diseases to avoid or limit the risk of their cross-border introduction.

Based on CoronaNet data, we were able to identify the most important dates of the epidemiological situation in the country through the types of policies implemented on these dates. These policies provide indications of the evolution of the decision-maker's reaction politics during the first wave of COVID-19 in Tunisia.

Methodology

This paper proposes an interoperability index of the measures taken and adjusted by the Tunisian government during the first wave of COVID-19. The concept of interoperability is defined in this study as the ability of measures, public policies, or programs that have interests or objectives to be achieved, to operate together (see, e.g., Ford, 2008; Ford et al., 2007; Novakouski & Lewis, 2012; Rezaei et al., 2014). The period between March 4, 2020 and June 13, 2020 (hereafter denoted by S) corresponds to the entire first wave of the COVID-19 pandemic in Tunisia.

To identify the first wave of the COVID-19 pandemic in Tunisia, we denote this period as $S = [P_1, P_2, ...P_\mathrm{T}]$, where P_i, $i = 1, ..., T$ are the subperiods that measure pandemic policies that are implemented, added, or modified. Once the set of subperiods has been identified, those subperiods are modeled using a set $X = \{M_1, M_2, M_3, ...M_n\}$, which represents the measures or decisions describing each subperiod.

These subperiod measures are represented by a set of states denoted by $C = \{c_1, c_2, ...c_n\}$, $c_i = [0, c_{\max}]$. If M_i was not taken during the subperiod P_i, then its state c_i is equal to 0; otherwise, it can assume the value 1 if it was recommended or 2 when the application of this measure was mandatory. According to the dynamic governance (discussed above), the improvement of the decision-making process implies that if a measure is absent in P_i, it does not necessarily need to be absent in P_{i+1}. Similarly, when the government realizes the nonusefulness of a measure, it can relax it. Hence, the state assigned to a measure may change over time. Indeed, implementing and announcing measures and policies is not enough to manage the pandemic situation and its consequences, strictness in their application is needed as well. At this level, we calculate an index that records the strictness of government policies in each subperiod. This index is a simple average of the individual component indicators (measures), and is described as follows:

$$I_{\text{Stringency}}\,(P_i) = \frac{1}{k}\sum_{j=1}^{k} 100 \times \frac{V_j}{N_j},$$

where k is the number of component indicators, N_j is the maximum state value of the measure (indicator), and V_j is the recorded policy value on the ordinal scale in subperiod P_i.

Meanwhile, for each subperiod $P_i \in S$ characterized by a set of measures $m \subseteq X$, we denote $\sigma_i = m\,(P_i) = \{M_1(P_i);\ M_2(P_i);\ M_3(P_i), \ldots M_n(P_i)\}$, called the instantiation of P_i, which models P_i by the states of the measures in m.

Once all P_i have been instantiated, the subperiod instantiations must be aligned with each other to support meaningful subperiod comparisons and to indicate how the measures taken/added or modified during a subperiod P_i operated with those taken, modified, or added during the subperiod that follows. The alignment of the instantiation of the entire period S is given by the matrix $\sum = M\,(S) = \{\sigma_1; \sigma_2; \sigma_3; \sigma_4, \ldots \sigma_T\}$.

Based on the matrix $\sum$, we build a matrix of interoperability measurements for all subperiod pairs in S, using an interoperability function (Interop), for measuring the similarity of subperiods instantiations.

The choice of the interoperability function depends on the measure states with which the subperiods are modeled. Two types of functions are present in the literature: The first type concerns modeling with binary-valued measures states (0 if the measure is absent and 1 if the measure is taken during the concerned subperiod). In this case, the appropriate interoperability function is given by:

$$\text{Interop}_{\text{Bin}} = \frac{1}{n}\sum_{i=1}^{n} \left(\sigma'_{(i)} \wedge \sigma''_{(i)}\right),$$

where $\sigma', \sigma'' \in \{0, 1\}^n$ and $\wedge$ is the Boolean AND operator.

The second type concerns the modeling of subperiods with real-valued measure states $C = [0, c_{\max}]$. In this case, the following function is recommended:

$$\text{Interop}_{\text{Real}} = w.\ \text{MMS} = \left[\frac{\sum_{i=1}^{n}\sigma'_{(i)} + \sum_{i=1}^{n}\sigma''_{(i)}}{2n.\ c_{\max}}\right]\left[1 - \left(\frac{1}{\sqrt[r]{n}}\right)\left(\sum_{i=1}^{n} b_{i\left(\frac{\sigma'_{(i)}-\sigma''_{(i)}}{c_{\max}}\right)^{r}}\right)^{1/r}\right],$$

$$b_i = \begin{cases} 0 & \text{if} \quad \sigma'_{(i)} = 0 \quad \text{or} \quad \sigma''_{(\mathrm{i})} = 0, \\ 1 & \text{else,} \end{cases}$$

where w is the mean value of the states characterizing two modeled subperiods, and MMS is the modified Minkowski similarity function. n is the number of measures used to model two subperiods, $c_{\max}$ is the maximum value of the measured states, and r is the Minkowski parameter (usually set to $r = 2$). $\text{Interop}_{\text{Real}}$ has the capability of yielding very precise similarity measures of subperiod instantiations limited only by the number of measures and the precision of the states of these measures.

Given two subperiods, P_i and $P_j \in S$ instantiated with σ_i, σ_j and an interoperability function (Interop), then, $m_{ij} = \text{Interop}(\sigma_i, \sigma_j)$ is the interoperability measurement of P_i and P_j. The interoperability matrix is given by $M = [m_{ij}]; i, j \le |S|$ for all pairs of subperiods (P_i, P_j) as

$$M = \begin{array}{c|ccc|} & P_1 & \dots & P_T \\ \hline P_1 & 0 & \dots & m_{1T} \\ \vdots & m_{ij} & 0 & \vdots \\ P_T & m_{ij} & \dots & 0 \\ \hline \end{array}.$$

In this study, we assume that measures taken early in a subperiod interact directly with the next successive subperiod in the decision process, but they interact indirectly with every successive subperiod in the process because the information they create or transform is eventually passed to successive sub-periods. No self-interoperability is assumed, so the diagonal of the interoperability matrix M will take a value of 0.

EMPIRICAL RESULTS AND DISCUSSION

Responses stringency, duration, and change during the first wave of COVID-19

Tunisia like several countries around the globe initiated the first responses against COVID-19 after the organization of the research and innovation forum on COVID-19 by the WHO on February 11 and 12, 2020. These measures have been adjusted over time according to the evolution of the epidemiological situation in the country.

Table 2 shows that the policy responses against COVID-19 during the first wave in Tunisia changed from one subperiod to another. These changes are observed in the new policy measures taken during each subperiod and in the adopted stringency level.

During the first subperiod P_1, the Tunisian authorities chose to recommend the cancelation of public events and imposed restrictions on international movement only in certain countries such as Italy, France, and Egypt. At the same time, public officials began to urge caution against the new virus. In terms of health, the Tunisian strategy is based on testing all those carrying the symptoms of the virus, meeting specific criteria, and tracing the contacts of certain positive cases.

The testing policy did not change during the whole period of the first wave of the virus and included the second subperiod P_2, which kept the same measurements taken in P_1 but with different degrees of rigidity.

We note that the cancelation of public events has become mandatory after being recommended in P_1. In addition, restrictions on international travel were imposed in all countries, and information campaigns became more intensive with coordination between traditional and social media.

Meanwhile, new measures and policies were implemented during the second subperiod, P_2. For example, the closure of schools and universities was imposed on all levels and categories. In addition, the closure of some workplaces was recommended or worked for a few hours, in groups, or with reduced capacity. Additionally, people were urged to avoid large gatherings. Enforcement of this latest ruling became mandatory during the P_3, P_4, and P_5 subperiods. During these subperiods (P_3, P_4, and P_5), the closure of workplaces was required for all activities except essentials. However, all other measurements taken in P_1 and P_2 were maintained at the same levels of rigidity and inclusiveness as P_2.

The new measures that came into effect during the P_3 subperiod were recommendations to reduce the volumes, routes of the main means of transport, the requirement not to leave the home except for necessities, curfews, imposition of restrictions on internal movement and support workers in the informal sector, the poor, and workers in the private sector who lost their wages and reduced debts and contracts for households.

TABLE 2 Policy responses, coding, and change during the first wave of COVID-19

Policy responses	Coding/states	Subperiods						
		P_1	P_2	P_3	P_4	P_5	P_6	P_7
M_1: Cancel public events	1- No measures							√
	2- Recommend canceling	√						
	3- Require canceling		√	√	√	√	√	
M_2: Restriction on international travel	1- No restrictions							
	2- Restrictions on one or more countries, but not all countries.	√						
	3- Restrictions on all countries		√	√	√	√	√	√
M_3: Public information campaign	1- No COVID-19 public information campaign							
	2- Public officials urging caution about COVID-19	√						
	3- Coordinated public information campaigns across traditional and social media and intensification.		√	√	√	√	√	√
M_4: Testing policy	1- No testing policy							
	2- Testing those who have symptoms or meet specific criteria	√	√	√	√	√	√	√
	3- Open public testing							
M_5: Contact tracing	1- No contact tracing							
	2- Contact tracing not done for all cases	√	√	√	√	√		
	3- Contact tracing done for all identified cases						√	√
M_6: School closing	1- No measures	√						
	2- Recommend closing schools for some levels							√
	3- Require closing schools for all levels and categories		√	√	√	√	√	
M_7: Workplace closing	1- No measures	√						√
	2- Recommend closing or work from home or restricted opening hours/groups or not all capacity for some businesses and government activities		√				√	
	3- Require closing all but keep essential workplaces (grocery stores, doctors, etc.)			√	√	√		
M_8: Restrictions on gatherings	1- No measures	√						√
	2- Recommend avoiding large gatherings		√					
	3- Require restrictions on gatherings			√	√	√	√	
M_9: Public transport closing	1- No measures	√	√					√
	2- Recommend significantly reducing volume/route/means of transport available			√	√	√	√	
	3- Require closing public transport							

TABLE 2 (Continued)

Policy responses	Coding/states	Subperiods						
		P_1	P_2	P_3	P_4	P_5	P_6	P_7
M_{10}: Stay at home requirements	**1-** No measures	√	√					√
	2- Recommend not leaving the house						√	
	3- Require not leaving the house except for daily exercise, grocery shopping, and essential trips			√	√	√		
M_{11}: Restriction on internal movement	**1-** No measures	√	√					√
	2- Recommend no traveling between region cites							
	3- Internal movement restrictions in place and curfew applied			√	√	√	√	
M_{12}: Income support	**1-** No measures	√	√					
	2- Government transfers support to informal workers, poor and private formal workers who lost salary			√	√	√	√	√
	3- Government transfers support to informal workers, poor and public and private formal workers who lost salary							
M13: Debt/contract relief	**1-** No debt/contract relief	√	√					
	2- Narrow relief, specific to one kind of contract							
	3- Broad debt/contract relief			√	√	√	√	√

Note: √ indicates the measure (policy) states during each subperiod.

All these measures were applied during the three subperiods P_3, P_4, and P_5 with the same level of rigidity and inclusiveness. However, we observed some changes during the P_6 subperiod. First, the contact tracing strategy became more inclusive by tracking all identified cases of the virus. In addition, we noticed the resumption of activities in groups or with reduced capacities with the opening of workplaces for a few hours. As a result, the request to stay at home was recommended and not required, as it was previously.

This gradual removal of restrictions occurred during subperiod P_7. As shown in the last column of Table 2, the total removal of restrictions concerns internal movements, mass gatherings, events, and public transport. In addition, workplaces, schools for certain levels, and universities were opened with the application of health protocols appropriate to each sector. We noted that aid transfer and debt relief were also present during P_7.

Subperiods instantiations and stringency index

The degree of interoperability between the Tunisian pandemic responses against COVID-19 during the first wave is estimated using subperiod instantiations, in which each subperiod is modeled by three coded states reflecting the dynamics of measures stringency and inclusiveness. The subperiod instantiations are as follows:

$$\sigma_1 = m(P_1) = \{1;1;1;1;1;0;0;0;0;0;0;0;0\} \implies I_{\text{Stringency}}(P_1) = 12.50\%,$$

$$\sigma_2 = m(P_2) = \{2;2;2;1;1;2;1;1;0;0;0;0;0\} \implies I_{\text{Stringency}}(P_2) = 50.00\%,$$

$$\sigma_3 = m(P_3) = \{2; 2; 2; 1; 1; 2; 2; 2; 1; 2; 2; 1; 2\} \implies I_{\text{Stringency}}(P_3) = 93.75\%,$$

$$\sigma_4 = m(P_4) = \{2; 2; 2; 1; 1; 2; 2; 2; 1; 2; 2; 1; 2\} \implies I_{\text{Stringency}}(P_4) = 93.75\%,$$

$$\sigma_5 = m(P_5) = \{2; 2; 2; 1; 1; 2; 2; 2; 1; 2; 2; 1; 2\} \implies I_{\text{Stringency}}(P_5) = 93.75\%,$$

$$\sigma_6 = m(P_6) = \{2; 2; 2; 1; 2; 2; 1; 2; 1; 1; 2; 1; 2\} \implies I_{\text{Stringency}}(P_6) = 81.25\%,$$

$$\sigma_7 = m(P_7) = \{0; 2; 2; 1; 2; 1; 0; 0; 0; 0; 0; 1; 2\} \implies I_{\text{Stringency}}(P_7) = 18.75\%.$$

These instantiations of the subperiods were done using 13 main measures and policies implemented by Tunisia to manage the first wave of the pandemic. The government policy stringency index is estimated directly from subperiod instantiations using the measures M_1, M_2, M_6, M_7, M_8, M_9, M_{10}, and M_{11} (Table 2).

Between March 4 and March 12, only five measures were implemented to control the circulation of the virus in Tunisian territory, representing 38% of all political responses taken during the first wave of COVID-19 in Tunisia. The degree of rigor of these measures is low, and it is estimated to be 12.50% during the P_1 subperiod.

On March 13, 2020, Tunisia officially entered epidemiological phase 3. This development forced the Tunisian authorities to add three new measures and increase the level of stringency of P_1 measures. We estimated the degree of rigor during P_2 by 50%. However, this change did not last long (1 week), after which Tunisia entered full containment, and five additional measures were added from March 22. During the P_3 subperiod, the level of stringency of government pandemic responses reached an estimated maximum of 93.75%. With this maximum level, Tunisia managed the two subperiods P_4 and P_5.

Unlike Egypt and Ethiopia that initiated their responses late and upgraded to a high response level in a very short time, Tunisia reached the highest level of the strictness of government policies, after 18 days of initial responses taken during the first wave in a stepwise manner (Ma et al., 2021). Additionally, Tunisia adjusted their response stringency to a high level only after WHO declared COVID-19 as a pandemic. This indicates that the announcement of COVID-19 pandemic triggered Tunisia to act more aggressively against COVID-19.

With such a maximum level of rigor, Tunisia managed the two subperiods P_4 and P_5 as well. The presence of 13 measures applied with a maximum stringency level led to the remarkable stability of the epidemiological situation in the country. The number of new cases per day fell to 10 cases on average during P_5. after having been approximately an average of 30 cases in P_3 and P_4.

In this same vein, Tunisia like the Netherlands and Denmark took a shorter time to reach reduced peak daily case (32, 36, and 41 days, respectively). Compared to Japan and Singapore where the time to the reduced peak daily new case was long (96 and 115 days respectively), Tunisia had an early achieve a reduced peak of new cases (Ma et al., 2021).

This stability was translated by a reduction in the level of policy stringency, which decreased to 81.25% in P_6 and fell to 18.75% during the P_7 subperiod, keeping only 53.8% of measurements that were present during P_5 and P_6.

Interoperability analysis of pandemic policies

In this section, we first present the degrees of interoperability between the measures taken or adjusted during two successive subperiods and then present the interoperability matrix of all subperiod pairs. Given the variation in the pandemic response states between 0 and 2, our estimates are based on the modified Minkowski similarity function and are presented as follows:

$$m_{12} = \text{Interop}\,(\sigma_1; \sigma_2) = \frac{5+12}{2\times 13\times 2}\left[1 - \frac{1}{\sqrt[2]{13}}\left(\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+1+\frac{1}{4}+\frac{1}{4}\right)^{\frac{1}{2}}\right],$$

$$m_{12} = \text{Interop}(\sigma_1; \sigma_2) = 0.327\times 0.583 = 0.190,$$

$$m_{23} = \text{Interop}\,(\sigma_2; \sigma_3) = 0.654\times 0.446 = 0.291,$$

$$m_{34} = \text{Interop}\,(\sigma_3; \sigma_4) = 0.846\times 1 = 0.846,$$

$$m_{45} = \text{Interop}\,(\sigma_4; \sigma_5) = 0.846\times 1 = 0.846,$$

$$m_{56} = \text{Interop}\,(\sigma_5; \sigma_6) = 0.827\times 0.76 = 0.628,$$

$$m_{67} = \text{Interop}\,(\sigma_6; \sigma_7) = 0.615\times 0.444 = 0.273.$$

The degree of interoperability between the measurements of P_1 and P_2 was estimated as $m_{12} = 0.190$. This low interrogability between the two subperiods P_1 and P_2, is mainly due to the number of measurements added in P_2 and also to the modification of the degree of rigidity of measures taken at P_1. In other words, this low degree of interoperability reflects the weak reaction of the average Tunisian public decision-maker to the evolution of the epidemiological situation. This reaction relatively improved in P_3 with the addition of new measures with a maximum level of stringency. Consequently, the degree of interoperability between P_2 and P_3, estimated by $m_{23} = 0.291$, also increased. Indeed, the number of measurements and their level of rigidity did not change during P_4 and P_5, which led to the estimation of the same degree of interoperability by $m_{34} = m_{45} = 0.846$ between P_3 and P_4, and between P_4 and P_5. This degree is the highest during the entire period and is explained by the prolongation of total confinement twice in P_4 and P_5. Furthermore, the ban of large gatherings measure was required during the subperiods P_3, P_4, and P_5, which targeted toward large gatherings of people and may thus prevent so-called "super-spreader events," which have been shown to account for a substantial fraction of the total number of infections (e.g., Adam et al., 2020; Lemieux et al., 2020; Wang et al., 2020).

By switching to targeted confinement, the rigidity of certain measurements was relaxed, and the degree of interoperability between P_5 and P_6 was estimated as $m_{56} = 0.628$. This decrease is mainly due to the modifications made to measure M_{10} represents the demand to stay at home, which became recommended after being required, and to measure M_7 with the partial opening of workplaces while reinforcing contact tracing.

The transition from the full to partial to no lockdown appears to be a more effective strategy of lifting the restrictions and can be explained by economic reasons. Demirgüç-Kunt et al. (2020) showed that countries that adopted a gradual, staged reopening experienced stronger economic recovery compared with the countries that rushed into lifting the restrictive measures before the pandemic was under control.

During the P_7 subperiod, the measures M_1, M_7, M_8, M_9, M_{10}, and M_{11} were removed and M_6 was relaxed. All these modifications in terms of management led us to estimate the interoperability index between P_7 and P_6, by $m_{67} = 0.273$. In contrast, the interoperability between the measures taken or modified over time during the first wave is estimated using the following interoperability matrix:

$$\left[\begin{array}{cccccccc} P_i & P_1 & P_2 & P_3 & P_4 & P_5 & P_6 & P_7 \\ P_1 & 0.000 & 0.190 & 0.130 & 0.130 & 0.130 & 0.160 & 0.172 \\ P_2 & 0.190 & 0.000 & 0.291 & 0.291 & 0.291 & 0.317 & 0.153 \\ P_3 & 0.130 & 0.291 & 0.000 & 0.846 & 0.846 & 0.628 & 0.212 \\ P_4 & 0.130 & 0.291 & 0.846 & 0.000 & 0.846 & 0.628 & 0.212 \\ P_5 & 0.130 & 0.291 & 0.846 & 0.846 & 0.000 & 0.628 & 0.212 \\ P_6 & 0.160 & 0.317 & 0.628 & 0.628 & 0.628 & 0.000 & 0.273 \\ P_7 & 0.172 & 0.153 & 0.212 & 0.212 & 0.212 & 0.273 & 0.000 \end{array}\right].$$

From this matrix, there is evidence that measures taken early in a subperiod interact directly with the next successive subperiod in the decision process, but they interact indirectly with every successive subperiod in the process because the information they create or transform is eventually passed to successive subperiods. This matrix could enhance understanding of the evolution of the managerial behavior of Tunisian public decision-makers over time by observing the measures taken at each subperiod and their stringency degrees.

Additionally, there is clear evidence that a pandemic crisis cannot be managed or defeated with a single measure or policy, even at the highest stringency level. Instead, it is managed with several policy responses that interreact together over time. In this regard, Banholzer et al. (2021), using a semi-mechanistic Bayesian hierarchical model, showed that the combination of some nonpharmaceutical interventions leads to a strong reduction in the number of new infections. Furthermore, Gurevich et al. (2021), using evo-epidemiological model, have shown that the timely application of nonpharmaceutical measures could significantly manage the COVID-19 crisis and may act to reduce virulence.

CONCLUSION AND POLICY IMPLICATION

In this study, we analyzed the interoperability of the measures taken by the Tunisian government to manage the first wave of the COVID-19 pandemic. The first wave of the COVID-19 pandemic in Tunisia lasted for almost three and a half months. It started after the discovery of the first case on March 2, 2020, and it extended until June 13, 2020, the date of total control of the health situation, where zero new confirmed cases were recorded during several successive days. The pandemic policies documented in this study are classified based on their implemented dates. This response classification allowed us to break down the first wave period into seven successive subperiods. Then, we modeled each subperiod using three coded states, which reflect the dynamics of measures in terms of their stringency and inclusiveness. The results obtained show that the process of making decisions during the first wave in Tunisia were revised and adjusted in continuous upgrading, in which policy responses were changed from one subperiod to another. This change is observed in the new policy measures implemented during each subperiod and in the adopted stringency level.

The establishment of a dynamic and flexible decision-making process can be useful in managing a future health crisis in countries whose public health systems suffer from several shortcomings.

By estimating the stringency index, we found that, as of March 23, the level of stringency of government responses to the pandemic reached an estimated maximum of 93.75%. With such a maximum level of rigor, Tunisia also managed the two subperiods where total containment was extended twice. Consequently, the presence of 13 measures applied with a maximum level of rigor led to the remarkable stability of the epidemiological situation in the country, with the number of new cases per day falling to 10 cases on average during the second extension of confinement after having been approximately an average of 30 cases at the start of the lockdown subperiod. This stability resulted in a reduction in the level of policy stringency, which decreased to 81.25% during the targeted containment and fell to 18.75% during the total deconfinement subperiod characterized by the end of several previously implemented policies. The transition from full lockdown to partial or no lockout appears to be a more effective strategy to lift restrictions without worsening the health situation.

However, after estimating the interoperability index, we found that the measures taken early in a subperiod interact directly with the next successive subperiod in the decision-making process, but they interact indirectly with other successive subperiods. An important implication that arises from this study is that a pandemic crisis cannot be managed or defeated with a single measure or policy, even at the highest stringency level. Instead, it is managed with several policy responses that interreact together over time.

There are some limitations to this study. First, the methodology of interoperability requires the presence of a set of decisions that change over time and have the same objective to achieve. This is not well identified for the other waves in Tunisia. In addition, the decision-making time is not the same for all countries, which makes the comparison of crisis management modes between countries difficult.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

ETHICS STATEMENT

On behalf of my coauthors, I attest to the fact that all authors have read the manuscript and the validity and legitimacy of the data and its interpretation. We confirm that we have read and have abided by the statement of ethical standard for manuscripts submitted to *World Medical & Health Policy* (WMHP).

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Applying the comprehensive model of information seeking to understand chronic illness information scanning: Hong Kong evidence

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Abstract

Chronic illness is the most prevalent and costly global public health challenge. To address this challenge, health information is essential for individuals to make informed decisions to self-manage their health and prevent and monitor chronic illness. Although previous studies show that health information scanning—a form of information gathering behavior to obtain health information, incidentally, when health topics of interest arise during daily conversations with others or through regular use of the media—positively influenced health decisions, little is known about information scanning in the context of chronic illness. This study applied the Comprehensive Model of Information Seeking to examine factors that influence individuals' use of different channels for health information scanning. Using quota sampling to resemble population demographic characteristics, we collected 1100 online survey responses from Chinese-speaking Hong Kong residents aged from 18 to 65 or older. Three structural equation modeling analyses were performed to examine how antecedent factors and information carrier factors influenced the use of interpersonal/group channels, the Internet-related channels, and the traditional media channels for scanning chronic illness-related information. The findings supported that channel utility was an important determinant of health scanning behavior, and channel characteristics were strong predictors of channel utility. However, mixed findings were observed on the relationship between antecedent factors and channel utility across the three-channel categories, because some antecedent factors had direct influence on health information scanning. These findings will inform the information dissemination and promotional message design for chronic illness prevention and care.

KEYWORDS

chronic illness, comprehensive model of information seeking, health communication, health information scanning, information channels

INTRODUCTION

Chronic illness presents significant public health challenges. Chronic illnesses, such as heart disease, hypertension, diabetes, and arthritis, are caused by pathological changes in the body that result in nonreversible, permanent, or residual disability such as impaired physical functioning, limitations in daily living activities, or loss of independence (Lubkin, 2005). According to the World Health Organization (WHO, 2021), chronic illness accounts for over 70% of all deaths in the world, annually. Yet, long-term treatment and care for chronic illness impose heavy financial burdens not only on individuals and households but also on the society's economy and public finances (Centers for Disease Control and Prevention [CDC], 2020).

This study is set in Hong Kong, which is struggling with a prevalence of chronic illnesses, as are other parts of the world. More than two million Hong Kong people (over one-third of the population) suffer from chronic illnesses (Census and Statistics Department [C&SD], 2019), and it has been observed to be increasing among young adults, notably under 40 (C&SD, 2019).

Chronic illness and its complications are preventable with self-management and monitoring one's own health condition (Battersby et al., 2010). Self-managed health condition requires individuals to make day-to-day decisions such as choosing a healthy diet, doing exercise, reducing tobacco and alcohol use, and complying with treatment regimens and dietary restrictions (CDC, 2021). To make informed decisions, health information is essential, which is often a catalyst for adopting and maintaining health behavior (Freimuth et al., 1989; Johnson & Case, 2012). One major form of health information acquisition behavior is called health information scanning, which is defined as incidental information gathering when health topics of interest come up during daily conversations with others or through habitual use of the media (Hornik & Niederdeppe, 2008).

Health information scanning was chosen as the focal information acquisition behavior of this study for three reasons. First, health information scanning behavior is particularly relevant to the context of acquiring health information for chronic illness prevention and care. Many chronic illnesses are caused by persistent unhealthy lifestyles such as imbalanced diets and lack of physical activity (CDC, 2021); most chronic illnesses cannot be completely cured (Department of Health, 2020). To prevent and manage chronic illness and its complications, people are required to continuously manage and monitor their health condition throughout their lives. Given these ongoing and long-term healthcare demands, people must stay on top of health information that enables them to effectively prevent and manage chronic illness and its complications. Health information scanning reflects people's behavior of continuously being aware of their health information of interest and giving their attention to it when that information arises during social interaction, or when they encounter it in their routine use of the media. Therefore, health information scanning is relevant to this study's context.

Second, health information scanning is a prevalent information acquisition behavior in the context of chronic illness. A study to examine different forms of cancer-related information acquisition behavior showed that information scanning is a more common behavior than information seeking, which is a purposeful and effortful form of information acquisition (Niederdeppe et al., 2007). A recent survey also revealed that information scanning is more prevalent than information seeking among cancer patients (Leung et al., 2017). Information scanning behavior is more common than information seeking probably because of the nature of chronic illness. People who have a chronic illness are living with the illness for life; therefore, enduring the nature of the illness conditions them to pay attention to health information related to care and complication prevention, throughout their life. Thus, they are attuned when they incidentally encounter applicable health information from interpersonal interactions or media use. As such, health information scanning is prevalent in the chronic illness context.

Finally, health information scanning influences health outcomes. Research shows that information scanning behavior significantly impacts people's health-related knowledge, attitude, and behavior (Lewis, 2017). Because health information scanning behavior occurs more frequently than information seeking behavior, communication scholars argued that the cumulative effect of information scanning on health outcomes could be substantial because of repeated attention on health information, over time (Hornik & Niederdeppe, 2008). While much theoretical and empirical work has developed explanations about health information seeking, the antecedents and process of health information scanning remain understudied, particularly for chronic illness. This study focuses on information scanning to fill the void in the existing literature on health information behavior.

To examine health information scanning behavior in the context of chronic illness prevention and care, this study applied the Comprehensive Model of Information Seeking (CMIS). With a wealth of information channels currently available, the CMIS model can shed light on the differences in antecedent factors and information carrier factors that shape the selection and use of different information channels for chronic illness prevention and care. The CMIS was chosen as the guiding framework because it has taken the attributes of information channels into consideration when examining the forces that drive health information scanning behavior, and it examines how antecedent factors predispose an individual to select and use a particular information channel for health information scanning (Johnson et al., 1995). Therefore, CMIS meets the needs of this study's focus on information channels. Several studies have shown that by applying the CMIS model to examine information scanning advanced the understanding of health issues (e.g., Ruppel, 2016; Shim et al., 2006; Tian & Robinson, 2008, 2009).

The purpose of this study, based on the CMIS, examines the antecedents of individual health information scanning for chronic illness prevention and care through the use of the three information channel categories (i.e., interpersonal/group channels, the Internet-related channels, and traditional media channels). This study advances the CMIS framework by providing a more nuanced understanding of the effect of antecedent factors. Rather than treating demographics, experience, salience, and belief as broad antecedent factors, we examined differential influences of specific variables under each antecedent factor on channel utility and information scanning behavior from different information channels. This sheds insights on how different sources of influence shape individuals to use different information channel categories for scanning health information related to chronic illness prevention and care. Furthermore, the findings can provide practical implications for policymakers and health promotion professionals on how to disseminate information through different information channel categories and how to design messages for chronic illness prevention and care.

HEALTH INFORMATION SCANNING

Health information acquisition can be broadly divided into two types of behavior: information scanning and information seeking. Given that this study centers on examining people's behavior of information scanning in the context of chronic illness prevention and care, we briefly highlight the major differences between these two behaviors because information seeking is a juxtaposed concept of information scanning (for an in-depth discussion on the conceptual distinction between the two concepts, see Hornik & Niederdeppe, 2008; Lewis, 2017).

Health information scanning and seeking differ in three ways. First, information scanning behavior takes place within an individual's habitual use of media and regular daily social interaction; whereas, information seeking behavior occurs when an individual initiates a nonroutine search for information (Lewis, 2017). Second, the level of energy allocated to information seeking behavior to acquire health information is higher than information scanning behavior (Hornik & Niederdeppe, 2008). Information seeking is highly active, effortful, and goal-oriented in searching for specific health information (Lewis, 2017). Although information scanning is relatively less active and is an unintentional encounter of specific health information of interest, it is not completely passive (Lewis, 2017). The process of health information scanning occurs when people's health issue of interest prompts them to attend to and retain the information related to the issue during their daily use of media and routine interactions with others. Therefore, health information scanning is often measured by the degree of attention paid to health information when encountering the topic of interest (Ruppel, 2016).

Finally, information scanning and seeking differ in the level of uncertainty (Hornik & Niederdeppe, 2008). The process that drives information seeking often involves an uncertain question of focus (e.g., 'should I get a mammogram?'). The behavior of information seeking deliberately attempts to reduce or resolve that uncertainty. However, the degree of uncertainty of an issue is sometimes not salient enough to motivate information seeking. The culmination of foundational knowledge of a health issue and individuals' interest affords them to pay attention and to retain the pertinent health information (i.e., information scanning) when it appears during the habitual exposure to mediated and interpersonal sources.

Information scanning is considered an important means of acquiring health information because of its effect on health outcomes. Research shows, for example, that individuals who frequently scan information are likely to hold more cancer knowledge, to exercise regularly, and to eat healthily (Bigsby & Hovick, 2018; Hornik et al., 2013; Shim et al., 2006). Studies also indicate that high scanners are more likely to get cancer screening tests than low scanners (Hornik et al., 2013; Shim et al., 2006). Despite the important role of health information scanning, the underlying factors that influence people to engage in scanning for chronic illness prevention and care are less understood. Therefore, we applied the CMIS as the guiding framework to study the phenomenon.

COMPREHENSIVE MODEL OF INFORMATION SEEKING (CMIS)

The CMIS model posits that antecedent factors influence information carrier factors and, in turn, determine information scanning behavior (Johnson & Meischke, 1993). As shown in Figure 1 (Johnson & Meischke, 1993), the model suggests that antecedent factors, including demographics, experience, salience, and belief, are underlying imperatives for individuals' action on health information. In addition, the CMIS hypothesizes that health information

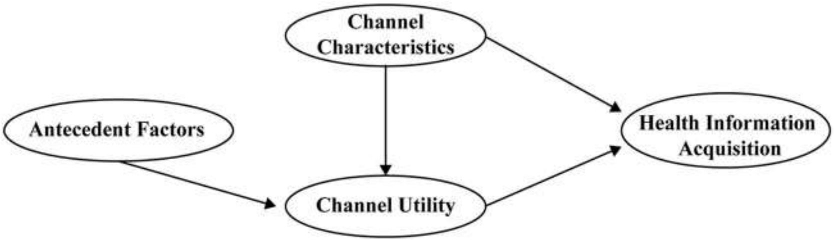


FIGURE 1 Comprehensive model of information seeking

scanning is influenced by information carrier factors that include people's perception of information channel characteristics and utility, which represent people's selection and use of information channels (Johnson & Meischke, 1993). Channel characteristics denote the content attributes in the messages delivered by information channels; channel utility refers to people's evaluation of how the information provided by an information channel can satisfy their needs. The perception of channel utility is influenced by antecedent factors (e.g., demographics, experience, salience, belief) and the perception of channel characteristics. The next section explicates the study's key variables and specifies the hypotheses and research questions.

ANTECEDENT FACTORS

Demographics

The CMIS model postulates that demographic-related variables are significantly related to information channel utility, but the direction of relationships vary from one information channel to another. For example, females and high-income earners perceive professional interpersonal channels as a higher utility (DeLorme et al., 2011). Meanwhile, age and socioeconomic status, indicated by education, income, and insurance status, were found negatively associated with the perceived utility of Internet-related channels (DeLorme et al., 2011; Van Stee & Yang, 2018). Evidence also suggested that females and older adults perceive traditional media channels as a higher utility (H. O. Lee & Kim, 2015; Paek et al., 2017). Based on the literature, we posited the following hypothesis:

Hypothesis 1 – *Demographic-related variables will be significantly associated with the (a) Internet-related channel utility, (b) interpersonal/group channel utility, and (c) traditional media channel utility.*

Experience

According to the CMIS theory (Johnson & Case, 2012), people experience a specific illness either through personal experience by having the symptoms of that illness or through their social environment, namely, knowing family members or close friends who have the illness. The model postulates that such an experience will influence channel utility perception (Johnson & Meischke, 1993). In one study, experience was positively associated with channel utility perception of professional interpersonal channels (DeLorme et al., 2011). A study on cancer information scanning found that people with family cancer history generally pay more attention to relevant information on the media (Shim et al., 2006). In Hong Kong, people with chronic illnesses more frequently use the Internet and television for health information (Wang et al., 2013; Wong & Cheung, 2019). We expect that people who have experience with chronic illnesses would have high channel utility perception across all channels. We proposed the following prediction:

Hypothesis 2 – *Experience with chronic illness will be positively associated with the (a) Internet-related channel utility, (b) interpersonal/group channel utility, and (c) traditional media channel utility.*

Salience

Salience, in this context, is defined as "the personal significance of health information to an individual [that] is related to the degree of perceived health threat an individual feels" (Johnson & Meischke, 1993, p. 347). CMIS researchers operationalized the concept of salience by using perceived risk as well as worry about the health-related risk (Hartoonian et al., 2014; Van Stee & Yang, 2018). Perceived risk involves individuals' perception of the likelihood to contract an illness and the perception of how serious the consequence would be, should that occur. Evidence supported that salience is positively related to perceived utility of interpersonal channels, Internet-related channels, and traditional media channels (Basnyat et al., 2018; Hartoonian et al., 2014; H. O. Lee & Kim, 2015; Pang, 2014; Xiao et al., 2020). Hence, this study posited the following hypothesis:

Hypothesis 3 – *Salience of chronic illness-related risks will be positively associated with the (a) Internet-related channel utility, (b) interpersonal/group channel utility, and (c) traditional media channel utility.*

Belief

Individuals' beliefs represent how effectively advocated medical procedures and preventive behaviors address health threats (Johnson & Meischke, 1993). To measure belief, the CMIS researchers examined individuals' perceptions of the benefits and drawbacks of the medical procedures and preventive behaviors. To manage and prevent chronic illness, a regular physical checkup is a recommended measure (CDC, 2021). Therefore, this study measured individuals' perceived benefits and drawbacks of regular checkups as a measure to prevent and manage chronic illness. Considering that some researchers added self-efficacy of preventing and managing potential health threats (e.g., Ruppel, 2016), this study also examined people's confidence in their ability to manage and maintain a healthy status. Evidence showed that belief is positively associated with the utilities of interpersonal channels (H. O. Lee & Kim, 2015; Pang, 2014), Internet-related channels (Basnyat et al., 2018; Van Stee & Yang, 2018), and traditional media channels (Paek et al., 2017; Ruppel, 2016). Thus, we posited the following hypothesis:

Hypothesis 4 – *Health beliefs regarding medical procedures and preventive behaviors in the context of chronic illness will be positively associated with the (a) Internet-related channel utility, (b) interpersonal/group channel utility, and (c) traditional media channel utility.*

INFORMATION CARRIER FACTORS

Health information scanning occurs in an environment in which a variety of information channels, go-between conveyance devices for a channel user and information sources, are potentially available for selection and use (Johnson & Meischke, 1993). Information channels play an important role in people's acquisition of health information. Different information channels possess different characteristics and utility that can satisfy people's different cognitive and affective needs for information. People will turn to specific channels to fulfill their different needs (Johnson & Case, 2012). Examining how people select and use different information channels for health information scanning will advance our understanding on why people expose themselves to different channels for health information.

The technological advancement drives rapid changes in the landscape of information and communication channels. On the one hand, the technology enables thee number and the capability of information channels to flourish; on the other hand, it causes the line between various communication situations to blur, which makes it difficult to precisely delineate the boundary of different information channels (Lievrouw, 2009). As a result, categorizing information channels becomes a complex and challenging issue for researchers.

A three-type channel categorization emerges from the CMIS literature (e.g., Johnson & Meischke, 1992; Johnson & Case, 2012) and communication research (e.g., Dunwoody & Griffin, 2014; Grunig et al., 2002): interpersonal channels, traditional media channels, and the Internet-related channels. We adopted this categorization for three reasons. First, the three-type channel categorization has been employed by health communication researchers and empirical evidence has supported its usefulness to examine health information acquisition behavior (e.g., Alwhaibi et al., 2017; Dutta-Bergman, 2004; H. O. Lee & Kim, 2015; Tian & Robinson, 2008; Yang et al., 2017). Second, by adopting the three-type channel categorization, in this study, allows the opportunity to make sense of and compare our findings with other CMIS studies using similar channel categorization (e.g., H. O. Lee & Kim, 2015; Xiao et al., 2020; Chhatre et al., 2020). The three-type channel categorization is one of the most common forms of categorization in CMIS research. The consistency in categorizing information channels affords analyzing the similarities and differences of the findings across CMIS studies. Such analysis is important for knowledge building. Third, adopting the three-type channel categorization helps health communication campaign planners to make channel selection choices for health information dissemination. When it comes to health communication intervention design, practitioners not only consider a channel's capability and impact but also consider the cost of disseminating information using that channel. The three-type channel categorization are often used by practitioners for media planning and budget estimate, and the cost of using the interpersonal/group, traditional media, and Internet-related channels differed significantly (Graham et al., 2008). Therefore, our categorization can help the practitioners to consider the relative cost effectiveness of the three-channel categories.

Under the three-type channel categorization, interpersonal channels include healthcare professionals, friends, family, and colleagues, and traditional media channels consist of television, radio, and print materials (e.g., newspapers, books, magazines, brochures, and pamphlets) (Dunwoody & Griffin, 2014; Johnson & Meischke, 1992). People acquire health information through interpersonal and group interactions in patient support groups and health-related nonprofit organizational settings. For example, health information may be obtained either on an individual basis, such as during interactions with social workers, volunteers, counselors, hotline receptionists, and other patients, or in a small group setting of patient support groups and health-related nonprofit organizations. On other occasions, health information could be acquired through patient group seminars or talks delivered by healthcare professionals. Therefore, in this study, we argue that the interpersonal channel category should include patient support groups and health-related nonprofit organizations, and be categorized as the interpersonal/group channels.

The third channel category is the Internet-related channels. As pinpointed by Johnson and Case (2012), the Internet is an omnibus channel, which involves multifaceted communication and information gathering activities. For instance, many social networking services empower individuals to connect with their friends; meanwhile, news media websites and online video channels provide mediated content of health risks. Similar to many CMIS researchers' channel categorization practice, we treated different Internet-related channels, such as websites, instant messaging, and discussion forums, as one broad channel category, because our interest was on the characteristics and utility of the computer network-enabled tool and how people select and use this tool for health information scanning (e.g., Basnyat et al., 2018; Reifegerste et al., 2020; Ruppel, 2016; Tian & Robinson, 2008; Van Stee & Yang, 2018).

Channel characteristics

The CMIS identifies two information channel characteristics: editorial tone and communication potential (Johnson & Meischke, 1993). Editorial tone concerns information channel users' perception of the credibility and intention of an information channel. When users are suspiciously aware that a channel may intentionally be doing more than merely delivering information (e.g., promoting a product), they may have second thoughts before acquiring information from that channel. Communication potential refers to how users of an information channel consider the presentation style and the comprehensibility of the message content. Users who perceive the information channel to have positive channel characteristics find the message content easy to understand and the presentation clear. Previous work showed that information channel characteristics are positively associated with information channel utility across interpersonal channels (Xiao et al., 2020), Internet-related channels (Basnyat et al., 2018; Fetherston, 2019), and traditional media channels (Paek et al., 2017). Thus, we proposed the following hypothesis:

Hypothesis 5 – *Perceived channel characteristics of the (a) Internet-related channels, (b) interpersonal/group channels, and (c) traditional media channels will be positively related with the perceived channel utility.*

The CMIS predicts that those who have a positive perception of channel characteristics are more likely to engage in health information scanning. The findings of a recent study (Tang & Zou, 2021) showed that because of positively perceived channel characteristics, such as trustworthiness, some respondents scanned information related to COVID-19 information posted on government agency social media accounts; others who perceived TV news as credible scanned their information. Therefore, we postulated the following hypothesis:.

Hypothesis 6 – *Perceived channel characteristics of the (a) Internet-related channels, (b) interpersonal/group channels, and (c) traditional media channels will be positively related with scanning chronic illness information.*

Channel utility

Information channel users assess the degree in which the information provided by an information channel can satisfy their needs based on their goals, relevancy, and timeliness (Johnson & Meischke, 1993). In CMIS studies, common indicators of information channel utility include personal significance, usefulness, usability, as well as trust in the information source (Johnson et al., 1995; Ruppel, 2016). The CMIS predicts that people who perceive an information channel as a higher utility are more likely to engage in information acquisition with that channel. For example, a study of cancer information scanning revealed that trust is positively associated with scanning behaviors on Internet-related and traditional media channels (Ruppel, 2016). Scholars also argued that information scanning commonly occurred during typical interpersonal interactions because they are usually considered trustworthy and available for immediate feedback (Robinson & Goode, 2014). Thus, we set the following hypotheses.

Hypothesis 7 – *Perceived channel utilities of (a) Internet-related channels, (b) interpersonal/group channels, and (c) traditional media channels will be positively related with scanning chronic illness information.*

Although the CMIS model argues that channel utility is a mediator between antecedent factors, channel characteristics, and health information acquisition (Johnson & Meischke, 1993), mixed findings of the indirect effects of antecedent factors were observed. For example, studies on the use of Internet-related and traditional media channels for information acquisition showed that channel utility mediated the effects of channel characteristics, but not other antecedent factors (Paek et al., 2017; Van Stee & Yang, 2018). Another study showed that only salience-related and belief-related variables exerted an indirect effect through Internet-related channel utility, and the Internet-related channel utility did not mediate the effect of demographics on individual action (Basnyat et al., 2018). In addition, mixed findings of the mediating role of channel utility were also observed across channel categories. For example, a study on source selection for drug information revealed that utility played a mediating role between demographic-related variables and the use of Internet-related sources, but not interpersonal sources (DeLorme et al., 2011). Given that the mediating effect of channel utility has not been examined in the health information scanning literature, we posed the following research question.

Research Question 1: Does perceived channel utility mediate the effect of antecedent factors and perceived channel characteristics on health information scanning?

METHOD

Data collection procedures and sample

A cross-sectional online survey by quota sampling was conducted from late May 2021 to early June 2021. The participants for this online survey were recruited through an online panel managed by Dynata, a US-based global market research firm. The management of the online panel is compliant with industry standards.

The target population was Hong Kong residents ranging from age 18 to 65 or older and who are literate in Chinese. We set the sample quota based on the gender and age that corresponded with the 2016 Hong Kong By-census. Despite multiple survey reminders, Dynata was unable to achieve the age group quota of the 50-year-olds or older. As a result, the target quota sample was later relaxed and adjusted to maintain a balance for each age group.

A total of 1100 valid responses were recorded in this study. The respondents took around 25 min to complete the survey, and those who completed it were each given a reward worth US$1. Table 1a shows a comparison of sample characteristics and cell percentages from the 2016 By-census, and Table 1b provides additional details about the sample demographic characteristics.

TABLE 1a Sample demographics as compared with Hong Kong 2016 population by-census data

Variables	Sample percentage (*n*)	By-census data percentage[a]
Gender		
Male	48.27 (531)	47.68
Female	51.73 (569)	52.32
Age group		
18–29	24.45 (269)	21.40
30–39	23.27 (256)	20.04
40–49	25.64 (282)	21.53
50 or above	26.64 (293)	37.03

Note: $N = 1100$.

[a] The by-census data percentage reflects the ratio of the age group to the target population (people who are at age of 18–50 or above), not the total population of Hong Kong. The original data are available on https://www.bycensus2016.gov.hk/en/index.html.

Measures

The measures in this study were based on the National Cancer Institute's Health Information National Trends Survey (HINTS) 5, Cycle 3 (unless otherwise stated). Guided by the CMIS framework, the questionnaire was broadly divided into three sections: antecedent factors, information carrier factors, and health information scanning. Most items (unless otherwise indicated) were measured on 5-point Likert scales. The following describes the questions in each section. The means, standard deviations, and reliabilities of all variables are presented in Table 2.

Antecedent factors

The antecedent factors included four sets of questions: *demographics*, *experience*, *salience*, *and beliefs* (Johnson & Meischke, 1993). For *demographics*, respondents were asked to indicate their gender, age, education level, and monthly individual income. In addition, we measured whether the respondents were covered by health insurance or received government subsidies. Respondents were asked to indicate whether any of the six health insurance/subsidy categories applied to them. A dichotomized index was then created (1 = covered by health insurance or received subsidy, 0 = not being covered or subsidized). Table 1b refers to the frequency distribution of the demographic variables.

Experience addressed whether the respondents have personally experienced chronic illnesses or are surrounded by people who have had chronic illnesses. Respondents were asked if any of the following have ever been diagnosed with a chronic illness: themselves, their immediate or extended family members, or their close friends. A dichotomized index was then created (1 = diagnosed as having a chronic condition or illnesses, 0 = not diagnosed). For the unsure responses to whether the participants or their immediate or extended family, as well as their close friends, had been diagnosed with a chronic illness, we treated as missing data. The missing data were treated with listwise deletion in the analysis. The frequency distributions of the three indices are presented in Table 1b.

Salience examined respondents' perceived susceptibility and severity of having chronic illnesses or experiencing their complications. One item was used to measure the perceived susceptibility: Respondents were either asked to indicate how likely they would experience the illness's complications throughout their life (for those who had been diagnosed as having

TABLE 1b Sample demographic characteristics

Variables	*n*	Sample percentage
Education (highest level completed)		
Completed elementary school or below	7	0.63
Completed high school	304	27.63
Post high school training or some college (Diploma/certificate/sub-degree course)	216	19.64
College graduate (Bachelor's degree)	487	44.27
Postgraduate (Master's or doctoral degree)	86	7.82
Monthly individual income in HKD[a]		
Less than $10,000	131	11.91
$10,000–$14,999	99	9.00
$15,000–$19,999	185	16.82
$20,000–$24,999	175	15.91
$25,000–$29,999	117	10.64
$30,000–$34,999	110	10.00
$35,000–$39,999	68	6.18
$40,000 or above	215	19.55
Covered by insurance or received government subsidies		
Yes	874	79.45
No	226	20.55
Diagnosed as having chronic illness		
Self	212	19.27
Family members and relatives	591	53.73
Close friends	87	7.91
Not sure[b]	140	12.73
Not diagnosed as having chronic illness[c]	278	25.27

Note: $N = 1100$.

[a] US$1 = HK$7.80.

[b] Respondents who were not sure about whether himself or herself, his or her family members and relatives, or close friends was diagnosed as having chronic illness. These respondents were treated as missing values in the regression analyses.

[c] Neither the respondent, his or her family members and relatives, nor his or her close friends was diagnosed as having chronic illness.

a chronic illness) or how likely they would be diagnosed with a chronic illness throughout their life (for those who did not have any chronic illnesses). Another single item was used to measure perceived severity: Respondents were either asked to rate the severity if they would have experienced complications that the illness can cause (for those who had been diagnosed as having a chronic illness) or to rate the severity if they had had a chronic illness (for those who did not have any chronic illnesses).

TABLE 2 Means, standard deviations, reliability, and correlation matrix for model variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1.00																						
2	0.01	1.00																					
3	0.07*	−0.19***	1.00																				
4	0.19***	0.21***	0.40***	1.00																			
5	0.00	0.05	0.10***	0.19***	1.00																		
6	0.07*	0.20***	−0.03	−0.01	−0.10***	1.00																	
7	−0.10***	0.07*	−0.01	−0.09**	0.01	0.03	1.00																
8	0.04	0.12***	0.04	0.05	−0.02	0.12***	0.13***	1.00															
9	0.02	0.01	0.12***	0.00	0.01	0.17***	0.21***	0.10***	1.00														
10	0.04	−0.01	0.10***	0.03	0.04	0.17***	0.12***	0.02	0.51***	1.00													
11	−0.01	0.03	0.09**	0.01	0.03	0.12***	0.12***	0.03	0.45***	0.52***	1.00												
12	0.00	0.02	0.06	−0.03	0.03	0.08*	0.13***	0.07*	0.16***	0.10***	0.15***	1.00											
13	0.06	−0.03	0.00	0.01	0.03	−0.05	−0.05	−0.05	−0.01	0.03	0.03	−0.32***	1.00										
14	0.07*	0.00	0.00	0.17***	0.10***	−0.18***	−0.14***	−0.05	−0.26***	−0.25***	−0.29***	0.07*	−0.01	1.00									
15	0.02	−0.03	−0.01	0.01	0.08**	−0.05	−0.08*	−0.03	−0.05	0.06	0.05	0.09**	0.04	0.15***	1.00								
16	−0.01	−0.01	0.01	0.02	0.09**	−0.01	−0.07*	0.01	0.02	0.12***	0.10**	15***	−0.02	0.15***	0.68***	1.00							
17	−0.04	−0.06	0.03	−0.00	0.13***	−0.03	0.01	0.02	0.01	0.07*	0.11***	0.15***	0.09**	0.17***	0.26***	0.35***	1.00						
18	−0.05	−0.01	0.04	0.00	0.08*	−0.04	−0.01	0.02	0.00	0.06	0.02	0.17***	−0.02	0.12***				1.00					
19	−0.03	0.00	0.04	0.05	0.09**	−0.02	−0.02	0.01	0.04	0.09**	0.05	0.21***	−0.12***	0.19***				0.71***	1.00				
20	−0.03	0.08*	−0.01	0.06	0.16***	0.03	0.01	0.01	−0.01	0.06	0.06	0.18***	0.02	0.20***				0.22***	0.35***	1.00			
21	−0.01	−0.04	0.04	0.04	0.07*	−0.07*	−0.04	−0.02	0.00	0.04	0.03	0.17***	0.02	0.18***							1.00		
22	−0.02	0.01	0.06	0.05	0.04	−0.03	−0.04	0.01	0.00	0.05	0.05	0.20***	−0.06	0.17***							0.75***	1.00	

(Continues)

TABLE 2 (Continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
23	−0.01	0.04	0.03	0.03	0.06	0.04	0.06	0.08*	0.08*	0.08*	0.11***	0.27***	−0.03	0.10***							0.26***	0.33***	1.00
M	0.48	39.86	5.85	5.00	0.79	0.22	0.62	0.09	3.46	3.11	3.33	3.84	2.59	3.63	3.17	3.31	3.13	3.37	3.47	3.36	3.27	3.36	3.19
SD	0.50	11.82	1.49	3.12	0.40	0.42	0.49	0.29	0.95	0.93	1.03	0.65	0.91	0.78	0.65	0.56	0.75	0.62	0.55	0.72	0.56	0.53	0.80
Reliability[a]												0.83	0.79		0.75	0.79	0.85	0.70	0.75	0.84	0.81	0.80	0.59[b]

Note: $N = 1100$. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. Demographics: 1, gender; 2, age; 3, education level; 4, income; 5, insurance; Experience: 6, self; 7, family members and relatives; 8, close friends. Salience: 9, perceived susceptibility; 10, perceived severity; 11, worry. Beliefs: 12, benefits; 13, drawbacks; 14, efficacy. Information Carrier Factors: 15, Internet-related channel characteristics; 16, Internet-related channel utility; 18, interpersonal/group channel characteristics; 19, interpersonal/group channel utility; 21, traditional media channel characteristics; 22, traditional media channel utility. Health Information Scanning: 17, Internet-related channel; 20, interpersonal/group channel; 23, traditional media channel.

[a] Cronbach's alpha.

[b] Inter-item correlation.

Worry, a salience-related variable, was measured by the extent to which the respondents worry about having a chronic illness or experiencing the complications it can cause. One item was used to measure worry: Respondents were asked to indicate the extent to which they were worried about having such a condition (for those who did not have a chronic illness) or to rate the extent to which they were worried about suffering the complications the illness can cause (for those who already had a chronic illness).

The concept of *belief* discerned efficacy belief in maintaining good health and belief in regular physical checkups (Johnson & Meischke, 1993). To measure efficacy belief in maintaining good health, a single item was used in which participants were asked to indicate the extent of confidence in their ability to maintain good health.

Belief in regular physical checkups measured the extent to which the respondents perceived their benefits and drawbacks to prevent chronic illnesses; the measures were developed in this study. Three items were used to assess the respondents' perceived benefits of regular checkups: “help to determine chronic conditions or illnesses,” “help to alleviate the worries about my health condition,” and “help to prevent latent health issues.” These three items were averaged to create the perceived benefits variable, and the reliability coefficient was satisfactory (Table 2). The perceived drawback was captured through three items: For the first two, participants rated their level of agreement on the statements that regular physical checkups “are harmful to my health,” “are useless and just a waste of money, time, and effort”; for the third, respondents were asked to indicate their reluctance to have regular checkups because of their fear of possibly learning they have health issues. The three items were averaged to create the perceived drawback variable, and the reliability coefficient was satisfactory (Table 2).

Information carrier factors

The information carrier factors involved two sets of questions: channel characteristics and channel utility. To measure channel characteristics and utility, we adopted the measure by Johnson et al. (1995). Specifically, respondents were asked to evaluate whether the extent to which they found health information given on each of the three categories of channels was (a) accurate, (b) well-intentioned, (c) understandable, and (d) clearly presented. The higher the scores the more positive the characteristics of a specific category of information channels were perceived by the respondents. The scores were averaged to compute the indices of interpersonal/group channel characteristics, traditional media channel characteristics, and Internet-related channel characteristics. The reliability coefficients of the three channel characteristics categories were acceptable (Table 2).

To measure channel utility (Johnson et al., 1995), respondents assessed the extent to which they found that a specific category of channels supplied health information that was (a) personally significant, (b) useful, (c) easy to understand, and (d) valuable. This study further surveyed the extent to which respondents trust the health information provided by 12 specific information channels (Ruppel, 2016). To create three separate indices for interpersonal/group channels, traditional media channels, and Internet-related channels, scores of the five items were averaged according to the channel category. The higher the score implied that the respondents perceived the channels to meet their information needs. The reliabilities of the three channel utility categories were all satisfactory (Table 2).

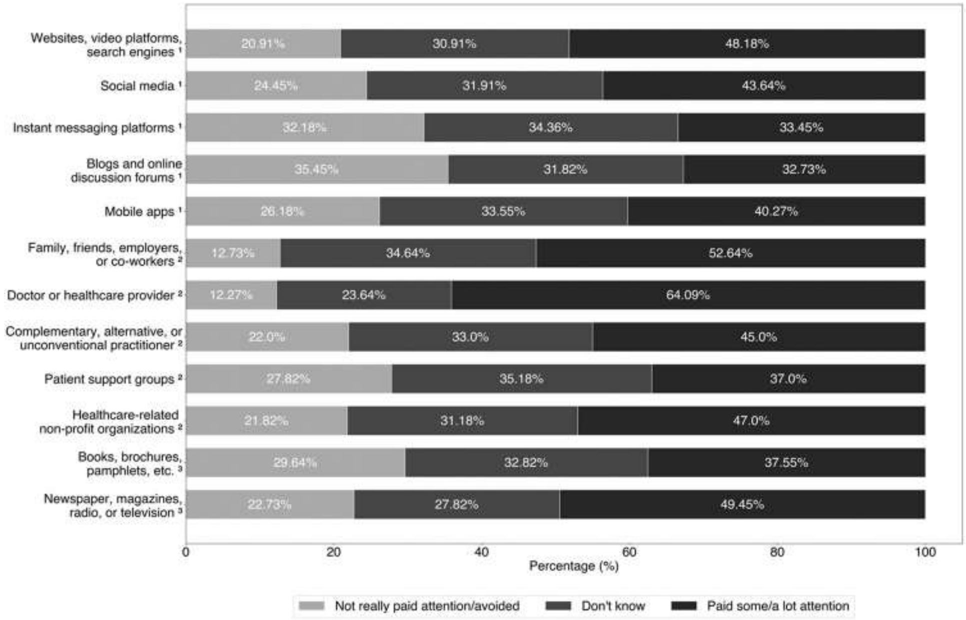
Health information scanning

Consistent with the literature (e.g., Jensen et al., 2017; Ruppel, 2016; Shim et al., 2006), Health information scanning behavior was operationalized by the degree of attention paid to health information channels. Respondents were asked, “In the past 12 months, how much attention have you paid to information about health or medical topics from each of the following,” and 12 information channels were listed for their assessment. Figure 2 presents the frequency distribution of health information attention paid to the 12 information channels. Based on the argument in the literature review, we created three-channel categories. To create measures of attention paid to the Internet-related channels, interpersonal/group channels, and traditional media channels, respectively, scores were averaged based on the channel category. The Cronbach's alpha of the Internet-related channels and interpersonal/group channels, and the inter-item correlation of traditional media channels were all satisfactory (see Table 2).

RESULTS

Analytic approach

Rather than treating demographics, experience, salience, and belief as latent variables and broad antecedent factors, we examined specific variables under each antecedent factor (e.g., perceived susceptibility and severity, worry, efficacy) because this affords a better understanding of the nuanced effect of the specific variables on channel utility and information scanning behavior across the three-channel categories.



Note. [1] Internet-related channels. [2] Interpersonal/group channels. [3] Traditional media channels.

FIGURE 2 Health information attention to each channel

Before conducting the structural equation modeling analyses, the multivariate normality test was performed, and the distribution of the variables met the normality requirement. For each channel category, we used a maximum likelihood estimation with robust standard errors in Mplus 8.3 to examine the paths and statistical fit of the measurement model, followed by the full structural model. Several indices were used to assess the model fit[1]. The results of model fit tests and paths analysis of each channel category are presented below, and the correlation matrix are presented in Table 2.

Health information scanning via Internet-related channels

Based on the model fit criteria, the measurement model achieved an acceptable fit (see Table 3a); then, we examined the statistical fit of the structural model. Although the initial results of the structural model provided a satisfactory fit (Table 3b), modification indices indicated improvements in model fit by specifying additional direct paths to channel characteristics and health information scanning. Methodologists suggest that changes of path specification should only be made when the changes are theoretically meaningful and empirically explainable (Byrne, 2005; Jöreskog & Sörbom, 2003). The literature showed that direct paths from worry to channel characteristics (Hartoonian et al., 2014) and health information scanning (Van Stee & Yang, 2018), as well as direct paths from efficacy belief to channel characteristics (Hartoonian et al., 2014) and health information scanning (Ruppel, 2016), are conceptually plausible. Furthermore, adding the direct path from age to health information scanning (DeLorme et al., 2011) and the direct path from insurance/subsidy to health information scanning (Johnson & Meischke, 1993) are theoretically reasonable. Finally, a correlation of error terms between perceived benefit and perceived drawbacks was added. Such a correlation was logical because the error terms are the unexplained variance and measurement error of variables. As shown in Table 3b, the structural model was modified and reestimated, resulting in a better fit of the final model to the data on all criteria (Figure 3a).

Of all the antecedent factors, perceived benefit of regular checkups was the only significant predictor of channel utility ($\beta = 0.09$, $p < 0.01$). H4a was partially supported, but H1a, 2a, and 3a were not supported. Channel characteristics were the strongest predictor of channel utility ($\beta = 0.77$, $p < 0.001$). H5a was supported. As predicted, channel utility was

TABLE 3a Model fit statistics for measurement models

Model fit statistics efficacy	**Internet-related channels**	**Interpersonal/group channels**	**Traditional media channels**	
			Initial model	**Final model**
χ^2	777.76***	970.63***	1542.50***	990.16***
χ^2/df	3.28	3.49	5.43	3.60
Root mean square error of approximation (RMSEA)	0.046 CI (0.042–0.049)	0.048 CI (0.044–0.051)	0.063 CI (0.060–0.067)	0.049 CI (0.045–0.052)
Comparative fit index (CFI)	0.93	0.91	0.84	0.91
Standardized root mean square residual (SRMR)	0.05	0.05	0.06	0.05

Note: ***$p < 0.001$.

TABLE 3b Model fit statistics for structural models

Model fit statistics	Internet-related channels		Interpersonal/group channels		Traditional media channels	
	Initial model	Final model	Initial model	Final model	Initial model	Final model
χ^2	769.35***	769.35***	668.97***	636.24***	778.57***	734.34***
χ^2/df	2.78	2.58	2.42	2.33	2.58	2.44
Root mean square error of approximation (RMSEA)	0.043 CI (0.039–0.048)	0.041 CI (0.037–0.044)	0.038 CI (0.035–0.042)	0.037 CI (0.033–0.041)	0.041 CI (0.037–0.044)	0.039 CI (0.035–0.042)
Comparative fit index (CFI)	0.91	0.92	0.92	0.93	0.91	0.92
Standardized root mean square residual (SRMR)	0.06	0.05	0.06	0.06	0.06	0.05

Note: ***$p < 0.001$.

positively associated with health information scanning ($\beta = 0.32$, $p < 0.001$). H7a was supported. In contrast, the relationship between channel characteristics and health information scanning was not significant. H6a was not supported.

The additional paths showed that worry ($\beta = 0.12$, $p < 0.01$) and efficacy belief ($\beta = 0.21$, $p < 0.001$) were positively related to channel characteristics. Furthermore, insurance/subsidy ($\beta = 0.09$, $p < 0.01$), worry ($\beta = 0.13$, $p < 0.001$), and efficacy belief ($\beta = 0.17$, $p < 0.001$) were positively associated with health information scanning. However, age ($\beta = -0.08$, $p < 0.001$) was negatively related to health information scanning.

To answer RQ1, the indirect effect analyses (Table 4) showed that the effect of channel characteristics on health information scanning was fully mediated by channel utility ($\beta = 0.23$, $p < 0.001$). The effect of perceived benefits was partially mediated by channel utility ($\beta = 0.03$, $p < 0.05$). Furthermore, the effects of worry ($\beta = 0.03$, $p < 0.05$) and efficacy belief ($\beta = 0.05$, $p < 0.001$) on health information scanning were serially and partially mediated by channel characteristics and channel utility.

Health information scanning via Interpersonal/Group channels

The measurement model of interpersonal/group channels was acceptably fit to the data (see Table 3a). Although the structural model achieved an adequate fit (Table 3b), modification indices suggested that specifying direct paths to channel characteristics and health information scanning further improved the model fit. Several additional paths were specified based on the literature: direct paths from worry to channel characteristics (Hartoonian et al., 2014) and health information scanning (Van Stee & Yang, 2018), a direct path from efficacy belief to health information scanning (Ruppel, 2016), a direct path from perceived severity to channel characteristics (Hartoonian et al., 2014), and direct paths from age (DeLorme et al., 2011) and insurance/subsidy (Johnson & Meischke, 1993) to health information scanning. Finally, based on logical reasoning, an error terms correlation between perceived benefits and perceived drawbacks were added. After the modifying and reestimating parameters (Table 3b), the final structural model achieved a better fit to the data (Figure 3b).

Two belief-related factors were significant predictors of channel utility. Specifically, efficacy belief was positively related to channel utility ($\beta = 0.09$, $p < 0.01$); whereas perceived drawbacks was negatively associated with channel utility ($\beta = -0.09$, $p < 0.01$). H4b was partially supported. However, all other antecedent factors were not significant, and H1b, 2b, and 3b were not supported. The findings indicated that channel characteristics were strongly and positively related to channel utility ($\beta = 0.83$, $p < 0.001$). H5b was supported. Consistent with H7b, channel utility was positively associated with health information scanning ($\beta = 0.41$, $p < 0.001$). However, channel characteristics were not significantly related to health information scanning, and H6b was not supported.

The newly added paths showed that perceived severity ($\beta = 0.11$, $p < 0.05$) and worry ($\beta = 0.17$, $p < 0.01$) were positively related to channel characteristics. Furthermore, efficacy belief ($\beta = 0.16$, $p < 0.001$), worry ($\beta = 0.09$, $p < 0.05$), age ($\beta = 0.07$, $p < 0.05$), and insurance/subsidy ($\beta = 0.12$, $p < 0.05$) were positively associated with health information scanning.

To answer RQ1, the indirect effect analyses (Table 4) showed that the effect of channel characteristics on health information scanning was fully mediated by channel utility ($\beta = 0.38$, $p < 0.001$). The effect of perceived drawbacks on health information scanning was partially mediated by channel utility ($\beta = -0.04$, $p < 0.05$). In addition, the findings showed that efficacy belief ($\beta = 0.04$, $p < 0.05$) and perceived severity ($\beta = 0.07$, $p < 0.05$) indirectly influenced health information scanning via two mediators, channel characteristics and channel utility.

Health information scanning via traditional media channels

The initial measurement model of traditional media channels was poorly fit (Table 3a). Based on the modification indices, items within channel characteristics as well as items within channel utility were freed to correlate. The model fit statistics were improved, and the final measurement model was satisfactory on all criteria.[1]

The initial structural model achieved an adequate fit; however, further improvement occurred when we added a direct path from perceived benefits to health information scanning. The literature suggested that such a direct path addition was conceptually plausible (Hartoonian et al., 2014). As shown in Table 3b, adding a direct path resulted in a better fit to the data in the final structural model (see Figure 3c).

Of all antecedent factors, three predictors were significantly related to channel utility. Specifically, age ($\beta = 0.05$, $p < 0.05$) and efficacy belief ($\beta = 0.06$, $p < 0.05$) were positively related to channel utility. Nevertheless, perceived drawbacks ($\beta = -0.09$, $p < 0.01$) were negatively associated with channel utility. Therefore, H1c and H4c were partially supported. The additional direct path of perceived benefits showed a positive relationship to health information scanning ($\beta = 0.26$, $p < 0.01$).

As hypothesized, channel characteristics ($\beta = 0.85$, $p < 0.001$) were the strongest predictor of channel utility, and H5c was supported. In addition, channel utility was positively related to health information scanning ($\beta = 0.29$, $p < 0.01$), and H7c was supported. In contrast, the relationship between channel characteristics and health

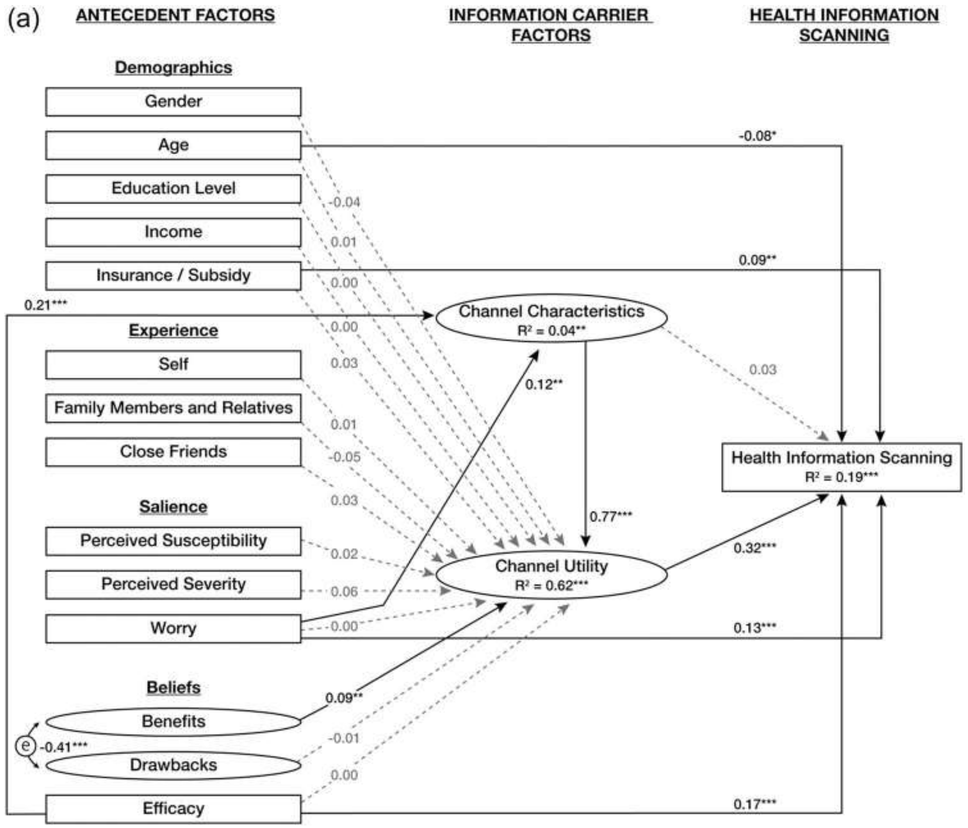


FIGURE 3 (a) Structural model of the Internet-related channels. (b) Structural model of interpersonal/group channels. (c) Structural model of traditional media channels

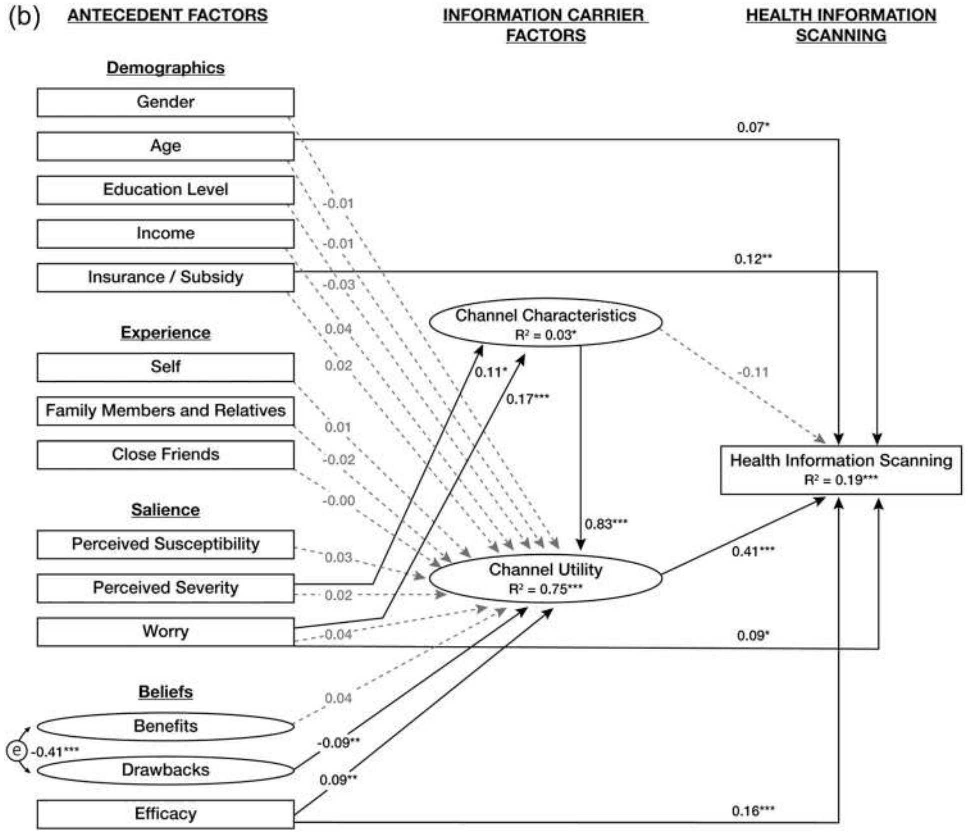


FIGURE 3 (Continued)

information scanning was not significant, and H6c was not supported. To answer the research question, the indirect effects analysis indicated that the effect of channel characteristics on health information scanning was fully mediated by channel utility ($\beta = 0.24$, $p < 0.001$).

DISCUSSION

Based on the worrying trend of the prevalence of chronic illnesses in Hong Kong, this study extended the application of CMIS to examine what drives people to use different information channels for scanning health information related to chronic illness prevention and care. We conducted an online survey with Hong Kong adults by using quota sampling based on 2016 By-census demographic data.

The results suggest that the CMIS is a useful theoretical framework to understand health information scanning behavior in the context of chronic illness prevention and care. The CMIS-related variables explained around 20% of the variances in using Internet-related channels, interpersonal/group channels, and traditional media channels for health information scanning, respectively. Three important CMIS theory-related findings were observed across the three-channel categories in the context of health information scanning for chronic illness prevention and care. First, channel characteristics are the strongest predictor of channel utility. Consistent with the CMIS model, the more individuals perceive

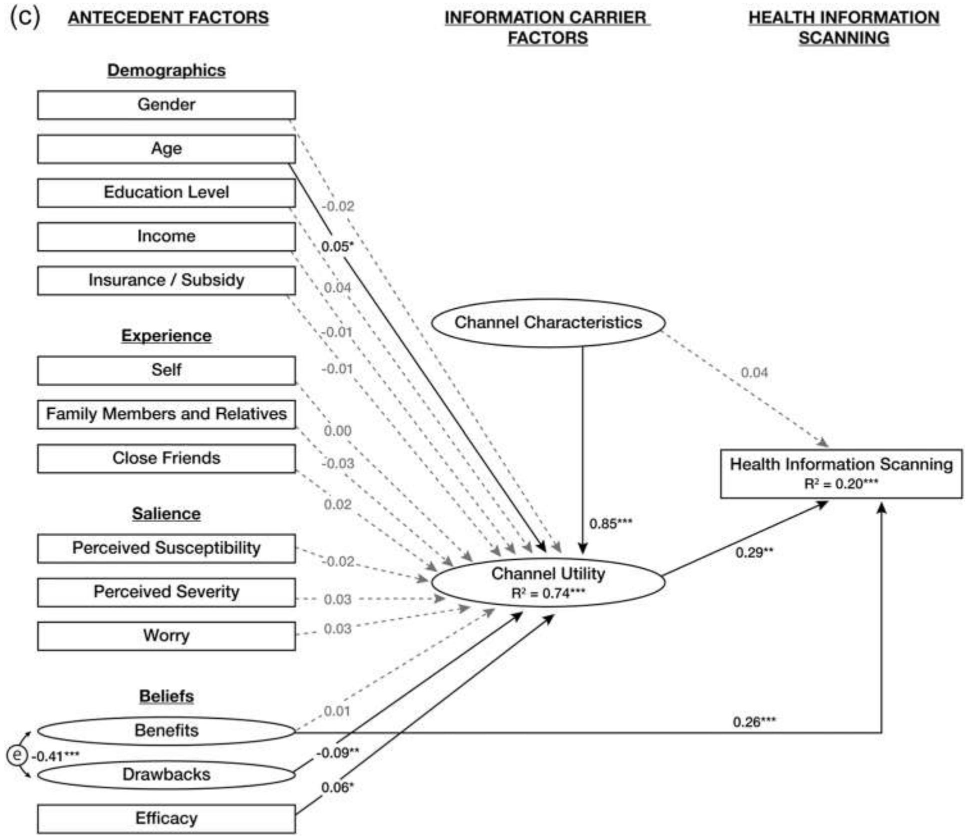


FIGURE 3 (Continued)

the editorial tone and communication potentials of the message content (i.e., channel characteristics) as positive, the more likely they perceive the messages carried by the channels as relevant and useful to them. Second, channel utility is a moderate predictor of health information scanning. Consistent with the model prediction, the more individuals perceive the messages carried by an information channel that is personally relevant and useful, the more likely they scan health information using that channel. Third, contrary to the model prediction, channel characteristics, in this study, is not a significant predictor of health information scanning. Instead, our study showed that the effect of channel characteristics on health information scanning is fully mediated by channel utility across the three-channel categories. These findings suggest that, regardless of the channel category in this study, channel characteristics indirectly influence health information scanning. More research is needed in the context of chronic illness to verify the relationship between channel characteristics and health information scanning.

Regarding the hypotheses of the direct effects of antecedent factors on channel utility, as specified in the CMIS model, the findings of this study provide partial support. For example, age is positively related to traditional media channel utility. In the case of interpersonal/group channel category and traditional media channel category, perceived drawbacks of regular body checkups, a belief-related variable, is negatively associated with channel utility. Perceived benefits of regular body checkups, a belief-related variable, is positively associated with the Internet-related channel utility. In the traditional media channel and the interpersonal/group channel categories, efficacy belief, a belief-related variable, is

TABLE 4 Significant indirect effect on health information scanning

	Internet-related channels				Interpersonal/group channels			Traditional media channels	
	Worry	Perceived benefits	Efficacy beliefs	Channel characteristics	Perceived severity	Perceived drawbacks	Efficacy beliefs	Channel characteristics	Channel characteristics
Total effect	0.16***	0.15**	0.24***	0.27***	0.08	0.08*	0.24***	0.21***	0.27***
Direct effect	0.12**	0.12**	0.18***	0.04	0.05	0.13**	0.16***	–0.17	0.03
Indirect effect via channel utility	0.00	0.03*	0.00	0.23***	0.01	–0.04*	0.04*	0.38***	0.24***
Indirect effect via channel characteristics	0.00		0.01		–0.02		–0.03		
Indirect effect via channel characteristics and channel utility	0.03*		0.05***		0.04*		0.07**		

Note: The estimates are standardized beta. Path (bootstrapped at 5000 resamples).

positively associated with channel utility. These belief-related findings are consistent with the literature that self-efficacy and perceived benefits and barriers of regular physical checkups are significant determinants of behavioral change in preventing and managing chronic illness and its complications (Bonsaksen et al., 2014; Chien et al., 2020).

Our findings also lend some support on the mediating role of channel utility, as specified in the CMIS framework. Through the perception of interpersonal/group channel utility, the perceived drawbacks of regular body checkups indirectly influence the use of interpersonal/group channels for health information scanning, albeit to a small degree. In addition, through the perception of Internet channel utility, the perceived benefits of regular body checkups indirectly influence the use of the Internet-related channels for health information scanning.

However, we observed some findings that are not consistent with the CMIS predictions. Rather than influencing the perception of channel utility, some antecedent variables have a direct effect on health information scanning behavior. The reasons why some variables, but not others, have a direct influence on health information scanning behavior is unclear. More research is required to determine if the direct effects are unique in the context of chronic illness prevention and management. We attempt to provide some plausible explanations below.

Our findings showed that age has a direct, positive effect on health information scanning from the interpersonal/group channels; whereas it has a direct, negative effect on health information scanning from the Internet-related channels. Some previous CMIS studies also showed that age has a direct and positive influence on the use of interpersonal channels, but it has a direct and negative influence on the use of the Internet-related channels (DeLorme et al., 2011; Ruppel, 2016). Furthermore, a direct and positive effect of health insurance or a government subsidy on health information scanning from the interpersonal/group channels as well as the Internet-related channels was observed in this study. A possible reason is that those people who have health insurance or get a government subsidy have fewer financial burdens to consider chronic illness prevention and management such as regular body checkups. Chronic illness literature also shows that people who have health insurance are less likely to develop chronic illnesses and their complications (M. Lee et al., 2020). Therefore, people who have insurance or get a government subsidy are more likely to pay attention to information related to chronic illness prevention and management when it arises.

Worry also has a direct and positive effect on health information scanning from interpersonal/group channels and the Internet-related channels. The direct effects of worry were observed in Van Stee and Yang's study (2018). They argued that because emotions can have a direct influence on behavior and decision (Loewenstein et al., 2001), the direct influence of worry on information behavior is independent from cognitive evaluation of the information channel utility. Finally, perceived benefits of regular checkups have a direct and positive effect on the use of traditional media channels for scanning chronic illness-related information.

Our study shed new light on the role of channel characteristics. First, several antecedent variables have a direct influence on channel characteristics, but not on channel utility as specified in the CMIS framework. Specifically, for people who perceive the consequences of chronic illness and its complications as more severe, the more they perceive positive characteristics (i.e., editorial tone and communication potentials) on the content delivered by interpersonal/group channels. People who are more confident in their ability to maintain a healthy status are more likely to perceive the content delivered by the Internet-related channels with positive characteristics. More worried individuals are more likely to perceive the content delivered by the Internet-related channels and interpersonal/group channels with positive characteristics. Whether these findings are unique to the context of chronic illness requires more research on health information scanning.

Second, channel characteristics also play a mediating role. Our findings show that perceived severity of chronic illness and its complications and efficacy belief indirectly influence the use of interpersonal/group channels for scanning health information via the perceptions of channel characteristics and channel utility. Moreover, the effects of worry and efficacy belief on the use of the Internet-related channels for health information scanning are indirect via the perceptions of channel characteristics and channel utility. Although the indirect effects of channel characteristics were small, our findings show its potential to mediate the effect of antecedent factors on health information scanning. Future research should explore the mediating role of channel characteristics in the CMIS framework.

The findings of this study show that experience has no direct effect on channel utility and health information scanning behavior across the three-channel categories. One possible reason is the attitude toward chronic illness. A chronic illness study showed that people with mild or diffuse symptoms have the tendency to misattribute their symptoms as part of the aging process (Newsom et al., 2012). That is, some people may consider having a chronic illness is an inevitable consequence of aging and part of life. Therefore, experience may not be a motivator for health information scanning in the context of chronic illness prevention and care.

In addition to examine the applicability of the CMIS to information scanning in the context of chronic illness prevention and care, this study also explored the peculiarities of different types of channels through people's selection and use of health information scanning. A major theoretical strength of the CMIS is its explanatory power on why individuals differentially select and use information channels (Johnson & Case, 2012). By examining the specific variables under each antecedent factor, this study affords to delineate the nuanced influence of the sociopsychological factors that shape people's choice of channel category and their use of scanning health information related to chronic illness. The findings show that the selection and use of the three channel categories is varied by different socio-psychological conditions. Specifically, in the case of interpersonal/group channels, older people and subsidy recipients or insurance policy holders are more likely to pay more attention to the information delivered by interpersonal/group channels. People who perceive the severity of chronic illness and its complications as more severe and who are more worried about chronic illness and its complications are more likely to perceive that interpersonal/group channels possess positive characteristics. Highly efficacious individuals are more likely to perceive interpersonal/group channels as more useful and relevant; whereas people who perceive more drawbacks of regular checkups are less likely to find interpersonal/group channels useful and relevant. These findings suggest how some of the distinctive features of interpersonal/group channels may fulfill people's chronic illness-related information needs. For example, interpersonal/group channels, such as physicians and medical professionals, are authoritative sources of health information; therefore, older adults are likely to pay more attention to this channel category (Chaudhuri et al., 2013). Furthermore, interpersonal/group channels have the advantage of effectively providing information to more tailored individual questions and more situation specific issues, and offering immediate feedback (e.g., Johnson & Case, 2012). Therefore, paying more attention to insurance agents and social workers during consultation, for example, may resolve subsidy recipients' or insurance policyholders' concerns. Moreover, interpersonal/group channels are seen as advantageous in conveying complex and serious information (e.g., Johnson & Case, 2012). Therefore, worried individuals, highly efficacious individuals, and people who have concerns over the severity of a chronic illness, for example, may find information delivered by physicians, nurses, and peer patients as useful and relevant, and to possess positive content characteristics (e.g., understandable, clearly presented, and accurate) that are useful and relevant.

In the case of the Internet-related channels, younger people and subsidy recipients or insurance policyholders are more likely to pay more attention to chronic illness-related information from this channel category. Worried and highly efficacious individuals are more likely to engage in health information scanning on the Internet. Furthermore, the more people perceive the benefits of regular checkups, the more likely they consider the Internet-related channels useful and relevant. These findings also suggest how unique features of the Internet-related channels may satisfy people's information needs. For example, younger adults' choice of Internet-related channels for information scanning behavior is consistent with young generation's preference of media use (e.g., C&SD, 2020). The Internet, as an omnibus channel, not only provides a more detailed as well as a variety of sources for factual information but it also enables users to virtually connect to others with similar encounters. As a result, worried and highly efficacious individuals may pay more attention to chronic illness-related information that concern them the most while surfing on the Internet or reading online comments on the social media. Similarly, people who perceive the benefits of regular checkups are likely to find the Internet-related channels useful and relevant because there is more detailed and diverse factual information related to physical checkups and its experiential information from people on the Internet.

Regarding the traditional media channels, older adults and highly efficacious individuals perceive information delivered by traditional media channels as useful and relevant to chronic illness prevention and care. People who perceive regular checkups as more beneficial are likely to scan information from the traditional media channels; whereas people who perceive more drawbacks for regular checkups are less likely to find the traditional media channels useful and relevant. These findings suggest that older adults' choice of traditional media channels for information scanning fit well into older generation's media use preference (Nimrod, 2017). Traditional media is seen as providing general information quickly to a large audience (e.g., Johnson & Case, 2012). Therefore, people who are more confident in their ability to maintain a healthy status and who perceive regular checkups as more beneficial are likely to find traditional media useful for staying on top of new information related to physical checkups or chronic illness prevention and care.

Finally, from the findings, we observed that people are not limited to one channel category for scanning health information; the three-channel categories may function complementarily to satisfy their information needs (Dutta-Bergman, 2004). For example, highly efficacious individuals made use all three channel categories for information scanning, and worried individuals made use of the Internet-related and interpersonal/group channels. People are likely to have multiple information needs such as getting new updates on chronic illness and concerns over illness/situation specific issues. Therefore, they take advantage of the unique features of each channel category to satisfy their needs.

CONCLUSION AND POLICY IMPLICATIONS

The prevention and managment of chronic illness and its complications requires that people continuously self-monitor and self-manage their health conditions throughout their lives. Staying on top of relevant chronic illness prevention and care information is essential to effectively manage and prevent chronic illness and its complications. One theoretical contribution of this study is extending the application of the CMIS framework to examine the process of how people engage in health information scanning in the context of chronic illness prevention and care. The results of this study generally show that the CMIS is applicable to the chronic illness context, which advances our understanding of health information scanning behavior in this underexplored health context. Another theoretical contribution of this study is the insights it offers regarding people's selection and use of the three different channel categories for health information scanning. Findings reveal which antecedent factors potentially determine people's predispositions to scan chronic illness information from interpersonal/group, Internet-related, and traditional media channels. By understanding the imperatives of health information scanning behavior, we can formulate evidence-based information dissemination and message design strategies to effectively communicate chronic illness preventive and care messages through people's routine use of information channels. Based on the findings, we make two sets of recommendations for policymakers and health professionals.

One recommendation is to improve information dissemination strategies to reach out to target audiences for promoting chronic illness prevention and care. The findings reveal a relationship between age and health information scanning across the three-channel categories. To reach older adults, chronic illness-related information should be placed on interpersonal/group and traditional media channels. To reach younger adults, that information should be placed on the Internet-related channels. To reach people who have health insurance or who get a government subsidy, chronic illness-related information would be more appropriate on the interpersonal/group and the Internet-related channels. Furthermore, our findings indicate that worry is a significant predictor. To reach people who are worried about preventing and managing chronic illness and its complications, chronic illness-related information should be placed on the Internet-related and the interpersonal/group channels.

Another policy implication is the message design of chronic illness prevention and care promotion. Our study shows that when deciding to attend to health information, people weigh heavily on the usefulness and relevance of information delivered by an information channel. The editorial tone and communication potentials of the message content are key determinants of people's perception of the usefulness and relevance of an information channel. Therefore, when designing chronic illness-related messages, it is essential for health professionals to understand what the target audience perceives as valuable, useful, and relevant information for them. For example, our findings show that people who perceive more drawbacks for regular body checkups are less likely to find useful and relevant information delivered by traditional media channels and interpersonal/group channels. The chronic illness literature also shows regular body checkups are an important determinant for chronic illness prevention and care (Chien et al., 2020). To better clarify the misperceptions of regular body checkup drawbacks for target audiences, we suggest that health professionals design mythbusting messages and place them on traditional media channels and interpersonal/group channels. Moreover, given the positive influence of perceived benefits, in the case of traditional media channels, health professionals can design messages to emphasize the benefits of regular body checkups to manage chronic illness, and to place those messages on traditional media channels. Another example is related to the findings of efficacy beliefs. Given the positive influence of efficacy beliefs on channel utility and health information scanning, we suggest that health professionals can design messages to build confidence in maintaining a healthy status. To do so, health professionals can provide specific steps on how to maintain a healthy status; in addition, they can emphasize that their target audience is capable to achieve a healthy status, if they follow the guidelines. Finally, during their interaction with the target audience, medical professionals could also discuss the consequences of chronic illnesses and their complications.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, the interpretation of the findings is restricted to the sample, which cannot be generalized to the entire Hong Kong population. Using the online panel, we collected the data based on a nonrandom sampling procedure. Still, based on the 2016 By-census data, we employed a quota sampling to match with Hong Kong's demographic characteristics (e.g., gender and age). Therefore, the results of our study can provide useful insights to address the public health challenge of chronic illness by engaging people to acquire health information during their routine patterns of exposure to information channels. Future research can improve the external validity by using the representative sampling procedure.

Another limitation is the underrepresentation of the elderly. Although our team and the research firm made the best effort to recruit participants aged 50 or above, the percentage of this age cohort in our sample did not match the percentage in the By-census. Because of the increasing number of young adults with chronic illnesses, our findings can be useful in designing communication campaigns that would engage them in chronic illness prevention and management. Moreover, during the next decade, as younger age groups get older, our study can assist policymakers to formulate immediate action on communication campaign designs that would serve to alleviate the problem of chronic illnesses.

The single-item measure of some concepts, such as worry, efficacy belief, perceived susceptibility, and severity, is a limitation of this study. which is part of the international studies to investigate the global health information trends (INSIGHTS) research program. To maintain consistency in the questionnaire design across different countries and with previous studies, we adopted those single-item measures from the original health information national trends survey for future potential comparison. Future research should develop multiple items to measure those concepts. Finally, the channel categorization is a limitation in this study. Although the categorization of interpersonal/group channels, the Internet-related channels, and traditional media channels is based on evidence in the literature, consistency across CMIS studies, and practical implication for campaign planners, our categorization is one of many ways to classify information channels. For example, some CMIS researchers categorized information channels based on channel function and usage (e.g., Ruppel, 2016). To shed additional insight on the use of different information channels for scanning information related to chronic illness prevention and care, future research can employ a different way to categorize information channels.

To further advance the knowledge in information scanning, future research can examine specific chronic illnesses such as hypertension and heart disease. This will give a more nuanced understanding of scanning behavior for chronic illness-related information. Future research would benefit to examine how preventive behavior and treatment adherence link to information scanning, which would provide a better understanding of the effect of information scanning on behavior. Moreover, to better understand the nuanced differences between information scanning and seeking behavior, future research can examine these two concepts simultaneously to compare the differences in the factors that predict the two behaviors. Finally, to examine health information scanning behavior, researchers can employ different theoretical frameworks, such as the planned risk information seeking model (Kahlor, 2010), in their future research. Such endeavors can offer additional insights on the process that influences information scanning behavior.

ACKNOWLEDGMENTS

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ETHICS STATEMENT

Ethical approval was obtained from Hong Kong Baptist University Research Ethics Committee (REC/20-21/0077) and all participants provided informed consent before data collection.

NOTE

[1] The model fit guidelines (Holbert & Stephenson, 2002; Hu & Bentler, 1995) suggest that a value of the root mean square error of approximation (RMSEA) below 0.06 indicates a good fit, and a value less than or equal to 0.08 is considered an adequate fit with the upper bound of the 90% RMSEA confidence interval less than 0.10. A value of comparative fit index greater than 0.90 suggests an adequate fit, and a value greater than 0.95 deems a good fit. The value of a standardized root mean squared residual of less than 0.08 would be acceptable. A nonsignificant chi-square distributed test statistic is a good fit; however, this statistic is sensitive to sample size (Hu & Bentler, 1995). Thus, χ^2/degrees of freedom was reported, and a value less than five is considered a good fit (Kline, 2005).

AUTHOR BIOGRAPHIES

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COMMENTARY

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Ensuring equity in access to online courses: Perspectives from the WHO health emergency learning response

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Abstract

The World Health Organization's (WHO) open-source learning platform, OpenWHO, allows diverse audiences worldwide to access self-paced, asynchronous online courses based on WHO technical expertise and guidance. In addition, the platform emphasizes equitable access to learning by aiming to remove barriers. All OpenWHO courses are therefore provided free of charge and in low-bandwidth friendly, downloadable, and offline formats. This paper explores differences in access to online learning across learner demographics, namely gender, country income status, and preferred language. The evidence presented is derived from surveys and statistical data extracted from the OpenWHO platform. It advocates for the importance of offering courses in non-time-bound formats that address the relevant diseases, outbreaks, and challenges of affected communities. Doing so is vital to ensure the broadest possible and most equitable access to learning, according to learners' availability and preferred media, languages, and health topics.

KEYWORDS

COVID-19 pandemic, equity, online learning, OpenWHO, public health

Key points

- Online learning can provide opportunity for inclusion and equity in education if adequately designed.

- OpenWHO has contributed to delivering critical learning during the pandemic and bolstering equity in learning. This has been achieved by providing formats that facilitate the attendance of women and all audiences, namely self-paced, low-bandwidth, and free-of-cost learning on topics of particular importance to low-income countries.
- Overall, OpenWHO courses and topics attract different audiences, but vital attempts are made to ensure equity in access to all learning.
- A consistent and effective push for equitable access to evidence-based public health and health emergency knowledge requires several axes: multilingualism, gender sensitivity, and meeting the requirements of low-income countries and communities affected by disease outbreaks.
- Barriers to learning can be bridged through multilingual course production, the inclusion of materials with language simplified for lay audiences and development of formats suited to those with hearing or vision impairments.

INTRODUCTION

Challenges to learning accessibility include gender inequality in education, poor knowledge of available learning in target audiences, infrastructure unavailability (such as with regard to internet, digital devices, workspace) and unaffordability of learning materials; these factors can prevent learners from freely accessing the highest-quality evidence-based, up-to-date courses (Barteit et al., 2020). Therefore, effective and affordable education strategies addressing these critical obstacles are required to ensure the quality and reach of learning courses. Furthermore, equitable access to online learning during an emergency, specifically during a pandemic, is critical to controlling the spread of the disease, particularly in areas with limited health budgets, an insufficient number of qualified health workers, minimal training facilities and a lack of continuing professional development (Al-Shorbaji et al., 2015). Thus, if properly designed and developed, online education can be of significant benefit, bypassing several of the aforementioned challenges. In addition, the forced and rapid shift toward online learning due to the pandemic could provide an opportunity for equity "consideration" in education, a sector in which inequality is persistent.

With this in mind, the OpenWHO platform was established in 2017 to focus on equity, accessibility, reach, flexibility, a "learning with speed" approach, utilizing only evidence-based, reliable information (Utunen, Ndiaye, et al., 2020). It has its beginnings in the lessons learnt from the Ebola Virus Disease outbreak of West Africa (2014), where WHO oversaw the international training response and quickly realized the centrality of real-time training on a massive scale. The platform was set up to provide free, easily accessible learning targeted at frontline workers in health emergencies, particularly those in low and middle-income countries. Other barriers were addressed by offering low-bandwidth and offline versions using the OpenWHO mobile application. Accessibility and uptake were prioritized by providing learning in an ever-growing number of languages (more than 50 languages when writing this article). Quality learning was guaranteed by applying adult learning science to the design and delivery of courses. The accuracy and trustworthiness of materials were spotlighted by the fact that the content of all courses would rely on evidence-based WHO guidance approved by WHO experts. Furthermore, mechanisms were put in place to regularly update course content whenever new or updated scientific evidence became available. These intrinsic characteristics of OpenWHO courses aimed to ensure an impactful and equitable life-long learning experience in an ever-changing world dynamic.

Learning and education are among the sectors principally disrupted by the COVID-19 pandemic (d'Orville, 2020). Although social distancing measures abruptly and significantly hindered face-to-face learning, online learning has fortunately constituted a panacea to the pandemic's unexpected effect on education (Dhawan, 2020). In January 2020, the Learning and Capacity Development Unit (LCD), which manages OpenWHO, began expediting the publication of courses on COVID-19 as soon as relevant evidence-based science became available. The free, open-source, mobile-friendly and low-bandwidth-adjusted COVID-19 courses have stimulated the platform's growing use by an increasingly geographically, demographically, and linguistically diverse audience. These first-time uses of the platform emerged from every point on the professional spectrum and joined OpenWHO's traditional target audiences: health workers, and frontline responders. OpenWHO's COVID-19 courses supported learners in embarking upon a self-paced, asynchronous learning journey with the ultimate goal of managing the COVID-19 pandemic and its impact on their professional and personal lives (Utunen, Attias, et al., 2020).

This paper reflects on the factors that impacted equity in access to life-saving knowledge during WHO's learning response to health emergencies, including the COVID-19 pandemic. It proposes necessary elements for ensuring equity during any health emergency.

METHODS, DATA, AND RESULTS

The results presented in this paper were analysed using OpenWHO users' self-reported preferred languages and automatically generated data on course uptake in low-income countries. The data were drawn from OpenWHO's built-in reporting system, which tracks learners' enrolments, completion rates, demographics, and other course-related data. In addition, data on the intersection between gender and learning were collected via a survey distributed in recognition of International Women's Day (IWD) March 2021 on OpenWHO. The survey invited responses detailing the challenges women face concerning learning during an emergency and how web-based learning materials have been used to address gender-related gaps in access to knowledge.

TRANSLATION AND MULTILINGUALISM

OpenWHO learners' language preferences

OpenWHO users have been found to reliably indicate at sign-up their preferred language for accessing learning, highlighting the importance of collecting such data to be utilized in creating production strategies. When OpenWHO users register on the platform for the first time, they are asked to indicate their preferred language. However, they are then free to enroll in courses of any language available on the platform. The platform's course uptake data suggest that the language breakdown of preferred languages at sign-up is similar to the language breakdown of course activity. For instance, 71.82% of users select English as their preferred language; of the COVID-19 courses, 74.20% of total enrolments occur on the English courses. Similar findings have been observed for the other United Nations (UN) languages and Portuguese (Table 1).

Languages spoken in low and middle-income countries

In pursuit of equitable access, LCD made the conscious decision to translate COVID-19 courses into as many languages as possible, with particular attention paid to the languages

TABLE 1 OpenWHO users' indicated UN language preference and the use of COVID-19 courses in UN languages

Language	Rank	Language preference indicated by learners	COVID-19 course language use	Rank
English	1	71.82%	74.20%	1
Spanish	2	21.08%	14.40%	2
Arabic	3	2.76%	1.50%	5
French	4	1.70%	2.40%	3
Portuguese	5	1.49%	1.70%	4
Chinese	6	0.86%	0.40%	7
Russian	7	0.25%	0.60%	6

spoken by vulnerable or underserved populations, such as those in low and middle-income countries. In this way, as many learners as possible would be able to access learning in their preferred languages, which has been proven to enhance learning uptake and retention (A. A. Nwokediuko, 2012; Watkins et al., 2012).

As of May 2021, OpenWHO's COVID-19 courses are offered in 53 languages, including the official languages of every WHO region, the 15 most commonly spoken languages worldwide and the official languages of 42 out of 46 of the United Nations Conference on Trade and Development's (UNCTAD) least-developed countries—with translation underway for 2 out of the four missing languages. OpenWHO's COVID-19 courses are also available in Indian Sign Language and Mongolian Sign Language to accommodate the country-specific needs of people with hearing loss. Languages other than the UN languages and Portuguese account for 6.50% (approximately 300,000) of the total enrolments on the platform. Of these languages, Indian sign language, Hindi, Indonesian and Italian are the most popular.

Gender

OpenWHO's IWD survey (disseminated in March 2021) received 365 responses, 67.00% of which were from women. More than half of respondents were healthcare professionals (35.00%) or students (20.00%). Respondents were most commonly based in India (32.00%), Nigeria (6.00%), Pakistan (6.00%), Bangladesh (3.00%), and Kenya (3.00%).

The survey illustrated that women are more likely than men to find time and cost to be challenges that hinder learning accessibility. For women, time was listed as the main barrier to accessing learning (44.00%), followed by cost (26.00%). Although men also found time to be the greatest hindrance (27.00%), this was followed by access to digital technology (20.00%) and language (17.00%) (Table 2).

TABLE 2 Gender-disaggregated responses to the survey question "What are the challenges that hinder you from accessing knowledge, training or education?"

Challenges								
	Time	Digital access	Cost	Biases against my profession	Language	Material is not suitable for learning	Not knowing where to access new knowledge or training	Gender
Men	27%	20%	19%	2%	17%	7%	6%	1%
Women	44%	6%	26%	2%	6%	1%	9%	3%

Meeting outbreak-specific needs in different locations

OpenWHO data illustrate that disease-specific courses are used most in the locations where these diseases are prevalent. The cholera outbreaks of 2018 are a clear example of this phenomenon. For instance, in one affected country, Zambia, the introduction to cholera course was the most popular course during the outbreak. During this period, the course generated 8.95% of all OpenWHO course enrolments in the country. A similar example can be found in Zimbabwe, another country hard-hit by the outbreak, in which 11.75% of enrolments in the country occurred on the introduction to cholera course.

Similarly, during the 2017 diphtheria outbreak in Yemen, the country accounted for 58.33% of all diphtheria course enrolments from low-income countries. The same applies to a diphtheria outbreak that occurred during the Rohingya refugee crisis; at that time, the diphtheria course was the most popular course in Bangladesh, accounting for 26.35% of all course enrolments. Furthermore, during the 2017–2018 Crimean-Congo hemorrhagic fever outbreak in Uganda, 21.64% of enrolments to the hemorrhagic fever course (from all low-income countries combined) were from Uganda.

The training on detection, prevention, and control of the Middle East respiratory syndrome (MERS) attracts 35.90% of its enrolments from the WHO Mediterranean region. Saudi Arabia, where the outbreak started, accounts for 23.08% of total course enrolments.

During outbreaks of Ebola virus disease in the Democratic Republic of Congo (DRC) and neighboring countries, the Ebola ePROTECT course was the most popular, accounting for 17.20% of all enrolments (regardless of course) from the DRC at the time. The Ebola ePROTECT course was also the most popular in neighboring countries, such as Tanzania (where it accounted for 9.38% of any course enrolments in the country), Uganda (6.17%), Rwanda (28.26%), andSouth Sudan (53.55%).

The breadth of health-related topics covered by OpenWHO courses critically reflects the burden of specific diseases and outbreaks in different countries.

Differences in courses used in low-, middle-, and high-income countries

OpenWHO data illustrate that online courses are used differently according to a country's income level (based on the World Bank classification). When examining the use of different courses in December 2019 in low-income, middle-income, and high-income countries, the link between country income level and patterns of course use is evident. For example, in low-income countries, the top 15 courses include three Ebola courses and two cholera courses (Figure 1). Conversely, the antimicrobial resistance course is the most popular in middle and high-income countries (Figures 2 and Figure 3), and yet takes 8th place in low-income countries.

The figures illustrate that in low-income countries, courses on epidemic-prone diseases are generally more popular than non-disease-specific emergency intervention courses. Also, unlike low-income countries, middle and high-income countries have witnessed the highest enrolments on several influenza-related courses, though these courses have low enrolments in low-income countries. Interestingly, courses on generic emergency interventions and operational skills are equally popular in all income classification groups. Some of these topics, such as WHO's Incident Management System (IMS), simulation exercise management and operational readiness, place among the top 15 in high, middle, and low-income countries and, overall, are some of the most popular courses on the platform.

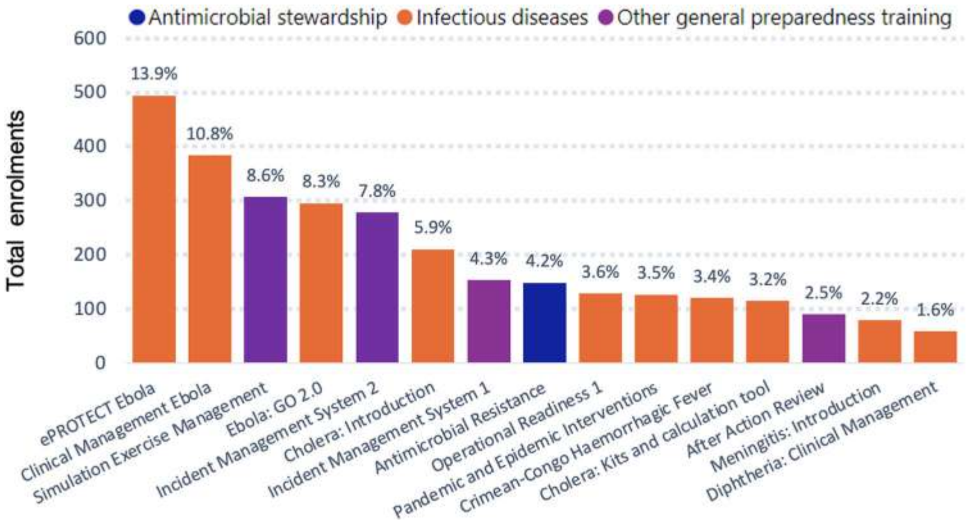

FIGURE 1 Top OpenWHO courses completed by learners in low-income countries

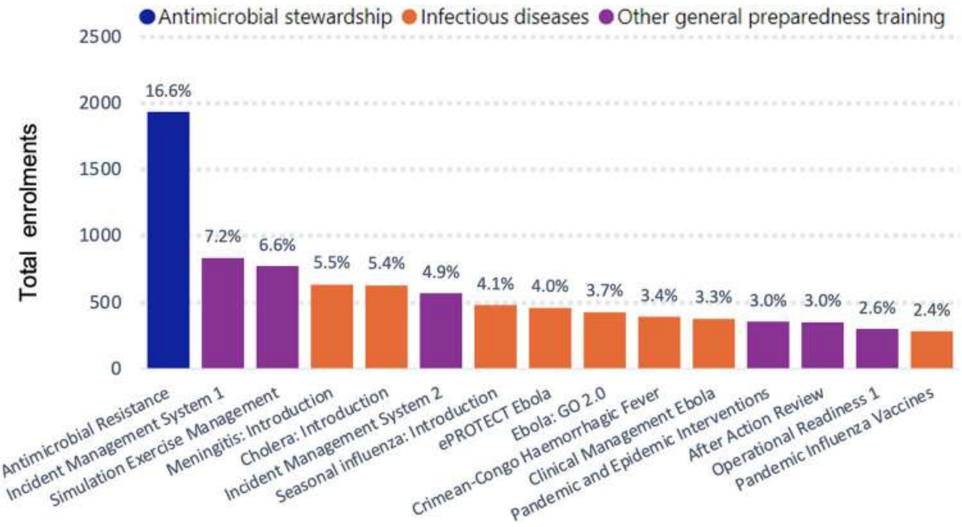

FIGURE 2 Top OpenWHO courses completed by learners in middle-income countries

DISCUSSION AND INSIGHTS

Overall, existing literature widely discusses the need to recognize gender as a determinant of health, but also as a factor that may influence effective receipt of communication, access to information and knowledge amongst healthcare professionals, students, and patients (Boniol et al., 2019; Brown et al., 2020; Bylund & Makoul, 2002; Samuriwo et al., 2020; Sharma et al., 2020; Verdonk et al., 2009; Westerståhl & Björkelund, 2003; Zelek, Phillips, & Lefebvre, 1997). Even though women represent around 70.00% of workers in the health and social sector globally, an average gender pay gap of approximately 28.00% exists in the health workforce (Boniol et al., 2019). This could be attributed to limited time, as women are more likely to be assigned "domestic responsibilities" (e.g., adopting a lighter work schedule to

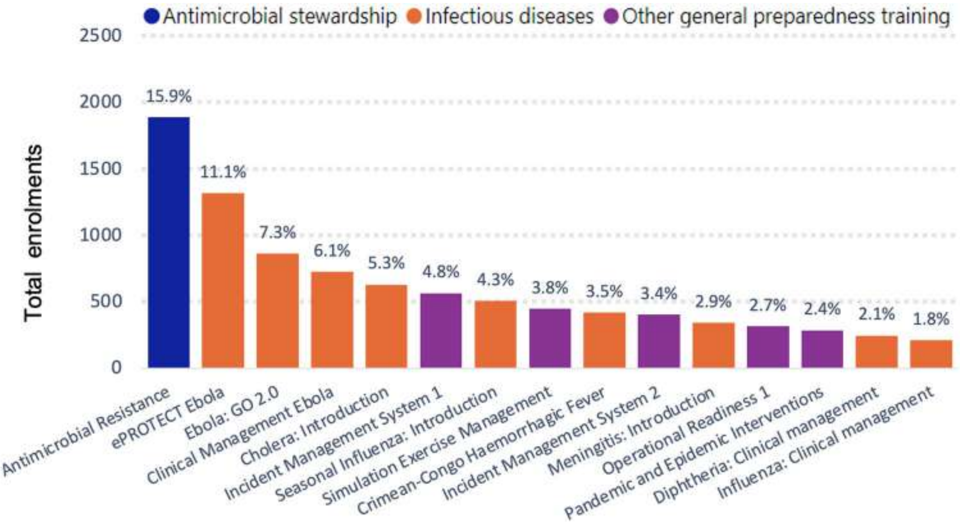

FIGURE 3 Top OpenWHO courses completed by learners from high-income countries

care for young children) (Jena et al., 2016). Women occupy lower status in the health and social sectors, receive lower pay, and constitute fewer than 25.00% of leadership roles. Thus, a phenomenon of maternal bias (which dictates that mothers prioritize responsibilities within the home and work fewer hours —particularly women with children) results in women being routinely pushed to the margins of the professional world. Thus, maternal bias should be considered concerning women's career pathways, progression, and education (Brown et al., 2020; Williams et al., 2014). Further, OpenWHO's IWD survey suggests women lack the time needed to attend online training but indicate that its growth in popularity has made it easier for them to access education.

Language is a well-documented barrier for patients accessing healthcare services or seeking health-related information. This is particularly true for those accessing knowledge in a language other than their native tongue or for people with limited language proficiency, such as migrants, refugees, people with hearing or visual impairments, as well as people with limited literacy, including digital literacy (Abraham et al., 2005; Burkardt et al., 2019; Fernández-Díaz et al., 2020; Rocio Garcia-Retamero & Dhami; Garcia-Retamero & Dhami, 2011; Jaeger et al., 2019; Kefalides, 1999; Martins et al., 2015; Nwokediuko, 2012; Sadoughi et al., 2020; Schlemmer & Mash, 2006; Schyve, 2007; Watkins et al., 2012). In light of this, Nwokediuko et al. called for global recognition of native languages in e-learning to enhance knowledge transfer across various communities (Nwokediuko, 2012).

LCD has consistently pursued equitable access to evidence-based public health and health emergency knowledge. This has occurred along several axes: multilingualism, gender sensitivity, and meeting the requirements of low-income countries and communities affected by disease outbreaks. As a result, the OpenWHO.org platform is ever-expanding and evolving, conceived with a dynamic and adaptable structure in mind that is necessary to accommodate global needs and changes. This has been evidenced during the pandemic, as OpenWHO witnessed an exponential increase in enrolments to the platform, from less than 200,000 in December 2019 to 5.3 million by mid-2021. The increase in enrolments has been abetted by the addition of 33 COVID-19 related courses. However, like any other online learning platform, some limitations and challenges arose.

Online learning can provide an opportunity for inclusion and equity in education if adequately designed. Concerning gender-based inequity, women, who often lack access to education (UNESCO, institute for statistics, 2021) and constitute up to 70.00% of the global health and social care workforce, are commonly unpaid or underpaid (Brown et al., 2020). Fortunately, however, they have been able to benefit from courses placed on the OpenWHO platform. In fact, before the COVID19 pandemic, only 40.30% of OpenWHO's users were female. During the pandemic, this increased to 50.30%. In addition, because women and men show little to no difference in terms of their preferences or behaviors concerning utilizing web-based education (Cuadrado-García et al., 2010; Ramírez-Correa et al., 2015), gender inequity in access to online education can be instead attributed to factors such as time and cost, as illustrated by OpenWHO's IWD survey. As such, gender inequality cannot simply be explained due to the innate characteristics of e-learning. These findings confirm the validity of WHO's efforts to design the OpenWHO platform such that it is freely available, consisting of self-paced, asynchronous courses that are convenient and malleable to the varying needs and priorities of women and men.

Low-income populations are most affected by risk factors known to directly impact health, such as poverty, unsafe water, poor sanitation, and hygiene, among other traditional health risks (Stronks et al., 1998). As a result, low-income countries bear a more significant share of the global burden of disease, with immunization levels still falling short of the targets needed to prevent the endemic prevalence of many infectious diseases (Binagwaho et al., 2021; Nhamo et al., 2021). In addition to modern risks, including lack of physical activity, obesity and other dietary factors, and tobacco and alcohol risks, middle-income countries also bear the burden of infectious diseases, not having overcome the battle with other health risk factors. (Ref: WHO Global Health Risks report: Introduction). However, on a positive note, studies showed that effective and well-designed e-learning interventions have significant potential benefits for low and middle-income countries (LMICs) (Barteit et al., 2020), which in turn will help alleviate the management of diseases through knowledge transfer and education. Studies examining observed differences in the course topics used across LMIC and HIC are needed.

CONCLUSIONS AND POLICY IMPLICATIONS

OpenWHO has been able to produce evidence-based learning in real-time, at scale and in multiple languages. These actions are an intervention against the COVID-19 pandemic and seek to lift barriers to learning; they have led to a significant increase in the platform's popularity for accessing life-saving knowledge and know-how during the pandemic. OpenWHO has thus contributed to delivering critical learning during the pandemic while defending equity in learning. This has in part been achieved by increasing and facilitating the attendance of women and other underserved audiences by providing self-paced, low-bandwidth, and free-of-cost learning on topics relevant, for example, in low-income countries. Overall, OpenWHO courses attract a variety of audiences, with vital attempts made to ensure equitable access across each.

Relevance to medical and health policy

Particularly at the beginning of the pandemic, when the prime objective was to expedite the production and transfer of life-saving knowledge to the masses, self-paced learning on its own was deemed sufficient to meet WHO's aims. However, the much-anticipated return to normalcy remains some what distant. Therefore, adding to the self-paced course provision on OpenWHO, the LCD unit has begun transforming its typical face-to-face training program into virtual classes, learning labs, online simulation exercises, and skill drills. This will allow for more in-depth learning and the transfer of skills and attitudes, in addition to knowledge sharing. Thus, while online learning is sufficient for immediate knowledge transfer and often acts as the first step in a learning pathway, additional methods and tools can engender improved learning outcomes.

Medical and health policymakers must acknowledge the need for equity in access to learning, no matter the audience. This must be planned for at the onset of designing any learning resources. There is undeniably a link between access to health-related learning and a relevant, rewarding and impactful lifelong learning journey for the global health workforce, in pursuit of the common goals of universal access to health and health for all.

Policy implication

These findings shed light on the actions needed to provide impactful and equitable health-related learning interventions for global audiences, including concerning course content, format, media, and language. This scientifically-based knowledge transfer needs to be established by organizations mandated to respond to any public health threat in a fast and scalable way. As such, equitable learning in health must be seen as a global public good.

As public health agencies, it is critical to push beyond knowledge transfer to measure learners' skills and competencies gained from online courses. In addition, it is imperative to have some level of certainty that learners who complete online, self-paced courses can apply that knowledge in real-life situations.

Finally, evaluating the reach, efficacy, and impact of e-learning will continue to grow in importance as the pandemic persists, particularly for public health professionals working on health emergency learning response in the UN system.

Future research

Future research should address and expand on questions such as:

1. What effect does the “multiplier effect” (whereby local actors disseminate OpenWHO course materials in offline formats in hard-to-reach areas) have on equitable access to learning? How are these materials adapted to suit local and national contexts?
2. How are disease-specific learning materials utilized in different contexts, according to local disease burden? What are the learning needs of communities in outbreak-affected areas?
3. How can the impact of self-paced, online learning on equity be more accurately and comprehensively measured? How can online learning become more interactive, to facilitate competency-based, virtual learning that targets the equitable acquisition of knowledge, skills, and attitudes?
4. What are the steps required for public health organizations and other learning providers to implement improved equity in access to learning?

Limitations and bias

This paper is subject to some limitations. First, the results presented by the article should be considered in light of the descriptive nature of the analysis conducted. Apart from location-related data, the paper relies on self-reported data, which may be subject to participation bias.

Finally, the authors of the paper are affiliated with WHO's Learning and Capacity Development Unit. However, the margin for bias was mitigated by the pivotal role of automatically generated data on OpenWHO's learners to drive this study's results. As such, the authors aim to lean not only on subjective judgements alone.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

OpenWHO data referred to were collected in line with the OpenWHO Terms of Use, which every enrolled user accepts. All OpenWHO users agree to the following statement which was provided by the WHO Legal Department "Records of your participation in OpenWHO courses may be used for education research. In the interest of this study, you may be exposed to variations in the course content. Research findings will typically be reported at the aggregate level. Your personal identity will not be publicly disclosed in any research findings without your express consent." The nature of this study is non-invasive.

AUTHOR BIOGRAPHIES

Richelle George is a Learning Officer in the Learning and Capacity Development Unit (LCD) of WHO's Health Emergencies Programme, and has worked for LCD since 2018. She is the thematic area lead for learning-related innovation and online tools, collaborating with WHO partners and stakeholders to discover, develop and deploy tools and initiate strategic partnerships to improve equity, uptake, and engagement among LCD's millions of learners. During the COVID-19 pandemic, Richelle also project managed the production and translation of hundreds of online courses for OpenWHO's COVID-19 response, working with dozens of experts, learning producers and national focal points in every WHO region around the world. Miss George was born and raised on the island of Saint Lucia. She completed an undergraduate degree at Trinity College, University of Cambridge, reading Human, Social and Political Sciences, with a focus on social and medical anthropology. She later returned to Trinity College Cambridge to complete a master's degree in Epidemiology; her thesis used statistical methods and nationally representative datasets to quantify inequalities in access to health services among older people in England during the COVID-19 pandemic. Prior to joining WHO, Miss George has worked on public health community engagement programmes for low-income women in New Delhi, intergovernmental fundraising and resource mobilization in the Eastern Caribbean, and public health consulting for a firm with projects in Mozambique, the Democratic Republic of the Congo and Pakistan. Richelle's interests include the social determinants of health, health equity in emergency response and the use of innovative approaches and tools for problem-solving.

Heini Utunen is Acting Head of Unit of the Learning and Capacity Development Unit of the World Health Organization's Health Emergencies Programme, a unit that was established in 2018 and in which she has worked since the beginning establishing the area of knowledge transfer for infectious diseases and health emergencies. Her functions and experience cover workforce capacity building, learning solutions and simulation exercise management. During the COVID-19 pandemic she has led the COVID-19 online learning response delivering massive scale learning interventions on OpenWHO.org based on WHO's technical evidence-based guidance, learning resources now reaching 6 million enrolments. Ms. Utunen joined the WHO during the Ebola West Africa outbreak in 2014 and led the pre-deployment trainings, and provided to the cascade training curriculum development, face-to-face trainings, and e-learnings. During 2016–2018 her functions covered country capacity building and simulation exercises for the novel area of risk communications in the Pandemic Influenza Preparedness. During 2009–2013 Ms. Utunen worked in the United Nations country team in Vietnam, in natural disaster preparedness and response and the humanitarian cluster system, where she functioned as the Food Security Cluster Coordinator. Ms. Utunen has prior experience in the government of Finland where she served as Communication Officer of the Minister of Health in Finland. She functioned also a Training Officer at the Crisis Management Centre, mainly involved in the capacity building of the European Union, African Union, and United Nations in several post-conflict missions. Ms. Utunen has Master's degree in Information Studies and Bachelor in Political Science and she is writing her PhD dissertation in the Information and Communication Technologies. She has the Principal's qualification in Finland.

Ngouille Ndiaye is a public health professional currently working as a consultant for the Learning and Capacity Development Unit (LCD) of the WHO Health Emergencies Programme. She previously worked for LCD as an intern in 2019 to study the topic of community-based learning in the context of emergencies and to characterize the scope and use case of the OpenWHO learning platform presented to management. Ngouille re-joined LCD to support the digital learning response to the new coronavirus outbreak. She has continued to strengthen the data analysis area of OpenWHO's massive work, also contributing to the documentation of WHO's online response to the pandemic via the OpenWHO learning platform through numerous research projects and publications that characterize the ever-growing global audience. Ms. Ngouille has a strong background in biomedical sciences and research, with a Bachelor's degree from the University of Montreal. She also holds a Master's degree in Public Health, specialized in global health, from the School of Public Health at the same university, hence her strong interest in evidence-based science that contributes to reducing health inequalities and ensuring equal access to health. Prior to working at WHO, she led a process evaluation study on diabetes mellitus in low socioeconomic settings in South Africa. She has also worked on the issue of malnutrition in Senegal and on access to health for migrants in Canada. Ngouille is passionate about equity and equal access to health, art, travel, and cultural discovery.

Anna Tokar was born in Poltava, Ukraine, where she completed secondary school. In 2008 year, Anna obtained a Bachelor's degree in Biology, from the National University of “Kyiv-Mohyla Academy,” Kyiv, Ukraine. Then, she continued her studies, and in 2010 year, Anna received a Joint Master's degree in Public Health and Health Care Management, from Maastricht University, Maastricht, The Netherlands and School of Public Health, the National University of “Kyiv-Mohyla Academy,” Kyiv, Ukraine. For almost six years Anna worked at the International Charitable Foundation “International HIV/AIDS Alliance in Ukraine,” where she gained experience in development and implementation of the interventions targeting sex workers, drug users, and men who have sex with men. In 2013 year, Anna started her academic carrier as a senior lecturer at the School of Public Health, the National University of “Kyiv-Mohyla Academy,” Kyiv, Ukraine. In 2015, Anna was awarded the TransGlobal PhD fellowship, funded by the European Commission and launched her own research focusing on access to health care services among migrant female sex workers (FSWs) from Eastern European (EE), non-European Union (non-EU) countries in Amsterdam. In 2020, she was awarded PhD degree, Cum Laude. In 2020 Anna has joined as a consultant the OpenWHO, Learning & Capacity Development Unit, WHO Health Emergencies Programme. Anna continues to work as an independent consultant in close collaboration with different organizations. In this capacity, she has assembled a portfolio of implementation work in Azerbaijan, Georgia, the Netherlands, Mozambique, the Russian Federation, Spain, Ukraine, and Uzbekistan.

Lama Mattar is a consultant in the Learning and Capacity Development Unit (LCD) in WHO's Health Emergencies Programme. Lama pursued her BSc and MSc in nutritional sciences at the American University of Beirut. She also completed a PhD specialized in eating disorders and behaviors at University of Pierre & Marie-Curie in Paris, France. Lama is currently an associate professor of nutrition. She believes that nutrition is the cornerstone of prevention and therapy of many diseases. She practised clinical dietetics in various specialized units in the USA, Switzerland, Lebanon, and France. She further broadened her experience by completing a post-doctoral project on cancer and malnutrition in hospitals. Lama has been actively engaged and strongly committed to teaching and mentoring at all levels in the university. She taught graduate and undergraduate nutrition courses at the American University of Beirut and since her appointment at LAU, she has taught 6 different courses of which she developed 4 and coordinated many. She got awarded from the French Ministry of Foreign and European Affairs an Excellence scholarship, and from King's College in London, a research Excellence fellowship. Alongside her academic and research career, Lama is a passionate photographer and has been immersed in the world of arts as she has been painting since a very young age. Lama developed a growing interest in photography a few years ago and has been honing her skills through a mix of self-teaching, seminars, and workshops in Paris, Monaco, and Beirut.

Corentin Piroux is a junior staff in Learning & Capacity Development. With a managerial background gained through his studies at IESEG School of Management. He has worked with the World Health Organization for more than 2 years all combined. Corentin started his journey in the Learning & Capacity Development (LCD) back in 2018 as an intern. He then kept collaborating with the team as a consultant and wrote his final thesis with WHO. At the very beginning of the COVID-19 pandemic, Corentin came back to work with the team to support the course production on OpenWHO. From the early stages of the development of a course to its actual publication on OpenWHO, Corentin has been able to follow each and every step of the course production process by assisting WHO technical teams develop their learning materials. He also coordinated the translation of those OpenWHO resources in UN and national languages, in partnership with volunteers, WHO country offices, and translation agencies. After completing his Master's Degree in Management, Corentin worked for a few months as a Financial Auditor at KPMG in Paris. In April 2021, Corentin became a WHO staff in the LCD unit and started leading the course production pipeline for OpenWHO. Thanks to his previous experience within the team, he has taken over a coordination role in the team. While having regular meetings with WHO technical colleagues developing courses, Corentin has also had a managerial role by assigning tasks to his colleagues working on course construction on the platform. Corentin has then strengthened his knowledge in adult learning and in public health beyond his academic background in management.

Dr. Gaya Gamhewage is a medical doctor and public health expert with three decades of experience in the health sector. She has worked with the World Health Organization for nearly 20 years, mostly leading institutional capacity-building initiatives for health emergencies, including for COVID19 trainings. Since July 2021, she is the Director a.i. for Prevention and Response to Sexual Exploitation, Abuse, and Harassment. Prior to this, Dr. Gamhewage was Head of Learning & Capacity Development for WHO's Health Emergencies Programme and worked in the Executive Director's Office where she introduced social learning for a diverse, equitable, and inclusive workplace. She led the capacity-building pillar of the WHE working group on PSEA. Previously she has led new areas of work for WHO including in health communications & behavioral change; risk communications & community engagement; and most recently, lifelong learning for health which included the development of the first-ever WHO Global Learning strategy for Public Health. Dr. Gamhewage has worked for national and international NGOs including the Save e the Children UK and Norway, and was at the beginning of her career the Director of Community Health for Sarvodaya, a Sri Lankan NGO working in more than 15,000 villages. Dr. Gamhewage also holds two Master's Degrees in addition to her medical degree - in International Health and in International Policy-Making and Negotiation. She is skilled in supporting countries to build up their own institutional and human resource capacity to protect the health of their populations. She is a passionate advocate for and creating fair and sustainable environments and ecosystems where women and men grow and thrive in the service of others. Her areas of expertise include education & learning for health; public health programming; negotiation & advocacy; knowledge networks & ecosystems management; child rights and protection; psychosocial health programming; and community engagement and risk communications. She is also an experienced trainer, facilitator, and certified professional coach.

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COMMENTARY

Strategies to counter disinformation for healthcare practitioners and policymakers

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Abstract

Medical disinformation has interfered with healthcare workers' ability to communicate with the general population in a wide variety of public health contexts globally. This has limited the effectiveness of evidence-based medicine and healthcare capacity. Disinformation campaigns often try to integrate or co-opt healthcare workers in their practices which hinders effective health communication. We describe a critical overview of issues health practitioners and communicators have experienced when dealing with medical disinformation online and offline as well as best practices to overcome these issues when disseminating health information. This article lists disinformation techniques that have yet to be used against the medical community but need to be considered in future communication planning as they may be highly effective. We also present broad policy recommendations and considerations designed to mitigate the effectiveness of medical disinformation campaigns.

KEYWORDS

disinformation, global health, health communication, health policy, misinformation

INTRODUCTION

Over the past year, medical misinformation and disinformation have been on the rise in countries across the globe aimed at various targeted audiences. This has countered the ability of healthcare practitioners to disseminate accurate information to their patients and has limited the effectiveness of evidence-based medicine. Misinformation is defined "information that is contrary to the epistemic consensus of the scientific community regarding a

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phenomenon" while disinformation is an intentional effort to spread misinformation (Swire-Thompson & Lazer, 2020). Mainly, the perception of the public has been broadly targeted, but in notable instances, the healthcare infrastructure was disrupted in several specific countries such as Ukraine, Brazil, and the United States (Brown, 2020; Patel et al., 2020; Ricard & Medeiros, 2020).

The medical community has been making strides to reduce incorrect or misleading information. However, successful disinformation campaigns from both state actors and from actors in civil society have shaken the confidence of the public in healthcare systems. Many members of the medical community have actively promoted the idea that healthcare workers should establish online presences to counter disinformation by incorporating digital health literacy programs (Rubin, 2019). At present, digital health and media literacy are becoming more accessible; however, it has been exceedingly difficult to gauge the efficacy of health literacy programs to address the complex nature of misinformation (Jackson et al., 2021; Swire-Thompson & Lazer, 2020). Health care workers need to be aware of the threats disinformation campaigns can pose against them when they establish an online presence or attempt to counter disinformation on behalf of their patients. Furthermore, disinformation has varied effects across varied contexts due to cultural, sociological, and technological differences. For example, areas with lower trust in media are more susceptible to belief in disinformation (Bontcheva et al., 2020). With this in mind, our best practices and policy recommendations are not for any particular context but represent broad steps that public health officials, governments, and organizations can take against disinformation. Much of the study of disinformation is communicated in English with a focus on western contexts. Therefore, more research and intervention are necessary to establish what is effective in other contexts outside the United States and globally.

In this commentary, we describe a critical overview of medical information issues health practitioners commonly encounter when dealing with disinformation online and offline, as well as best practices to overcome these challenges. We also identify disinformation tactics and technologies which can be utilized against the medical community. Finally, we present longer-term policy recommendations designed to make these disinformation tactics less effective in the future.

Existing practices in spreading medical disinformation

A large portion of disinformation surrounding health information does not involve members of the medical community. Social media and the vast majority of the internet consists of user-generated content with different sites having varying degrees of moderation. Many users post unverified medical information, whether with malicious intent or because they are misguided. When medical practitioners attempt to disseminate public health information, they should be aware that they may be co-opted by disinformation campaigns. Additionally, disinformation campaigns often originate from healthcare providers within the medical community, and public health communicators need to be able to respond to these qualified experts who intentionally spread discredited information.

Co-opting medical practitioners

Medical practitioners and researchers often attempt to combat disinformation but instead become unknowing actors in disinformation campaigns themselves. For example, a well-meaning physician took a photo of himself in front of empty hospital beds which people online misinterpreted as the COVID-19 pandemic being a "hoax", when in fact, he was in front of additional bedding which was being set up due to increased patient volume and hospital overcrowding from COVID-19 disease (Dupuy, 2020). There are innumerable other examples among conspiracists which feature videos or pictures of members of the medical community which are labeled with incorrect contexts to promote false narratives. Additionally, pictures can be altered, sound bites taken out of context, and videos selectively edited to give false impressions.

Conspiracists frequently view public health messaging as part of sinister conspiracies to manipulate the population. As such, the credentials of medical professionals are often seen as evidence that they are complicit in these conspiracies. Conspiracists will actively co-opt public health messaging to counter official narratives. In March 2020, a physician created #DoctorsSpeakUp to speak out against the anti-vax community, instead the anti-vax community hijacked the hashtag and used it to ask doctors to speak out in favor of their conspiracies. The hashtag then "went viral" and began widely trending after it was co-opted (Morris, 2020).

Even if practitioners are not directly co-opted, controversial findings can be misinterpreted or emphasized to generate fear. In the Kremlin-backed influence campaigns against the COVID-19 Pfizer vaccine, they emphasized known vaccine side effects mixed with complete fabrications to dissuade the public from receiving the vaccine while encouraging them to wait for the "superior" Russian-sponsored Sputnik V vaccine to become available (Volz & Dustin, 2021).

Practitioners need to be cautious with what information they enter online as their content can be readily altered or misconstrued. On the internet, nuanced debates and discussions are few and far between and practitioners should assume nothing regarding the reliability, intent, or comprehension level of their audience. There should be no expectations that others online will be reasonable, logical, or sympathetic. Additionally, online campaigns can utilize tools such as automated fake accounts to drown out health policy content they disagree with. A study by researchers at Carnegie Melon University in May 2020 found that nearly half of all Twitter accounts promoting reopening campaigns after COVID-19 lockdowns in the United States were likely internet bots (Alvino Young, 2020). When practitioners see that their content is being misused, they should inform social media platforms and other relevant authorities as quickly as possible to avoid further dissemination. In the longer term, there should be health policy aimed at increasing scientific literacy so that people are able to better understand the argumentation and reasoning of medical practitioners and identify logical fallacies in conspiratorial thinking.

Pseudoscience promoted by medical professionals

There are some medical professionals who choose to misuse their titles so that they can lend credibility to unscientific or outright false claims. A former virologist was featured on the conspiracy documentary "*Plandemic"* which was viewed tens of millions of times globally and asserted that COVID-19 disease could be prevented by exposure to sunlight. In late 2020, the former vice president of Pfizer co-authored a petition that, without evidence, concluded that COVID-19 vaccines could cause infertility in women (Stecklow & Macaskill, 2021). The Center for Countering Digital Hate found that up to 65% of anti-vaccine content was spread by only a dozen people, of which, three were physicians (The Center for Countering Digital Hate, 2021). Medicine has a long history of people misusing their credentials to promote unscientific views. With the expansion of social media, this will continue to be a perennial problem beyond the current pandemic.

Physicians must be prepared to speak out about those in the medical profession who spread conspiracies. Most major social media platforms have reporting features which allow individuals to flag mis or disinformation. Social media platforms can screen for medical disinformation and have been working with organizations like the World Health Organization (WHO) and other public health authorities (Meyer & Alaphilippe, 2021). However, more medical organizations and informed healthcare professionals are needed to assist these efforts as social media platforms are ill-equipped to counter individuals spreading disinformation who have a reasonable claim to expertise. For this reason, unbiased, creditable medical professionals should work with social media companies to properly verify information.

Potential disinformation threats

The nature of online disinformation is that it is ever changing and rapidly adapting to countermeasures. The medical community including public health communicators, medical practitioners, and administrators need to be prepared for existing trends in disinformation as well as for how emerging technologies will impact health communication. Below are a few information gaps currently not addressed in health communication strategies that demonstrate current vulnerabilities. In health policy terms, there needs to be concrete communication strategies in place to prepare for and counter new developments in the promotion of disinformation. Additionally, beyond being aware of these threats, healthcare practitioners, social media platforms, civil society, and government organizations need to collaborate and develop tools for a resilient information ecosystem that can combat ever adapting technological threats without restricting public free speech (Felten & Nelson, 2019). Tools such as artificial intelligence (AI) detection of altered media with improved cyber security of the healthcare infrastructure can directly counter the disinformation techniques addressed below.

Altered websites

Legitimate sources can be replicated and manipulated online. For example, in 2017 a disinformation campaign managed to copy the web design of an influential Harvard University Center and several news outlets including Le Soir and The Guardian and they inserted their own false articles which were designed to discredit US and Saudi Arabian policies in the Middle East (Lim et al., 2019). Actors spreading disinformation can do this by copying the source code of websites to make them appear exactly as they would normally, copying the same design, advertisements and putting in functional “share” buttons to social media. The URLs can be made to look similar to the websites they are imitating with subtle differences in typos, letters that look similar (e.g., using the lowercase of the letter L “l” instead of the uppercase of the letter “I”), and the top-level domain (e.g., from.info to.net). These fake web pages may even redirect to the actual source they are trying to imitate so that clicking on sections of the page will lead you to the actual site. Prominent high-impact medical sources like peer-reviewed journals need to be aware that they can be imitated by factions who are willing to use their platform to spread medical inaccuracies. This goes beyond “predatory” journals to potentially any online medical source the public views as legitimate. As a result, healthcare providers must closely check URLs to see if they are correct. Cross-checking information with multiple sources is important to discern if the information is genuine. Whenever one of these false web pages is identified, the organization being imitated needs to quickly respond to any online platforms where the links to the false page are disseminated so that they can remove the inaccurate content.

Deep fakes

"Deep fakes" or artificial intelligence-generated false videos came into prominence in 2017 and have become increasing accessible for nonvisual effects specialists to use. While extremely convincing, deep fake videos still require professional visual effects (VFX) designers and actors, although there have been cases where amateurs have created deep fakes to damage reputations of others. Rogue companies are working to develop deep fake technology that can be used in real-time. Thus far, deep fakes have not been used to target the medical community, but health practitioners need to be prepared for this eventuality. Most social media platforms have some form of ban on artificial intelligence generated false videos and images, but they require tools to properly identify deep fakes. Experts are creating tools which will allow artificial intelligence (AI) to automatically detect when deep fake technology is used; currently this technology is still in development.

Leaked or altered information after a cyber security breach

The medical field has been highly impacted by cyber-attacks. A 2017 survey of the American Medical Association (AMA) found that 83% of physicians claimed their practices had experienced some form of cyber-attack (AMA Staff News Writer, 2021). Sensitive healthcare information is frequently revealed in hacks. One list was publicly posted on 4chan, an image-based bulletin board where anyone can post comments and share images anonymously. This particular list was compiled from a series of hacks which had thousands of emails and passwords from the National Institute of Health (NIH), Center for Disease Control and Prevention (CDC), World Bank, and World Health Organization (WHO) (Wakefield, 2020). Often these attacks come in the form of "phishing", where emails will impersonate legitimate sources to try to get access to information. In 2020, a hack for hire campaign targeting healthcare companies and consulting services used Gmail accounts impersonating the WHO to direct users to WHO lookalike websites where they were urged to sign up for alerts which required them to give personal information (Vavra, 2020). Disinformation campaigns have used information gained during cyber breaches and leaked altered versions of official documents to create false narratives. In one instance, journalist David Satter had his e-mail hacked by the pro-Russian hacktivist group Cyberberkut who proceeded to alter his documents and leak them online (Hulcoop et al., 2017). Additionally, information gained during leaks can be misinterpreted or represent incomplete scientific findings which if made publicly available, constitute a form of disinformation.

To combat this, effective cybersecurity requires ensuring that both hardware and software are well maintained and regularly updated. Medical personnel need to be informed about threats from malware, hackers, and viruses and need to be transparent when breaches do occur. Additionally, they should be educated regarding online impersonation and methods to discern genuine websites. Health documents should be backed-up such that if leaked and altered, practitioners have original unaltered documents to refute the leak. When there is a breach, the healthcare professional should notify the related services targeted (e.g., Google, Facebook) as well as the local authorities as quickly as possible (See Table 1).

How to deal with the nontechnical side of disinformation

Most of the factors that can mitigate disinformation go beyond the field of medicine or technology but with public health communication. At the root of disinformation is often

TABLE 1 Ten tips for healthcare practitioners about disinformation

1. Practitioners need to be cautious posting online - anything said can be altered
2. Social media organizations need to be informed when videos or images are being used to promote disinformation
3. Be prepared to speak out about those in the medical profession who spread conspiracies.
4. Closely check URLs to see if they are legitimate
5. Cross check information with multiple sources to better discern if information is genuine
6. Effective cybersecurity requires hardware and software be maintained and regularly updated - out of date security software is more susceptible to online threats
7. When a breach is detected contact relevant services as well as the local authorities
8. Backup documents so that if they are leaked or altered the original documents can refute the disinformation
9. Medical staff personnel need to be informed about the threats from malware, hackers, viruses, and those phishing for sensitive information
10. Conspiracies are often best countered through compassion and empathy rather than fact or argumentation.

miscommunication and distrust, which require more than just several correct facts to resolve.

Health practitioners should be made aware of the common disinformation which is easily accessible to patients. However, given the sheer volume of disinformation, this will be a difficult undertaking. Health communicators must work to inform practitioners about the most common or dangerous narratives that their patients have been exposed to through means of periodically published condensed reviews of disinformation. Additionally, practitioners must be aware that the cold facts are not enough. Fact checking has been shown to have positive effects in terms of correcting inaccurate information, however, it is far less effective at altering beliefs and actions (Barrera et al., 2020). Many scholars blame this on "motivated reasoning" where audiences ignore information that does not fit their preconceptions (Bardon, 2019). Other scholars have suggested that a lack of reasoning is to blame for people's inability to differentiate between what is true and what is false (Pennycook & Rand, 2019). Furthermore, factual corrections can lead to a "backfire effect" where people reinforce their incorrect views in light of contradictory information (Nyhan & Reifler, 2010). Studies claiming to identifying this effect or phenomenon have been recently disputed (Guess & Coppock, 2020). There are effective means to reach patients who believe in disinformation campaigns. Prompting analytical consideration of conspiracies to examine inconsistencies can lead to "the elusive backfire effect" where people cease to believe conspiratorial thinking (Wood & Porter, 2019).

Academic and healthcare training workshops address how to deal with patients who display conspiratorial thinking, emphasizing that it is best to always show consistent messaging, empathy, and understanding rather than argumentation (Abbasi, 2021). Healthcare policymakers need to incorporate training and educational materials for healthcare providers to better communicate with their patients when exposed to disinformation.

Policy recommendations to combat health disinformation

Public Health disinformation constitutes a significant challenge for policymakers as actions taken against disinformation can infringe upon freedom of speech. Educational programs that encourage critical thinking and allow users to identify disinformation for themselves are an attractive solution as no outside bodies need to remove or add disclaimers to content. There have been large increases in the accessibility of digital health however, there are barriers and disparities to digital literacy, such as "inequitable access to digital technologies; and low general and domain-specific literacies." (Jackson et al., 2021). Additionally, it is exceedingly difficult to gauge the efficacy of these health literacy programs (Swire-Thompson & Lazer, 2020). Additional research is necessary to find the most effective solutions to the evolving problem of disinformation. Policymakers should support research on disinformation to have multi-stakeholder collaborations between vested civil society, health care, and technology actors. Disinformation is a global problem and policymakers must coordinate transnational digital health literacy programs concerning disinformation threats, including those that come from newly generated technologies. We recommend increased international collaboration between stakeholders affected by disinformation to improve learnings and best practices (Felten & Nelson, 2019). Additionally, policymakers need to consider that government-led initiatives to counter disinformation may be impartial as they have proven to be most effective only when they are transparent and not unidirectional strategic communications serving self-motivated political interests (Bontcheva et al., 2020).

Besides these measures, it will be essential in the long term for policymakers to address the structural factors which facilitate disinformation online. Currently, information from unofficial sources is frequently conflated with those from official sources. It is crucial for social media platforms to identify and act against content harmful to public health initiatives and implement features that allow for easier distinction between official and unofficial content (such as banners or notifications that identify sources) (Simpson & Conner, 2020). However, it is equally important that platforms exercise caution when implementing actions that prioritize only official sources as their sites should also be able to serve scientists who want to collaborate and share findings that may have yet to be officially verified. Policy makers can push for social media platforms to emphasize and amplify content from public health sources. Additionally, credible sources should inform the content moderation efforts of social media platforms. Policymakers can work to ensure that platforms work collaboratively with public health authorities to have the most current information for fact-checkers. These broad policy recommendations and considerations are ultimately designed to mitigate the effectiveness of medical disinformation campaigns.

ETHICS STATEMENT

This article is an original work, which has not been published before, and is not being considered for publication elsewhere in its final form, in either printed or electronic media. Any republication of the content will not constitute redundant publication, will not breach copyright, and will reference the original publication.

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COMMENTARY

Communication in context: How culture, structure, and agency shape health and risk communication about COVID-19 in Ghana

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Abstract

Despite impressive strides toward proper health education about the pandemic, in resource-limited contexts, health information dissemination occurs within a structural context that restricts the enactment of agency and further marginalizes the most vulnerable. Through observations of and reflections about Ghana's work in health communication about the COVID-19 pandemic, this essay examines the key processes and outcomes of COVID-19 information dissemination in Ghana, highlighting the structural factors that contribute to health inequities during the pandemic. We argue that although Ghana has been commended continentally and globally for the country's efforts in containing the virus and vaccinating its populace, there is evidence of health information access disparities across the country, especially in rural communities. In doing so, we increase knowledge about health information needs and gaps, and conclude by making recommendations for public health practitioners in Ghana and similar contexts.

KEYWORDS

COVID-19 pandemic, fake news, health disparities, information deserts, misinformation and disinformation

Highlights

Health information access disparities, particularly in rural areas of Ghana worsened the impact of COVID-19. Gaps in access and structural inequities have the largest impact on the most vulnerable populations. To increase effectiveness of health information dissemination, it is important to critically engage with culture and larger socio-cultural structures that may impact community members' enactment of agency.

INTRODUCTION

Like many countries around the world, the COVID-19 pandemic has had a profound impact on Ghana. According to reports by the World Health Organization, in the period dating from January 3, 2020, to June 6, 2021, Ghana has had over 90,000 confirmed cases of the virus (World Health Organization, 2021). According to the same source, over 700 people have died of the virus in Ghana. The pandemic in Ghana impacted not only the health of the population but also, specifically, the health of healthcare providers in a context with an already overburdened healthcare system (Afulani et al., 2020). In Ghana, there is just one hospital bed for every 10,000 people and there are about 1.1 physicians and 27.1 nurses for every 10,000 individuals (Afulani et al., 2021). The overburdening of the healthcare system is also evidenced by the strikes threatened by physicians and nurses against the conditions they had to work in during the pandemic (Ghanaweb, 2020). Thus, while many health systems around the globe were struggling to keep up with demands created by the pandemic, Ghana's health system was facing similar issues under conditions that predated the pandemic (Afulani et al., 2020). The government of Ghana responded to the global health crisis in a variety of ways, including bans on public gatherings, bans on travel from particularly stricken countries, a mandatory quarantine, partial lockdowns, and the use of face masks (Kenu et al., 2020). In tandem with these public health policy measures were health education interventions and health information dissemination efforts to foster preventive behaviors among the population. While Ghana has made positive strides to protect the population, including being one of the first countries to administer the AstraZeneca vaccine and administering over one million doses of the COVID-19 vaccine as of May 2021 (World Health Organization [WHO]), we argue that there is evidence of health information access disparities, particularly in marginalized and rural communities. Expounding upon these disparities and the resulting challenges and gaps in health information dissemination during the COVID-19 pandemic, we highlight the importance of foregrounding the intersection of culture, structure, and agency in the contextualization of health information dissemination in similar contexts worldwide.

CULTURE, STRUCTURE, AGENCY, & HEALTH INFORMATION DISSEMINATION

Health information dissemination cannot be isolated from the cultural, structural, and agentic factors that shape the context in which it occurs. The disproportionate impact that health disasters and crises like COVID-19 have on communities that are already marginalized (Rivera & Fothergill, 2021) highlights the importance of engaging with health information dissemination in light of culture and contextual structures that enable or constrain health behavior.

The culture-centered approach (CCA) is an analytical framework in health communication that provides a useful lens through which to understand the impact of context and value systems on health. CCA foregrounds the intersection of culture, structure, and agency, highlighting the way these three dynamically interact to shape health meanings for individuals and communities (Dutta, 2007). In this framework, 'culture' refers to systems of meaning, 'structures' refer to social constructions that enable/constrain resource access, and 'agency' refers to the individual capability for dynamic action (Sastry et al., 2019). While cultural sensitivity approaches in health communication emphasize health education that is congruent or attentive to cultural practices, CCA, by foregrounding voices from the margins and localized health meanings, engages with culture as an entry point for transformation and disruption of unequal power dynamics (Dutta, 2008; Dutta et al., 2017). In this essay, we apply this approach as an orienting metatheoretical framework to move toward opening a new line of discourse on COVID-19 health communication in Ghana.

Understanding COVID-19 communication in Ghana through a CCA lens means drawing into the center individuals' and communities' meaning making around health and health issues such as COVID-19, with attention to how structural factors and policies enable Ghanaians to enact their agency in response to the risk of COVID-19.

Despite Ghana being commended widely by the international community for its approach to addressing and containing COVID-19, contextual factors shape COVID-19 infection rates. Structures within Ghana form a foundation for the way COVID-19 health information has been disseminated and negotiated during the pandemic. In this essay, we describe some of the main contextual factors that shaped health information dissemination in Ghana, grounding our discussion in the intersection of culture, structure, and agency.

CONTEXTUALIZING HEALTH INFORMATION DISSEMINATION IN GHANA

Historically, Ghana has employed various avenues to facilitate information dissemination on various health issues such as HIV/AIDS, malaria, cholera, and guinea worm. Before and after the diffusion of new and social media, the public health sector in Ghana employed extensive use of traditional media to make health information accessible to the populace. This medium of communication was culturally suited to the local context, and studies have provided evidence of the effectiveness of “edutainment” programs in African contexts (Scheepers et al., 2004).

The Ghana Broadcasting Corporation (GBC), Ghana's public broadcaster, has played a pivotal role in health education in the country with programs such as HeHaHo, a weekly radio drama, which aired on GBC's subsidiary stations across the country on Sundays in the 2000s (Compass, n.d.). HeHaHo was a campaign to “roll back malaria for a healthier, happier, home,” as the name suggests. Like many health campaigns in Ghana, HeHaHo was funded by foreign organizations like GoodLife/USAID (Compass, n.d.). This again draws attention to the way power dynamics and global geopolitics shape funding for development programs in the Global South. This campaign was actualized as a weekly drama broadcast in English, Dagbanli, Akan, and Ga, mostly on Sundays to teach the populace about malaria prevention strategies. As a child, the second author and their family tuned in to this program to be entertained and educated. Beyond HeHaHo, there were various songs, mostly led by children to provide education on malaria prevention.

Radio and television have also proven to be important mediums for the communication of health information in Ghana (Agyemang-Duah et al., 2020). For example, as many African countries worked to prevent the spread of HIV/AIDS, Ghana once again utilized traditional media platforms to air catchy songs about HIV prevention on radio and TV. Beyond these platforms, paper flyers were created and circulated to facilitate education on HIV prevention, stigma, and management.

Today, health education campaigns have drastically reduced in the country due to a lack of government commitment to providing funding for health education programs (NCCE Ghana [@nccegh], 2020). In addition, communication about health information has grown complicated as the public health education sector is burdened with not only providing education but fighting misinformation and disinformation propelled by access to platforms such as WhatsApp and Facebook. For individuals with limited access to these platforms, health information dissemination is even further hampered. While research on health information seeking behaviors among individuals in rural communities in Ghana is sparse, a recent study in one such community found that the majority of respondents experienced difficulties gaining access to health information due to language barriers, poor information infrastructure, and lack of access to mobile phones (Sokey & Adisah-Atta, 2017).

When Ghana went into lockdown in March 2020, President Nana Akufo Addo began to provide weekly updates about the country's strategies to contain the virus and how the country was performing in their bid to contain the spread of the virus (Mohammed, 2020). Media organizations across the spectrum mostly based in Accra provided extensive coverage for these through live broadcasts, news stories, and circulating digital flyers about major points made on their social media platforms among others. Despite the growth in social media, radio and TV continue to be the major avenues for health information dissemination in Ghana. While these platforms were also used to provide information on COVID-19, they could not exhaustively address the information needs of the Ghanaian population due to the digital divide caused by limited access to internet data and digital technology.

In the following section, we highlight the key structural challenges that hindered the enactment of agency through protective health behaviors during the COVID-19 pandemic in Ghana.

STRUCTURAL CHALLENGES AND COVID-19 IN GHANA: FAKE NEWS, INFORMATION DESERTS, & INEQUITABLE ACCESS

Fake news and information deserts

Although digital media access continues to rise around the world, the digital divide continues to undermine access for people in rural communities, people who do not have access to digital technology and internet data, people who are not literate in the language of many digital platforms, and people who are not technologically literate (Mohammed, 2019a). This divide is mirrored across various sectors of the digital economy including the health sector (Abdulai et al., 2021; Ankamah et al., 2021). A lack of access to these technologies, platforms, and literacy skills creates information deserts in an increasingly digitized world, ultimately stripping community members of the opportunity to assert their agency in finding credible information. While some users may have various levels of access to these platforms, misinformation, and disinformation continue to thwart efforts to use digital platforms for health information dissemination. WhatsApp, which has become one of the most popular mediums of communication across Africa, and specifically Ghana, has in recent times been inundated with fake news about various topics from education to health and politics (Abdulai et al., 2021). While some young college students accessed COVID-19 health information via the Internet (Ankamah et al., 2021), a wide digital divide means that majority of the population do not have access to these platforms (Abdulai et al., 2021). Although there are increasing conversations around digitization and digitalization in Ghana, the fact remains that the most widely accessible media in the country is radio. Sixty-nine percent of women and 80% of men in Ghana have access to the radio (Ghana Statistical Service, 2011). Radio is accessible in Ghana and across Africa because it is cheap; can run on electricity, battery power, or solar energy; can be carried to remote areas like farms and has signals that are more widely accessible than other platforms such as TV and print (Mohammed, 2019b). Ultimately, traditional media (radio, TV, print) became the avenue to access more credible information about COVID-19 in Ghana (Agyemang-Duah et al., 2020). Despite radio's wide accessibility, there was very little effort on the part of the Ghanaian state to provide resources to develop public health campaigns to educate the populace about the virus (NCCE Ghana [@nccegh], 2020). In fact, the National Commission on Civic Education, which is mandated to carry out such campaigns, was only provided with GHS 100 (the equivalent of $20 at the time) to develop and launch health education campaigns in each district office across the country (NCCE Ghana [@nccegh], 2020). Ultimately, independent actors such as NORSAAC, a Tamale-based NGO, and citizens led efforts to provide education on COVID-19 in indigenous Ghanaian languages (Mohammed, 2020; Norsaac @Norsaac, 2020). Therefore, the prevalence of fake news, lack of access to credible media platforms, limited digital media accessibility (Abdulai et al., 2021; Ankamah et al., 2021) and media literacy have exacerbated information deserts that predate COVID-19 (Mohammed, 2020). It does not help that some journalists and opinion leaders who hold tremendous sway in their communities amplified disinformation. For example, a renowned journalist shared fake news on her Facebook account that insinuated that the COVID-19 vaccine could cause infertility in women (Aminu, 2021). Therefore, health information dissemination efforts are not only mitigated by lack of media infrastructure and information deserts but also by actors, such as journalists, who ideally should be the arbiters of credible information. These issues pose profound structural challenges that restrict the extent to which individuals can enact agency through protective health behaviors during the COVID-19 pandemic.

Inequitable vaccine access

The COVID-19 pandemic has highlighted the need for robust health systems that can quickly and efficiently respond to crises (Paintsil, 2020). These systems must ensure their strategies are equitable. While Ghana's public officials and health practitioners advocated that people take the COVID-19 vaccine, at the same time, there were inequities related to vaccine distribution that hindered a significant segment of the population from heeding that advice. While Ghana received its first consignment of vaccines in February, systemic factors related to resource distribution in the country meant that the vaccines were very slow to arrive in Northern Ghana (even for health workers), and when they did, they were already on the verge of expiration (Ghanaweb, 2021). While urbanization and other factors have led to poverty reduction in Southern Ghana, the same has not been true for Northern Ghana as the region has been systematically excluded in development efforts in colonial and postcolonial Ghana. While the number of poor people in Southern Ghana reduced by 2.5 million between 1992 and 2006, it actually increased by 900,000 in Northern Ghana (UNICEF, 2014). Thus, the deprivation of individuals in Northern Ghana of the vaccine only served to expose and exacerbate existing inequities. Health information about the vaccine, particularly communications encouraging people to receive them, was thus rendered ineffectual to a group of people in the country who were already marginalized and were further restricted in their ability to enact their agency by making a choice about the vaccine. This severely compromised the extent to which health information dissemination can actually result in protective health behaviors. This example highlights the importance of public health practitioners understanding and engaging with the structures that shape health behavior.

Inequitable policies and corruption

Another factor that posed a challenge to health information dissemination in Ghana was policies that were potentially or in actuality harmful to citizens. During the COVID-19 pandemic, and at a time when health messaging was promoting staying at home, some homes in Old Fadama were demolished, severely reducing the possibility of these individuals being able to maintain the social distancing required to be safe (Mohammed, 2020). In addition, police and military officers were enlisted to enforce lockdowns (Ghanaweb, 2020). In other African countries such as Nigeria, Uganda, Rwanda, and Kenya the enforcing of lockdowns by members of the police force had life-threatening implications (Hammond, 2020). In Nigeria, at a time when COVID-19 had only led to 11 deaths, the enforcement of lockdown by police officers led to 18 deaths (Nigerian Human Rights Commission). As a result of the potentially grave consequences of enforcing lockdowns using police and military force, it would have been more effective for the government to fund more community-based programs led by community members, instead of enlisting the help of the police and military who might have fraught relationships with the community. The discordance between health information dissemination and policies that constrained the abilities of individuals to take the actions advocated again highlights the importance of establishing policies that support and enable protective health behaviors.

Finally, even when sound policies were put in place, there are examples of political leaders themselves neglecting orders. For example, although President Nana Addo instituted a ban on public gatherings, his political party flouted this ban several times by organizing rallies and large funerals. This set a negative precedent for citizens in their own responses to directives.

Finally, there have been concerns of corruption in Ghana's response to the virus which can create mistrust between public health practitioners and citizens. For example, like in other countries, there has been doubt raised about the transparency of procurement processes related to COVID-19 testing and equipment at Kotoka International Airport (Corruption Watch Ghana, 2021).

ENACTMENT OF AGENCY BY INDIVIDUALS & COMMUNITY MEMBERS

Despite these structural challenges, community agency was still enacted in the way that individuals and community groups, through local means and meanings, worked to fill gaps in health education. Some organizations took advantage of already-existing information services infrastructure to make COVID-19 health information accessible to the most disenfranchised groups (Mohammed, 2020). Noting the inaccessible communication campaigns for deaf people during the pandemic, the Northern Regional Association for the Deaf advocated for COVID-19 education in sign language (Mohammed, 2020). In Krobo Odumase, community members worked with opinion leaders to produce COVID-19 public health campaigns to be broadcast on loudspeakers at vantage points in the community (Desmon, 2021). Culturally, it is imperative to note that these urban information centers mirror indigenous modes of information dissemination like the town-crier walking through the community to announce and share important information with the public. We assert that these indigenous modes of communication should be leveraged, particularly as they have established legitimacy in these communities given that many announcers have connections to,and often take orders from, the chief's palace. Complementing these modern information dissemination strategies with already existing indigenous communication structures that are still concordant with contemporary cultural practices will help fill gaps left by information deserts. Individual citizens and groups can and should be provided with the resources necessary to enact their agency, creating strategies that align with local cultural values and practices

CONCLUSION

We have expounded upon health information dissemination about COVID-19 in Ghana, highlighting the ways in which cultural and structural factors interacted with health dissemination efforts to enable or constrain the enactment of agency through protective health behaviors. While Ghana made exemplary strides in advocating protective health behaviors, these measures, examined in the context of larger sociocultural structures, were limited in their impact, mto the detriment of the most vulnerable communities. The challenges presented in this essay are not unique to Ghana but are merely reflective of a reality pervasive in many contexts globally. Health information dissemination should be a multisectoral effort that occurs with a strong understanding of culture. Furthermore, institutions, government agencies, and nongovernmental organizations must move beyond shallow efforts to convince, persuade, and nudge individuals toward health behaviors and move toward broader actions to dismantle structures that produce inequitable outcomes.

ETHICS STATEMENT

This commentary is not based on research with human participants, and therefore did not require approval from an institutional review board.

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BOOK REVIEW

Disaster by choice. How our actions turn natural hazards into catastrophes

Ilan Kelman

Oxford, UK: Oxford University Press, 2020. ISBN: 9780198841340.

Dr. Ilan Kelman, Professor of Disasters and Health at the University of London, and a Senior Research Fellow at the Center for International Climate and Environmental Research, Oslo, challenges the reader to rethink the meaning of a disaster. Natural phenomena, such as severe weather and hazardous conditions that can result in loss of life and property, need not be disasters. Disasters occur because we don't prepare for the occurrence of natural phenomena. Disasters as man-made situations are preventable.

The book is thematically organized into six chapters, each providing either examples of how particular societies addressed natural phenomena, or, more broadly, suggesting solutions of what can be done to reduce the cost of rebuilding. "An Island Shattered" (Chapter 1) offers a brief history of Haiti as a nation impoverished by outside interference and internal dictatorships that left it with little infrastructure and resources to withstand the onslaught of earthquakes, hurricanes, and torrential rains that happen with some regularity over time, leaving thousands dead. Dealing with the aftermath of these natural events cost billions Haiti does not have and has left the country susceptible to further loss of life and property in the predictable return of devastating weather events.

Natural environmental changes that result from landslides, earthquakes, volcanic activities, floods are really hazards rather than disasters ("Nature's Hazards" [Chapter 2]). Disasters happen when there is inadequate preparation for these occurrences. England's Canvey Island serves as an example of how developing this island into an ocean-front mecca has worsened flooding in upstream London. Not accounting for what we know about the environment we live in, has led to costly disasters.

Kelman asks in "The Story of Vulnerability" (Chapter 3) "Why do we not continually use the knowledge we have to avert disasters?" (p. 43). By doing so, many societies can reduce their vulnerability to costly rebuilding. He continues in "Vulnerability (Chapter 4) to look at how human migration increases the potential for new hazards. He does make a case for a broader societal responsibility in addressing vulnerabilities. "The reason why vulnerabilities are not overcome and why advantages are not reaped relate to ideologies, governance, prejudices, assumptions, resources, power relations, and availability of choices" (p. 96).

Chapter 5's "Making the Choice," asks the reader to rethink what can be done about man-made disasters. Drought today is not necessarily caused by nature as it is a disaster resulting from mismanagement of water and people. Similarly, we have not given much thought to potentially unstoppable space hazards as meteor strikes, which could take down electronic and communication systems we have become so dependent on today. Such disruptions could bring our daily lives to a complete standstill, yet no preventive measures have been developed to address such possibilities.

Finally, “Making the Change” (Chapter 6) offers Toronto as an example of how planning ahead for natural hazards can reduce the disasters that come when no planning is done to address the inevitable onslaught of nature taking its course. Land use policy such as developing parks and not building housing in places with a history of flooding has reduced property damage while offering land for recreation when the land is not flooded.

Two towns in Bangladesh serve as examples of how their citizenry's participation in programs to shore up their infrastructures by building better roads, water wells and diversifying their income sources through skill development has reduced postdisaster rebuilding costs. When the inevitable cyclone hit, the recovery time was lessened because of better infrastructure. Although the farmlands were flooded, farmers were able to fish to feed their families.

Throughout the book, Kelman offers a new perspective for dealing with natural hazards. With adequate planning and appropriate infrastructure development, Kelman asserts, residents need not lose their lives, livelihood, and property, but can rebuild and recover with less cost and effort. Kelman also calls for leaders to be more cognizant of the reality of existing hazards and to set aside the funding necessary to build what's needed to prevent disasters from happening. He notes,

> “If we choose to, we can create a culture of warning and safe sheltering,” and “…we can shun places likely to be hit by them or we can create a culture which understands and accepts periodic destruction, again with warning and safe evacuation, to permit swift rebuilding afterwards” (p. viii).

Environmental planners and policymakers can use this book to make a case for considering more innovative solutions to address the inevitable changes that will result from climate change. For example, how will societies absorb the potential inland migration of millions now living on coastlines that will be underwater in a matter of decades?

The book is an easy-to-read introduction to what can be done to start addressing climate change. Though it offers examples of solutions to natural hazards that have worked for several countries, the important message is the need to start planning now for inevitable events, which will, in turn, reduce the cost of recovering from man-made catastrophes.

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BOOK REVIEW

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Corona, climate, chronic emergency: War communism in the twenty-first century

Andreas Malm

Verso, 2020, 215 pp. ISBN 9781839762178.

In much of public health and medicine, we are taught to look at immediate causes and at interventions that existing health institutions can implement. In the HIV field, for example, the emphasis was initially on finding behavioral risk factors for HIV transmission and then turned to research on health education and counseling to change the implicated behaviors. It was considered acceptable, but somewhat edgy, to develop interventions that used social networks or other community approaches to win local groups of people who injected drugs or men who had sex with men to exert influence on others to change their behaviors. Lip service was given to reducing institutional racism or poverty, but almost always the interventions around these issues were things such as individual training or microfinance, that is, things focused on helping or giving "opportunity" to individuals improve their individual situations, and few were focused on changing institutions or structures.

As some of us have argued for decades, this approach is extremely limited. It might work for specific diseases like smallpox (given a successful vaccine) or HIV (if Treatment as Prevention could be sustainably financed and organized over decades—which seems increasingly unlikely). Indeed, as I have argued in a book manuscript on the AIDS epidemic as a whole that is seeking a publisher, and as Andreas Malm splendidly argues in the book under review, thinking small in this way is totally inadequate to deal with the menaces to public health that humanity faces in the 21st Century.[1]

Malm first discusses the different responses governments have made to the COVID-19 pandemic, which emerged rapidly and hit relatively powerful and rich countries first, and to the climate crisis, which is emerging slowly and has hit poorer countries earlier and harder. For the pandemic, they shut down large parts of their economies and much of social life for weeks or months at a time. For climate change, nothing remotely like this has taken place, in part because the capitalist enterprises that benefit from fossil fuels and industrial agriculture had time to organize disinformation campaigns and other efforts to prevent any effective action that might threaten their profits. Against the argument that the pandemic was an acute short-term emergency whereas climate change is chronic, Malm correctly puts COVID-19 in its true context—as just the most dramatic of a number of zoonotic diseases (including HIV/AIDS, Ebola, SARS, MERS, and a series of influenzas) that became epidemics or pandemics due to the spread of capitalism into undeveloped lands where animals live that harbor infections which can cause human disease and to which few humans have resistance. He then reviews considerable literature that describes how prestige purchasing of wild animals to eat in "wet markets," industrial farming that brings together hordes of cattle, pigs, or chicken together (in contexts where wild birds abound who can transfer infectious agents to them), and the destruction of swamps and forests for development or due to climate change all assist the evolution of viral or bacterial organisms into pathogens harmful to humans, and the transmission of these pathogenic infections to humans. Rapid widespread intercontinental travel then spreads the emerging epidemics more rapidly than states can respond. Malm's conclusion from this—that COVID-19 is likely to be followed by other pandemics, some of which may be much worse—is thoroughly supported and in line with others' predictions (Davis, 2005; Johnson et al., 2020; Sharp & Hahn, 2011; United Nations Environment Programme and International Livestock Research Institute, 2020; Wallace et al., 2020; Wallace, 2016; Weiss & McMichael, 2004). The epidemic/pandemic emergency is thus chronic as well as acute and is based on the fundamental need of capitalism to expand to remain profitable and avoid collapse.

What is to be done in a situation where both recurrent epidemics and climate change and other ecological disasters are based on the fundamental dynamics of the mode of production, distribution, and exchange—capitalism—and in a state system that both depend upon capitalism and is ideologically and institutionally devoted to capitalism (Friedman, 2021)?[2] Malm's proposal is political in the broadest and deepest sense—a mass social movement that aims either to force existing states to establish "war communism" (see below) or that overthrows these states and sets up new "movement" states to establish war communism.

More specifically, he argues that to prevent utter catastrophe, action must be taken as soon as possible to take two momentous steps: (1) Restrain capital from encroaching on wild ecosystems (together with ending industrial meat farming), and (2) rapidly and massively decrease greenhouse gas emissions generated by capitalist production of fossil fuels and corporate agriculture. This requires the seizure of productive assets and running them through a state system that focuses on these two requirements of protecting the "wilds" and protecting the atmosphere (and rest of the environment). This will not be done under conditions of "socialist luxury," but under conditions in which the deteriorating climate and probable recurrent epidemics create massive problems. In this sense, it will resemble the "war communism" implemented by the Russian Revolution to deal with impending and then real famine and with foreign invaders' allying with internal reactionary armies. He fully acknowledges the danger of tyranny developing from this situation, but he calls for a "Libertarian Leninism" that unwaveringly insists upon and defends rights of free speech and free assembly.

In summary, this is a brilliant book that synthesizes what is known about epidemics and climate destruction in capitalism and draws conclusions that may not be pleasant to contemplate but that parallel those reached by my coauthors and I in our manuscript on the AIDS epidemic as well as by others (Davis, 2005; Wallace et al., 2020; Wallace, 2016). I wholeheartedly recommend that you read *Corona, Climate, Chronic Emergency*, and do what you can to help its proposals come to pass.

ENDNOTES

[1] I am writing this review for public health and medical researchers, practitioners, and policymakers. I strongly urge readers to read in addition the review by Simon Butler at https://climateandcapitalism.com/2020/09/30/book-review-corona-climate-chronic-emergency/.

[2] His Figures on pp. 101 and 102 show how capitalism produces causal processes of vulnerability to the diseases and also produces drivers of "global sickening" through befouling the environment and by mixing the wild with human (capitalist) enterprise. I would add that, at least for HIV/AIDS, capitalism causes interventions to be inadequate because of its fundamental ideology of individualism, its related scientific commitment to methodological individualism (and analytic models that see parts as the causes and wholes as the results), and its need for pharmaceutical production to be profitable.

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BOOK REVIEW

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Epidemics and the modern world

Mitchell L. Hammond

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In *Epidemics and the Modern World*, Mitchell L. Hammond, Assistant Professor of History at the University of Victoria and medical history researcher, offers a comprehensive analysis of major epidemics and pandemics in recorded human history. The author goes beyond simple discussion of diseases' etiology and epidemiology to deeply engage with the ways in which human culture and behavior drive infectious disease outbreaks. While much of Hammond's previous work centers on medicine, contagion, and disease in Europe, his expertise in engaging with the social and political economic forces that drive the evolution of epidemics and human society provides a compelling foundation for a book of this type. The overarching goal of the text is to show the myriad ways in which "the forces of modernity are mutually constitutive… diseases have both shaped and been shaped by distinctive aspects of the modern world" (p. 2). Throughout the book, discussions of biological determinants and historical context are successfully interwoven to expertly demonstrate how pathogens have been shaped by the human condition, and vice versa.

The book is organized roughly chronologically, both in general chapter organization and within-chapter discussion of the diseases and primary sociocultural themes. The book appropriately begins with bubonic plague (Chapter 1); followed by smallpox and the development of the inoculation that would eventually lead to the invention of modern-day vaccinations and its eradication (Chapters 2–3); yellow fever, cholera, and tuberculosis (Chapters 4–6); a chapter devoted entirely to an animal disease, rinderpest, the only other disease to be successfully eradicated in nature (Chapter 7); the 1918 influenza pandemic and its tremendous and varied global impact (Chapter 8); the changing disease-scape of malaria (Chapter 9); polio and the rise of the visibility of disability in society (Chapter 10); and the most historically proximate major epidemic, HIV/AIDS (Chapter 11).

Each chapter of the book is dedicated not only to a unique major epidemic in human history, but also to one or more of the primary social conditions of the modern world that have helped shape that epidemic. For example, Chapter 1, "Bubonic Plague and the Modern State" discusses the rise of the Black Death and the ways increasing social complexity and social stratification helped sustain the presence of the pathogen in complex societies. Chapter 5, "Cholera and the Industrial City," is not just about the proximate determinants of cholera, although the etiology of the disease is discussed at appropriate length for an audience unfamiliar with its biological processes. It also tackles the monumental discovery and description of microbes in the 1880s, a virtual cultural and medical reset. It is a complex topic riddled with competition (readers will find Koch's contempt of Pasteur—and vice versa—entertaining and educational, pp. 211–212), politics, and controversy. Chapter 10, "Illness, Disability, and the Struggle for Inclusion," a standout chapter, discusses polio but more broadly addresses how disability is one of the most overlooked social inequalities in health and disease research.

Some diseases are clearly punctuated by a certain period and make for obvious placement in the timeline of human culture and their relationships with that disease. The text is bookended by the Black Death, which occurred in the Medieval period, and HIV/AIDS, which rose to prominence in the late 20th century, but some of these diseases cannot be so easily sequestered into one specific time period. Tuberculosis, for example, has been a constant companion of our species for longer than complex societies have existed. Yet, one of the most nascent and pressing infectious threats at the turn of the 21st century is that of multi- and extensively-drug resistant tuberculosis. Hammond, however, effectively shows in each chapter that many infectious diseases traverse time and space and can be best understood with a holistic, critical perspective of their ultimate determinants and consequences. Specifically regarding tuberculosis (Chapter 6), Hammond writes that it is a "social disease that reflects *persistent inequalities* and hardships within a nation" (p. 263, italics added), for which it was originally "a disease of urban poverty that accompanied growing cities" and has since come "to reflect the fault lines of the global economy" (p. 264) in the 20th and 21st centuries.

The broad temporal depth with which each disease is discussed is also an effective way in which Hammond shows how scientific knowledge builds upon itself through time to make things once unknown or seemingly impossible into some of the most transformative moments in medicine. On Edward Jenner's (1749–1823) pivotal development of the smallpox vaccination technique, Hammond writes: "… it won the rapid acceptance from many, but it also inspired controversial questions that have echoes today: should governments be empowered to enforce an invasive procedure in the name of public health?" (p. 121). In light of the highly politicized nature of the COVID-19 vaccines in 2020–2021, this line is virtually prophetic. Hammond, however, goes on to show how this critical technology laid the groundwork for the future treatment and eradication of rinderpest using tissue culture technology (Chapter 7) to ultimately the wildly successful polio vaccine (Chapter 10).

This book is ideal for both undergraduate- and graduate-level history of medicine or anthropology of epidemics courses. The "Workshops" at the end of each chapter stand out as clear opportunities for students to learn historical archival methods, and they could pique the interest of students who had not previously realized what can be learned from primary documents. This book is structured as an educational textbook, but readers outside of academia seeking a thorough treatment of the major infectious disease epidemics in modern history (and there are sure to be many, given the high applicability of this text to the present moment) will find this book to be accessible, narrative-driven, and full of engaging visuals.

Readers who enjoy medical history and the intricate ways in which pathogens, culture, behavior, politics, and economics push and pull at each other will be happy to find that the field of anthropology, specifically those who study the impacts of disease and culture on population health, also addresses these questions (Armelagos et al., 2005; Singer & Clair, 2003). Much in the same way Hammond illustrates the through lines of major epidemic diseases, anthropologists have begun to make direct connections between ultimate determinants and consequences of the 1918 influenza and COVID-19 pandemics, illustrating parallel and related ways to approach this important and timely topic (van Doren, 2021). Ultimately, *Epidemics and the Modern World* is a masterful treatment of the complex relationship between humans and pathogens from a truly holistic perspective.

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BOOK REVIEW

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Critical Epidemiology and the People's Health

J. Breilh

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The prominent Ecuadorian critical epidemiologist, Dr. Jaime Breilh, has been proposing the theory of a “social determination of health” since the 1970s (Breilh, 1977, 1979). The idea that health is socially determined lies at the core of the Latin American Movement of Social Medicine/Collective Health, and is a notion that has influenced diverse health discourses and practices around the world. Breilh's proposal is born out a sound critique of the positivist, Cartesian, empiricist, functionalist, and biomedical epistemology of hegemonic epidemiology. From such critique arises a disruptive paradigm that invites us to rethink the promotion of life in the 21th century, in the context of a civilization that has ideologically normalized structural inequity. Breilh highlights how such inequity is rooted in cultures that promote greed and individualism, associated with a capitalist political economy that destroys nature and society. The English publication of *Critical Epidemiology and the People's Health* is a valuable opportunity to explore these important issues; to vindicate the theory of a social determination of health that emerged in Latin America; and to deepen and expand international academic dialogs. The text is structured in three substantive chapters.

The book's first chapter provides an essential historical and epistemological overview. Ideas by Breilh and his Latin American colleagues do not emerge from a historical vacuum. The author mentions several thinkers who influenced him. Among others, Ecuadorian anticolonial physician and writer Eugenio Espejo—and his equally combative and enlightened sister Manuela—in the 18th century; Chilean physician and socialist politician Salvador Allende (1930s–1970s); and reformist collectives from Brazil who coined and consolidated the concept of *collective health*, from the late 1970s–1980s. The influence of authors like Rudolf Virchow, Karl Marx, Max Weber, Georg Luckács, and Pierre Bourdieu, among several others, is apparent not only in this first chapter, but throughout the entire book. Breilh explicitly mentions three of his ethical and intellectual sources: the critique of capitalist political economy; feminist and gender studies; and the knowledge and struggles of indigenous movements. It is from these perspectives that Breilh conceives health as the dialectical interrelation of three dimensions: objectivity, subjectivity, and social practice. Health, he argues, is not an individual phenomenon, but a collective one, conditioned by power relationships in the context of unequal social stratification. Breilh provides an overview of the agendas that emerged from this conception of health, which include ruptures with hegemonic scientific epistemology, institutionalization, resistance to neoliberalism, and a deepening of interculturality and transdisciplinarity.

The second chapter explicates Breilh's thesis regarding the social determination of health. It begins by contextualizing its relevance in the 21st century given that a capitalist, neoliberal, oligopolistic, and unsustainable global order is still in force. Such order implies enormous challenges, which include climate change, neo-extractivism, urban–rural rupture, and the collapse of certain political utopias of a common good. Within such context, Breilh argues that what determines health is a simultaneous movement between three dimensions that are dialectically interconnected: a general dimension ("society": capitalist political economy and its cultural relations; a metabolism that constructs and mediates nature and society); a particular dimension (modes of living of concrete communities and collective patterns of vulnerability, shaped by social class, gender, and ethnicity); and an individual dimension (personal lifestyles; embodiments; pheno-genotypes; psychism). Connections between dimensions are linked to what the author calls "metabolism", which includes a "physical and chemical environment," and a "biotic ecological community" (p. 96). The main challenge of critical epidemiology, he argues, is "deciphering the essence and factual evidence of such connections" (p. 94). There are dialectical tensions and contradictions between the three dimensions, as well as subsumptions, or complex processes conditioning less complex ones, which results in metabolic processes that can be either protective and healthy, or destructive and unhealthy; and which also leave space for agency, autonomy, and resistance. Breilh criticizes hegemonic empirical models that, despite their sophistication (e.g., the linear analysis of the *causes of the causes*), ignore the dialectical essence of the social determination of health. He then calls us to build collective health through four dimensions (what he calls "the *four S's*"): sustainability; sovereignty; solidarity; and security of life. Each dimension includes various material, subjective, behavioral, organizational, and cultural–spiritual aspects.

In the third and final chapter, Breilh delves into the dialectical, intercultural and transdisciplinary nature of his proposal, delineating a sort of "critical methodology" (p. 148). He invites us to redefine concepts such as knowledge, interculturality, embodiment, and space (including cyberspace); to reject the operationalization of variables and risk factors as reified and fragmented entities; to acknowledge the dialectical interdependence between quantitative and qualitative aspects; and to transcend technocratic practices. Breilh criticizes knowledge claims based solely on the hegemonic utilization of statistics, as they may be "incomplete and frequently misleading" (p. 151). He argues that qualitative and mixed-methods designs that fail to break away from hegemonic epistemology can have the same limitations. Crucially, he critiques health policies based on instrumental analyzes of "social strata" (instead of dialectical analyses of social class) which can lead to a "cosmetic indicator mitigation instead of fighting for sound comprehensive transformative reform" (p. 161). In contrast, he invites us to a critical analysis that seriously considers inequity, social class, geography, and power (i.e. economic; political; cultural–epistemological; administrative; and scientific). Breilh mentions several practical applications of his theoretical–methodological approach; for example, the application of the concept of "social power concentration matrix" (p. 190); and a model and questionnaire of social insertion (p. 165). The chapter provides an enlightening epidemiological–critical analysis of dengue, through the use of a "critical process matrix" (p. 139) and the interpretation of "analytic nodes" (p. 143). Such case also illustrates what the author calls "deep prevention" (p. 206): a subversion of health promotion and prevention, leading to complex actions that challenge the very economic, political and cultural systems that make us ill.

By contrasting Breilh's proposal with other "social" approaches to health and wellbeing, readers will find both interesting convergences and radical ruptures. Some may be struck by the fact that the World Health Organization (2021) has not paid more serious attention to this well-established critical and dialectical perspective. Reasons for this are multiple and complex. The author interprets that Anglo-European academic work relegated his theory of social *determination*, advancing one of social *determinants* instead (e.g., Mamot & Wilkinson, 2006), and fitting it into the usual "neocausal paradigm" and "empiricist-functional mold" (p. 114). He suggests that, intentionally or not, "advanced scientific contributions and proposals from the South were bluntly ignored by the proponents of new materials from the North, in their Eurocentric spirit" (p. 118). It is never too late. The author calls us to intensify decolonial efforts, and advance horizontal international dialogs. Certainly, the publication of this book by *Oxford University Press* will be of help in materializing such call.

Many readers who are familiar with critical scholarly traditions will probably enjoy Breilh's book, which summarizes decades of work and collective struggles. For those less versed in such traditions, some of these radical ideas may seem, as Nancy Kreiger puts it in her preface, “as if they come from another planet” (p. xii). Nonetheless, the invitation for dialogues and action involves all of us, as the author argues for a deeply intercultural and metacritical project, possible only through the democratic participation of academics form diverse fields and regions; universities; and, specially, communities and collectives fighting for their rights. Breilh seems to suggest that such a project can find inspiration in the indigenous Andean concept of Sumak Kawsay (“Good Living”): a non-Cartesian approach to wellbeing, equity and sustainability (p. 198). Such a notion appears to be as important as ever in times of COVID-19, a pandemic that is also socially determined (p. 183). Perhaps, as can be read in the author's reference to Zapatista wisdom, this book can inspire us to build knowledge arising from “our collective heart” (p. 217). This is, after all, the same collective heart that sustains life and health in our planet.

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Critical Epidemiology and the People's Health (*Epidemiología Crítica y la Salud de los Pueblos*), J. Breilh Oxford, UK: Oxford University Press, 2021. ISBN 9780190492786 (hardback)/ISBN 9780190492809 (epub)

El Dr. Jaime Breilh, destacado epidemiólogo crítico ecuatoriano, viene proponiendo la teoría de una “determinación social de la salud” desde la década de los 1970s (Breilh, 1977, 1979). La idea de que la salud está determinada socialmente es fundamental dentro del Movimiento Latinoamericano de Medicina Social/Salud Colectiva, y es una noción que ha influido en diversos discursos y prácticas de salud en todo el mundo, de diferentes maneras. La propuesta de Breilh nace de una sólida crítica a la epistemología positivista, cartesiana, empirista, funcionalista y biomédica de la epidemiología hegemónica. De tal crítica surge un paradigma disruptivo que nos invita a repensar la promoción de la vida en el siglo XXI, en el contexto de una civilización que ha normalizado ideológicamente la inequidad estructural. Breilh destaca cómo tal inequidad tiene sus raíces en culturas que promueven la codicia y el individualismo, asociadas con una economía política capitalista que destruye la naturaleza y la sociedad. La publicación en inglés de *Critical Epidemiology and the People*'s *Health* es una valiosa oportunidad para explorar estos importantes temas; reivindicar la teoría de una determinación social de la salud surgida en Latinoamérica; y profundizar y ampliar diálogos académicos internacionales. El texto está estructurado en tres capítulos sustantivos.

El primer capítulo del libro proporciona una descripción histórica y epistemológica esencial. Las ideas de Breilh () y sus colegas en Latinoamérica no surgen de un vacío histórico. El autor menciona a varios pensadores que lo influenciaron. Entre otros, el médico y escritor anticolonial ecuatoriano Eugenio Espejo - y su igualmente combativa e ilustrada hermana Manuela - en el siglo XVIII; El médico y político socialista chileno Salvador Allende (1930-1970); y colectivos reformistas de Brasil que acuñaron y consolidaron el concepto de salud colectiva, desde finales de los setenta hasta los ochenta. La influencia de autores como Rudolf Virchow, Karl Marx, Max Weber, Georg Luckács y Pierre Bourdieu, entre varios otros, es evidente no solo en este primer capítulo, sino a lo largo de todo el libro. Breilh menciona explícitamente tres de sus fuentes éticas e intelectuales: la crítica de la economía política capitalista; estudios feministas y de género; y el conocimiento y las luchas de los movimientos indígenas. Es desde estas perspectivas que Breilh concibe la salud como la interrelación dialéctica de tres dimensiones: objetividad, subjetividad y práctica social. La salud, sostiene, no es un fenómeno individual, sino colectivo, condicionado por relaciones de poder en un contexto de estratificación social desigual. Breilh ofrece un panorama de las agendas que surgieron de esta concepción de la salud, que incluyen rupturas con la epistemología científica hegemónica, institucionalización, resistencia al neoliberalismo y una profundización de la interculturalidad y transdisciplinariedad.

El segundo capítulo explica la tesis de Breilh sobre la determinación social de la salud. Inicia contextualizando su relevancia en el siglo XXI, dado que aún se mantiene vigente un orden global capitalista, neoliberal, oligopólico y no sostenible. Dicho orden implica enormes desafíos, que incluyen el cambio climático, el neo-extractivismo, la ruptura urbano-rural y el colapso de ciertas utopías políticas en torno al bien común. En ese contexto, Breilh (2021) sostiene que lo que determina la salud es un movimiento simultáneo entre tres dimensiones dialécticamente interconectadas: una dimensión general ("sociedad": economía política capitalista y sus relaciones culturales; un metabolismo que construye y media naturaleza y sociedad.); una dimensión particular (modos de vida de comunidades concretas y patrones colectivos de vulnerabilidad, conformados por clase social, género y etnia); y una dimensión individual (estilos de vida personales; embodyments – corporalizaciones o encarnaciones - ; fenogenotipos; psiquismo). Las conexiones entre dimensiones se vinculan con lo que el autor denomina "metabolismo", que incluye un "entorno físico y químico", y una "comunidad ecológica biótica" (p. 96)[1]. El principal desafío de la epidemiología crítica, argumenta, es "descifrar la esencia y la evidencia fáctica de tales conexiones" (Breilh, p. 94). Existen tensiones y contradicciones dialécticas entre las tres dimensiones, así como subsunciones, o procesos complejos que condicionan a los menos complejos, lo que resulta en procesos metabólicos que pueden ser protectores y saludables, o destructivos y nocivos; y que también dejan espacio para la agencia, la autonomía y la resistencia. Breilh critica los modelos empíricos hegemónicos que, a pesar de su sofisticación (por ejemplo, el análisis lineal de *las causas de las causas*), ignoran la esencia dialéctica de la determinación social de la salud. Luego nos llama a construir salud colectiva a través de cuatro dimensiones (lo que él llama "*las cuatro S*"): sostenibilidad; soberanía; solidaridad; y seguridad de la vida. Cada dimensión incluye varios aspectos materiales, subjetivos, comportamentales, organizativos y culturales-espirituales.

En el tercer y último capítulo, Breilh profundiza en el carácter dialéctico, intercultural y transdisciplinario de su propuesta, delineando una suerte de "metodología crítica" (p. 148). Nos invita a redefinir conceptos como conocimiento, interculturalidad, *embodyment* y espacio (incluido el ciberespacio); a rechazar la operacionalización de variables y factores de riesgo como entidades reificadas y fragmentadas; a reconocer la interdependencia dialéctica entre aspectos cuantitativos y cualitativos; y a trascender prácticas tecnocráticas. Breilh (2021) critica el conocimiento basado únicamente en la utilización hegemónica de la estadística, ya que tales conclusiones pueden ser "incompletas y frecuentemente engañosas" (p. 151). Argumenta que los diseños cualitativos y de métodos mixtos que no logran romper con la epistemología hegemónica pueden tener las mismas limitaciones. De forma crucial, critica las políticas de salud basadas en análisis instrumentales de "estrato social" (en lugar de análisis dialécticos de clase social) que pueden conducir a una "mitigación cosmética de indicadores en lugar de luchar por una reforma transformadora integral sólida" (Breilh, p. 161). Por el contrario, nos invita a un análisis crítico que considere seriamente la inequidad, la clase social, la geografía y el poder (económico, político, cultural-epistemológico, administrativo y científico). Breilh (2021) menciona varias aplicaciones prácticas de su enfoque teórico-metodológico; por ejemplo, la aplicación del concepto de "matriz de concentración del poder social" (p. 190); y un modelo y cuestionario de inserción social (p. 165). El capítulo proporciona un esclarecedor análisis epidemiológico-crítico del dengue, a través del uso de una "matriz de procesos críticos" y de la interpretación de "nodos analíticos" (p. 143). Tal caso también ilustra lo que el autor llama "prevención profunda" (p. 206): una subversión de la promoción y prevención de la salud, conducente a acciones complejas que cuestionen los propios sistemas económicos, políticos y culturales que nos enferman.

Al contrastar la propuesta de Breilh con otros enfoques "sociales" sobre la salud y el bienestar, las y los lectores encontrarán interesantes convergencias y radicales rupturas. Algunas personas también podrían sentirse sorprendidas por el hecho de que la Organización Mundial de la Salud (2021) no haya prestado más atención a esta bien establecida perspectiva crítica y dialéctica. Las razones para ello son probablemente múltiples y complejas. El autor interpreta que el trabajo académico anglo-europeo relegó su teoría de la *determinación* social, avanzando una sobre *determinantes* sociales en su lugar (por ejemplo, Mamot & Wilkinson, 2006), y ajustándola al habitual "paradigma neocausal" y a un "molde empirista-funcional" (Breilh, p.114). Sugiere que, intencionalmente o no, "contribuciones y propuestas científicas avanzadas del Sur fueron abiertamente ignoradas por los proponentes de nuevos materiales del Norte, en su espíritu eurocéntrico" (p. 118). Nunca es demasiado tarde. El autor nos llama a intensificar esfuerzos decoloniales y avanzar diálogos internacionales horizontales. Ciertamente, la publicación de este libro por parte de Oxford University Press ayudará a materializar tal llamado.

Probablemente muchas lectoras y lectores familiarizados con tradiciones académicas críticas disfrutarán del libro escrito por Breilh, que resume décadas de trabajo y luchas colectivas. Para aquellos menos versados en tales tradiciones, algunas de estas ideas radicales pueden parecer, como lo expresa Nancy Kreiger en su prefacio, "como si vinieran de otro planeta" (p. Xii). Sin embargo, la invitación al diálogo y la acción nos involucra a todos y todas, pues el autor defiende un proyecto profundamente intercultural y metacrítico, solo posible a través de la participación democrática de académicos de diversos campos y regiones; universidades; y, especialmente, comunidades y colectivos que luchan por sus derechos. Breilh parece sugerir que tal proyecto puede inspirarse en el concepto indígena andino de Sumak Kawsay ("Buen vivir"): un enfoque no cartesiano del bienestar, la equidad y la sostenibilidad (p. 198). Tal noción parece ser tan importante como siempre en tiempos del covid-19, una pandemia que también está determinada socialmente (p. 183). Tal vez, como puede leerse en la referencia del autor a la sabiduría zapatista, este libro pueda inspirarnos a construir conocimientos que surjan de "nuestro corazón colectivo" (p. 217). Después de todo, se trata del mismo corazón colectivo que sustenta la vida y la salud en nuestro planeta.

Nota:

1. Todas las citas textuales han sido traducidas del inglés por el autor de la reseña

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