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## MEDIA & COMMUNICATION STUDIES | RESEARCH ARTICLE

# Health information seeking in the digital age: An analysis of health information seeking behavior among US adults

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**Abstract:** We live in a digital age and this has changed the landscape of health information. With the changing US demographic, otherwise acute diseases morphing into chronic diseases as a result of treatment advancements, and evolving health needs of the population, there is need for increase in available and accessible health information. It is estimated that one in three US adults use the internet to diagnose or learn about a health concern. Nevertheless, a nagging question is whether the Web is reducing or creating disparities in health information availability and use for making health decisions. This study examined factors associated with health information seeking from the internet, traditional media, and health care professionals among a diverse population of US adults. Data for the analysis was from four cycles (2011–2014) of the Health Information National Trends Survey (HINTS), a national survey of US adults. Controlling for age, race/ethnicity, gender, and socioeconomic status (SES), regression analyses were conducted. STATA 13 was used for analyses. Findings indicated that there is a possibility that while the Web is an easily available source of health information, it could also create inequalities in health information

### ABOUT THE AUTHORS

The authors' research area focus on chronic disease prevention across the lifespan. With the changing health information landscape, the authors wanted to examine what factors are associated with use of different sources of health information for protecting health and making health-related decisions. Findings from this work identifies numerous gaps that need to be researched and addressed as the US and many other developed countries transition to e-health. This study serves a foundation for the authors' future work and demonstrates the need for studies targeted at qualitatively addressing the nuances of health information seeking and comprehension among ethnic minorities. This is very essential especially given that minority health is increasingly becoming a public health concern.

### PUBLIC INTEREST STATEMENT

We live in a digital age that has changed the landscape of health information. People are living longer and with chronic diseases that require being up-to-date on their disease-specific health information. This changing health information landscape has increased the need for easily accessible health information such as is available on the Web. However, there are many people who do not possess the skill needed to search for information on the web or the devices required to assess the web. This study showed that while the Web is an easily available source of health information, it could also create inequalities in health information accessibility especially among the elderly, those with low income, minimal education, and of certain ethnicities. Many people still rely on alternative sources of health information such as personal networks, traditional media, and health care providers. Hence, the Web should not be considered a substitute for alternative health information sources. Doing so, might create disproportionate access to health information essential for health decisions.

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**Subjects:** Health Communication; Health and Social Care; Public Health Policy and Practice; Health Communication

**Keywords:** health communication; health information; information seeking behavior; health information seeking behavior; web; traditional media; healthcare professional

## 1. Introduction

It is no news that we live in a digital age. A study found that one in three US adults use the internet to diagnose or learn about a health concern (Fox & Duggan, 2013). This growth in internet use and increase in health information available on the web is changing the landscape of health information. Given that information is a valuable factor that mediates the relationship between social status and health, the changing health information landscape could potentially help reduce social inequalities in health (Link & Phelan, 1995; Rains, 2008). However, there is also a nagging question of whether the Web is reducing or perpetuating disparities in health information availability and use for making health decisions, especially if only those with access to alternative sources of health information are the same ones with access to online health information (Percheski & Hargittai, 2011).

Health information seeking behavior (HISB) refers to the ways in which individuals seek information about their health, risks, illnesses, and health-protective behaviors (Lambert & Loiselle, 2007; Mills & Todorova, 2016). Previous research on HISB have either focused only on health information seeking online or used a cross sectional research design approach. We add to this literature by examining, over a period of four years, what factors—including Internet skills, health status, overall health perception, cancer family history, socioeconomic, and individual factors—are associated with use of different sources of health information. We also report demographic (e.g. gender, educational level, and socioeconomic status (SES)) trends in HISB over the four year period.

Even though 86% of the US population are connected online, studies have found that there are still many people who prefer to use traditional media (such as library, books, brochure, magazines) or healthcare professionals as their primary source of health information (Baker, Wagner, Singer, & Bundorf, 2003; Cotten & Gupta, 2004; Dolan, Iredale, Williams, & Ameen, 2004; Dutta-Bergman, 2004, 2005; Rains, 2007). Trust, confidence in information source, and access are some of the main factors highlighted as motivators for preferring one source of information over the other (Rains, 2007). Studies have also showed that many of those who use these other (traditional media and health care professional) health information sources also turn to the internet as an alternative information source in order to gain a perspective different from what they read or heard from a traditional media source, from what they heard from a healthcare practitioner, or from an unsatisfactory doctor-patient interaction (Rains, 2007). The main advantages and attractions for health information seeking online have been found to include access, anonymity, potential for interactivity, and social support (Cline & Haynes, 2001).

Online HISB is explained by both psychological and social factors (Mills & Todorova, 2016; Wang, Viswanath, Lam, Wang, & Chan, 2013). Health anxiety, self-efficacy, internet-efficacy, and neuroticism have been identified as psychological factors that predict use of the internet/web for health information seeking (Eastin & Guinsler, 2006; Lagoe & Atkin, 2015). Social, demographic, and lifestyle factors linked to online health information seeking include being female, higher educational achievement, and age (Hesse et al., 2005; Lambert & Loiselle, 2007; Rains, 2008; Wang et al., 2013; Weaver et al., 2010).

A study of health information seeking behavior found that age, education, literacy, and accessibility had a positive influence on the use of library and print materials for seeking health information among this population (Gollop, 1997). With the advent of e-health and e-technologies, very few

recent studies have examined the characteristics of those who seek health information from sources other than the Web (such as traditional media, healthcare providers, and personal network). Thus, there is a paucity of studies examining the salient predictors of using traditional media sources or relying on healthcare professionals as a primary source of health information.

Beyond identifying psychological and social factors that influence use of one information source over another, it is important to examine the context in which health information seeking occurs (Lambert & Loiselle, 2007; Mills & Todorova, 2016). For example, an individual's HISB could be motivated by perception of their health, their current health status, and family health history. As Lagoe and Atkin (2015) indicated in their study, examining the influence of these antecedents to information seeking provides a more robust understanding of HISB among US adults.

An important component of preventive health practice is the provision and availability of information regarding risks to health and promotional measures for enhancing health status. With more people living longer and a changing US racial/ethnic demographic, there is a need to examine the factors (beyond socio-demographic characteristics) associated with use of the Internet, traditional media, or healthcare professional as sources of healthcare information. Hence, we aimed to fill this knowledge gap and further expand understanding of linkages between HISB and overall health perceptions, health status, and cancer family history and how, if at all, these associations have changed over a period of four years.

## 2. Methods

### 2.1. Data collection

The Health Information National Trends Survey (HINTS) is a biennial, cross-sectional survey used to assess the impact of the health information environment. HINTS is a nationally-representative sample of non-institutionalized US adults. "Specifically, HINTS measures how people access and use health information; how people use information technology to manage health and health information; and the degree to which people are engaged in healthy behaviors" (HINTS Report, 2017). For this study we used the four cycles in HINTS 4 to measure change over time in information seeking behaviors among the US population. Data collection for all four cycles was through mailed questionnaire. The following are the response rates for HINTS 4 iterations: HINTS 4 Cycle 1 (2011), 37%; HINTS 4 Cycle 2 (2012) 40%; HINTS 4 Cycle 3 (2013), 35%; and HINTS 4 Cycle 4 (2014), 37%. HINTS sample design was a 2-stage stratified sample with addresses selected from a comprehensive United States Postal Service national residential file, and individual respondents were selected per each household in the sample. More details on survey design, sampling strategies and methodology of the HINTS are published elsewhere (Finney et al., 2012; Nelson et al., 2004).

### 2.2. Measures

#### 2.2.1. Health information-seeking

To examine the different avenues through which health information can be obtained, participants were asked to report on "where they looked first," the most recent time they looked for information about health or medical topics. The original question had several options, but for the purposes of this study responses were recoded into four categories: Internet; Family and Friend/Co-worker; Health care professionals (doctor, complimentary practitioner); Traditional media (Books, Brochures, magazines, telephone info, and library). These categories were coded as binary variables, with a "0" indicating that participants did not use this source first and a "1" if they did.

The socio-demographic variables that were included in this study were participant age in years, income ranges, body mass index (BMI), education, gender, race/ethnicity and marital status. Other health-related variables analyzed were participants' current health condition, cancer family history and perception of overall health.

### 2.3. Analytic strategy

Several logistic regressions were conducted to assess the relationship between the demographic and independent variables on the use of the internet, family/friend/co-worker, healthcare professionals, and traditional media as a source of health information. After cleaning and preparing the data for analysis, it was observed that approximately 4% of the data was missing from each of the four cycles. As this is less than the 5% cut-off set forth by Little and Rubin, we can assume that the results are reliable. Jackknife adjustments using replicates of 50 were also included in each model to account for the type of survey.

## 3. Results

### 3.1. Social and demographic characteristics

Table 1 shows descriptive information for the sample across the four cycles. The majority of participants in the sample were female and white. Education level was recoded into four groups with the largest percentage of participants having a college degree. Socioeconomic status was also recoded with the largest percentage of participants having an income ranging from \$20,000 to \$74,999. For the purposes of the analyses and to understand the overall impact of education and SES, the original variables were used as ordinal variables. Finally, the majority of participants were in good health condition, although the majority also indicated a family history of cancer. Breakdown of the variables are presented in Table 1.

**Table 1. Descriptive information for participants in the Health Information National Trend Survey (HINTS) 4**

		Cycle 1	Cycle 2	Cycle 3	Cycle 4
<i>Gender</i>					
Male	<i>n</i>	1,552	1,390	1,197	1,424
	%	39.2	38.3	37.6	38.7
Female	<i>n</i>	2,304	2,172	1,906	2,184
	%	58.2	59.8	59.8	59.4
<i>White</i>					
Not white	<i>n</i>	878	799	729	841
	%	22.2	22.0	22.9	22.9
White	<i>n</i>	2,843	2,604	2,162	2,510
	%	71.8	71.7	67.9	68.3
<i>Black</i>					
Not black	<i>n</i>	3,064	2,747	2,306	2,676
	%	77.4	75.7	72.4	72.8
Black	<i>n</i>	657	656	585	675
	%	16.6	18.1	18.4	18.4
<i>Hispanic</i>					
Not hispanic	<i>n</i>	3,322	2,768	2,301	2,763
	%	83.9	76.3	72.2	75.1
Hispanic	<i>n</i>	461	511	511	540
	%	11.6	14.1	16.0	14.7
<i>Education</i>					
Less than a high school diploma	<i>n</i>	391	329	297	308
	%	9.9	9.1	9.3	8.4

(Continued)

**Table 1. (Continued)**

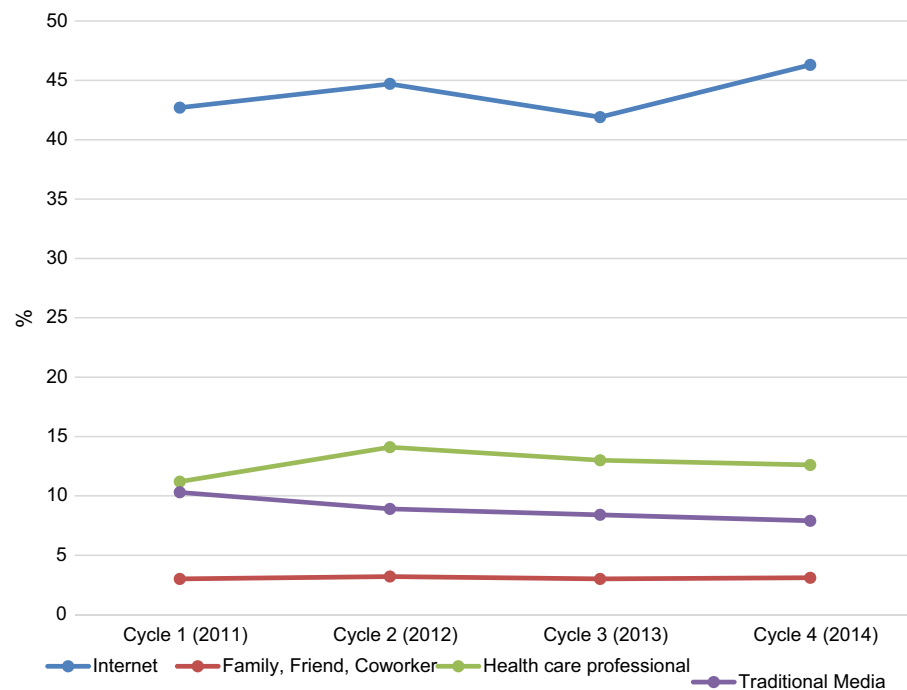
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
High school diploma	<i>n</i>	785	775	699	670
	%	19.8	21.3	21.9	18.2
Some college experience	<i>n</i>	1,167	1,057	933	1,090
	%	29.5	29.1	29.3	29.6
College graduate	<i>n</i>	1,531	1,380	1,167	1,458
	%	38.7	38	36.6	39.7
<i>Income</i>					
\$0 to \$19,999	<i>n</i>	896	837	763	844
	%	22.6	23.1	24	23
\$20,000 to \$74,999	<i>n</i>	1,863	1,631	1,382	1,676
	%	47.1	44.9	43.4	45.6
\$75,000 or more	<i>n</i>	1,114	1,043	882	1,102
	%	28.1	28.7	27.7	26.3
<i>Health condition</i>					
No cancer	<i>n</i>	3,382	3,135	2,676	3,106
	%	85.4	86.4	84	84.5
Cancer	<i>n</i>	563	464	459	542
	%	14.2	12.8	14.4	14.7
<i>Family history of cancer</i>					
No family history of cancer	<i>n</i>	928	870	761	909
	%	23.4	24	23.9	24.7
Family history of cancer	<i>n</i>	2,424	2,412	2,012	2,425
	%	61.2	66.4	63.2	66
<i>Internet skill</i>					
No internet skill	<i>n</i>	1,043	909	880	827
	%	26.3	25	27.6	22.5
Internet skill	<i>n</i>	2,914	2,720	2,284	2,802
	%	73.6	74.9	71.7	76.2
Age	<i>M</i>	53.95	53.86	54.68	55.11
	<i>SD</i>	16.55	16.5	16.48	16.37
	Min	18	18	18	18
	Max	99	96	105	98
Health perception	<i>M</i>	3.42	3.35	3.37	3.33
	<i>SD</i>	0.97	0.97	0.96	0.97

Notes: Cycle 1 (2011); Cycle 2 (2012); Cycle 3 (2013); Cycle 4 (2014).

### 3.2. Health information seeking trend

To examine HISBs over the four year period examined in this study, the percentage of participants using each of the sources of health information was plotted as shown in Figure 1. Overall, a greater percentage of participants reported using the internet as the first place they go for health information compared to family/friend/co-workers, health care professionals, and traditional media. This is especially true in cycle 4. Only a small percentage of participants reported using family/friends/coworkers for health information and this remained relatively constant across the four cycles. The use of health care professionals increased from cycle 1 to cycle 2 but declined across the final two cycles. Finally, the use of traditional media consistently declined across the four cycles.

**Figure 1. Participants' report of where they sought information first the most recent time they looked for information about health or medical topics.**



### 3.2.1. Health information seeking on the Internet

The overall models predicting use of the internet as a source of health information across age, race, education, gender, socioeconomic status, health condition (cancer status), family history of cancer, health perception, and internet skill variables were significant for the four cycles. The overall model fit for cycle 1 was  $\chi^2(11) = 594.27, p < .001$ ; cycle 2 was  $\chi^2(11) = 603.51, p < .001$ ; cycle 3 was  $\chi^2(11) = 483.59, p < .001$ ; and cycle 4 was  $\chi^2(11) = 555.34, p < .001$ . Across all four cycles, participants who were younger had higher SES and higher internet skills, and were more likely to report using online sources for health information. Education level also became significant ( $p < .05$ ) at cycle 2 and remained significant ( $p < .05$ ) through cycle 4. Participants with more education were more likely to use the internet as a source of health information. The odds ratio and significance are presented in Table 2.

### 3.2.2. Health information seeking from family, friend, and co-worker

The overall models predicting the use of family, friends, and co-workers as a source of health information across age, race, education, gender, socioeconomic status, health condition (cancer status), family history of cancer, health perception, and internet skill variables were significant for the four cycles. The overall model fit for cycle 1 was  $\chi^2(11) = 41.20, p < .001$ ; cycle 2 was  $\chi^2(11) = 55.05, p < .001$ ; cycle 3 was  $\chi^2(11) = 32.07, p < .001$ ; and cycle 4 was  $\chi^2(11) = 48.93, p < .001$ . Of the predictor variables, only internet skill was significant across the four cycles. Participants with less internet skill were more likely to use family, friends, and co-workers as a source of health information. In addition, gender was a significant ( $p < .05$ ) predictor in cycle 1. Female participants were less likely to use family, friends, and co-workers as a source of health information compared to male participants. Finally, education level and participants who identified as black became significant ( $p < .05$ ) predictors in cycle 4. Black participants were less likely to use family, friends, and co-workers as a source of health information compared to non-black participants. In addition, participants with more education were less likely to use family, friends, and co-workers as a source of health information. Odds ratios and  $p$ -values are presented in Table 2.

**Table 2. Multiple logistic regression models assessing trends in the determinants of health information seeking from different sources**

	Internet				Healthcare professional				Traditional media				Friends & family			
	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 1	Cycle 2	Cycle 3	Cycle 4
Age	0.96 ***	0.97 ***	0.98 ***	0.97 ***	0.97 ***	0.98 ***	0.97 ***	0.97 ***	1.03 ***	1.02 ***	1.01 *	1.02 ***	0.98	1.00	0.98	0.99
White	1.52	1.62	1.55	1.32	1.62	1.55	1.32	1.62	0.62	0.69	0.66	1.87	0.64	0.47	1.30	0.67
Black	0.98	1.03	0.89	0.79	1.03	0.89	0.79	1.03	0.92	0.94	0.69	1.97	0.80	0.60	1.89	0.34 *
Hispanic	0.91	0.76	0.86	0.79	0.76	0.86	0.79	0.76	1.11	1.47	1.29	1.07	0.89	1.23	0.59	0.64
Education Level	1.14	1.29 ***	1.19 *	1.32 ***	1.29 ***	1.19 *	1.32 ***	1.29 ***	1.07	0.94	0.94	1.14	0.87	0.78	0.93	0.61 ***
Gender	1.14	1.21	1.09	1.29 *	1.21	1.09	1.29 *	1.21	1.13	0.88	1.44	0.97	0.64 *	0.77	0.60	1.25
SES	1.06 *	1.07 *	1.13 **	1.09 **	1.07 *	1.13 **	1.09 **	1.07 *	0.93	0.95	0.86 ***	0.85 ***	0.96	0.93	0.92	1.02
Health condition	1.00	0.96	0.84	0.89	0.96	0.84	0.89	0.96	0.79	1.04	1.07	1.12	0.79	0.81	0.43	1.09
Family history of cancer	1.05	1.14	0.81	0.70 *	1.14	0.81	0.70 *	1.14	0.93	0.91	1.12	1.04	1.39	0.75	1.47	1.00
Health perception	1.11	1.07	0.89	1.00	1.07	0.89	1.00	1.07	0.91	0.96	1.01	0.93	0.94	0.91	1.14	1.05
Internet skill	12.31 ***	12.45 ***	23.69 ***	15.02 ***	12.45 ***	23.69 ***	15.02 ***	12.45 ***	0.30 ***	0.34 ***	0.23 ***	0.20 ***	0.29 ***	0.33 ***	0.26 ***	0.30 ***
Constant	0.30	0.17	0.20	0.30	0.17	0.20	0.30	0.17	0.24	0.22	0.43	0.10	0.93	1.26	0.28	0.89
R <sup>2</sup> /R <sup>2</sup>	0.22	0.23	0.25	0.22	0.23	0.25	0.22	0.23	0.10	0.09	0.13	0.14	0.06	0.08	0.06	0.07
χ <sup>2</sup> (df)	χ <sup>2</sup> (11) = 594.27 ***	χ <sup>2</sup> (11) = 603.51 ***	χ <sup>2</sup> (11) = 483.59 ***	χ <sup>2</sup> (11) = 555.34 ***	χ <sup>2</sup> (11) = 603.51 ***	χ <sup>2</sup> (11) = 483.59 ***	χ <sup>2</sup> (11) = 555.34 ***	χ <sup>2</sup> (11) = 603.51 ***	χ <sup>2</sup> (11) = 177.60 ***	χ <sup>2</sup> (11) = 130.15 ***	χ <sup>2</sup> (11) = 142.72 ***	χ <sup>2</sup> (11) = 178.37 ***	χ <sup>2</sup> (11) = 41.20 ***	χ <sup>2</sup> (11) = 55.0 ***	χ <sup>2</sup> (11) = 32.07 ***	χ <sup>2</sup> (11) = 48.93 ***

\*Significance level at  $p < 0.05$ .

\*\*Significance level at  $p < 0.01$ .

\*\*\*Significance level at  $p < 0.001$ .



### 3.2.3. Health information seeking from healthcare professionals

The overall models predicting the use of healthcare professionals as a source of health information from age, race, education, gender, socioeconomic status, health condition (cancer status), family history of cancer, health perception, and internet skill were significant across the four cycles. The overall model fit for cycle 1 was  $\chi^2(11) = 192.35, p < .001$ ; cycle 2 was  $\chi^2(11) = 213.68, p < .001$ ; cycle 3 was  $\chi^2(11) = 167.13, p < .001$ ; and cycle 4 was  $\chi^2(11) = 209.75, p < .001$ . Of the predictor variables, only age and internet skill were significant across the four cycles. Older participants and participants with less internet skill were more likely to use healthcare professionals as a source of health information. In addition, education level and gender were significant ( $p < .05$ ) predictors in cycle 1. Participants with less education and female participants were less likely to use healthcare professionals as a source of health information. Finally, white and Hispanic participants, gender, and family history of cancer became significant ( $p < .05$ ) in cycle 4. White participants were less likely to use healthcare professionals as a source of health information compared to non-white participants. In contrast, Hispanic participants were more likely to use healthcare professionals as a source of health information compared to non-Hispanic participants. Finally, female participants were less likely to use healthcare professionals as a source of health information compared to male participants, and participants with family history of cancer were more likely to use healthcare professionals. Odds ratios and  $p$ -values are presented in Table 2.

### 3.2.4. Health information seeking from traditional media

The overall models predicting the use of traditional media as a source of health information across age, race, education, gender, socioeconomic status, health condition (cancer status), family history of cancer, health perception, and internet skill variables were significant for the four cycles. The overall model fit for cycle 1 was  $\chi^2(11) = 177.60, p < .001$ ; cycle 2 was  $\chi^2(11) = 130.15, p < .001$ ; cycle 3 was  $\chi^2(11) = 142.72, p < .001$ ; and cycle 4 was  $\chi^2(11) = 178.37, p < .001$ . Of the predictor variables, only age and internet skill were significant across the four cycles. Older participants and participants with less internet skill were more likely to use traditional media as a source of health information. In addition, socioeconomic status became a significant ( $p < .05$ ) predictor in cycles 3 and 4. Participants from lower SES were more likely to use traditional media as a source of health information. Table 2 presents odds ratios for all the determinants.

## 4. Discussion

The current study examined what set of characteristics, including age, education, socioeconomic status, cancer family history, current health status, and perception of health are associated with HISBs among a sample of US adults. Findings from the study indicate that there is an age, socioeconomic, and ethnic divide among US adults' HISB. This finding is one supported by previous studies which have found that there are digital disparities in health information seeking especially with regards to age and SES (Lorence & Park, 2007; Massey, 2016; Rains, 2008). The study results also highlight that being younger, more educated, and having a higher SES were predictors of internet use for health information seeking (Tennant et al., 2015). Being older, having low internet skill, and being Hispanic were determinants of using a health care provider or traditional media, such as print and magazines, as source of health information. Having lower SES was also a determinant of using traditional media as a source of health information.

Contrary to previous studies that have shown that certain sub-populations might be disadvantaged with regards to internet use for health information (Lee, Boden-Albala, Larson, Wilcox, & Bakken, 2014), we did not find any association between race/ethnicity and health information seeking on the internet. This finding may be due, in part, to the study sample which is predominantly female and White. However, findings from this study indicate that having more education, higher SES, being younger, and having internet skill were factors associated with health information seeking on the internet. This finding further supports the notion that there is a digital disparity which is widening (Hargittai & Hinnant, 2008; Lorence & Park, 2007; Massey, 2016). The internet is a practical and cost efficient health information source and by the virtue of its ubiquity, it is expected to provide individuals, families, and caregivers access to information that otherwise might be inaccessible (Massey, 2016).



However, with this ongoing digital revolution, and the health sector relying increasingly on electronic health information and records, our findings suggest that, a vast majority of the US population with little education, lower SES, and low internet skill are at a disadvantage and not benefiting from the revolution. One of the implications of this finding is that although one of the main goals of making health information available online is to reduce the inequalities in health information accessibility and availability, the sole reliance of health practitioners on digital health information in a context of uneven diffusion of health technologies can perpetuate or increase inequalities. This is particularly the case if those who already have access to alternative sources of information are also the ones who are able to access online sources of health information (Weaver et al., 2009).

This study's findings also suggest that certain groups of people still rely on traditional media (e.g. print, magazines) for health information, despite the fact that use of print material is declining. Across the four waves (years) of the study, being older, having low SES and low internet skills were consistently associated with seeking health information from traditional media. This finding, supported by other studies (Cotten & Gupta, 2004; Rains, 2007), is concerning. The group of people who rely on this medium of health information (older people, low SES, and low internet skill) are those that are more likely to have health issues requiring up-to-date health information. Relying on a source of information rapidly going extinct and also more likely to be outdated presents a greater risk for their health and wellbeing. In addition, with the time and cost involved in updating and developing print materials, this group is further at a disadvantage especially with healthcare providers increasingly transitioning to internet technologies for disseminating cutting edge health information. Healthcare providers and organizations will do well to invest in developing culturally and linguistically appropriate print resources for this older population with low SES and low internet skill as they transition, howbeit slowly, to internet technologies for their health information.

Healthcare professionals have traditionally been the primary source of health information (Hesse et al., 2005). They served as gatekeepers in determining what health information their patients received. However, with the changing health information environment, the dynamic between patients and healthcare professionals is also changing. This study's findings show that only those who were older, with lower education level and lower internet skills used a health care professional as their primary source of health information. Further, in the fourth wave (2014), there were additional determinants (being White, being Hispanic, and having a family history of cancer) which became significantly associated with using healthcare professionals as a primary source of health information. The interesting contribution of this finding is that even with the abundance of health information on the web and alternative sources of health information, those with a cancer family history sought health information first from a healthcare provider. Although research evidence supports the notion that people turn to the internet as their first source of health information (Ayers & Kronenfeld, 2007; Cotten & Gupta, 2004; Nguyen & Bellamy, 2006), our findings indicate that those with higher risks of chronic diseases and conditions, such as cancer, rely on healthcare providers for health information. Given that there is an issue of trust in the accuracy of health information provided on the internet (Massey, 2016), our findings are not surprising or unexpected as supported by other studies (Niederdeppe et al., 2007; Talosig-Garcia & Davis, 2005). A possible explanation for this finding could be these groups of people might require technical details on risk assessment, prevention strategies, or treatment, and healthcare professionals are the most reliable source for this type of information. Nevertheless, with increasing patient advocacy, consumerism, and pharmaceutical companies' direct-to-consumer campaigns, the news media's increasing involvement in health and illness discussions, and rapidly evolving e-health technologies, there might be a change in this reliance on healthcare providers as the primary source of trusted health information especially for those with higher risks for certain diseases and conditions.

This study also examined the correlates of health information seeking from one's personal network (family, friends, and co-workers). Findings indicate that low internet skill was the only determinant consistently and inversely associated with seeking health information from personal networks. However, in the in the fourth wave (2014), there were additional determinants (being Black and low education level)

that were associated with health information seeking from one's personal network. This finding indicates that those with low internet skills, low level of education, and of Black ethnicity were less likely to rely on their personal networks for their health information. Although we are unable to determine what the correlates of seeking health information from personal networks are, one can infer that this finding offers a glimpse into the characteristics of those who do not rely on surrogate seekers (those who seek information on behalf of others) as their primary source of health information.

In sum, although online access to and use of health information can play a key role in effectively increasing people's knowledge and also help in health-related decision-making, findings from this nationwide data show that sub-populations may have more challenges in benefitting from online health information. Findings suggest that a particular group of people (i.e. those with more education, who are younger, have higher SES, and are more internet skilled) with access to alternative health information sources, such as a healthcare provider, is also able to take advantage of the health information available on the Web. This indicates that sole/heavy reliance on e-technologies for disseminating health information may increase the likelihood of further perpetuating health disparities. Thus, there is a need for interventions and efforts focusing on developing ways to reduce this digital disparity and perhaps design e-health information services targeted at older adults, those with lower SES, lower educational level, and lower internet self-efficacy. More research is also warranted to further explore the different sub-populations and the factors associated with their HISBs.

## 5. Limitations

This study is not without limitations. Most notably, it is not possible to infer causal relationships between constructs or items in the survey, because HINTS is a cross-sectional survey collected annually. Additionally, while researchers can examine trends over time at the national level for outcomes included in multiple iterations of the survey, one cannot assess change over time at the individual level. Also, given that the sample was predominantly female and White, it is possible that some associations could not be detected because of the lack of variability in the study sample.

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