Is Online Health Activity Alive and Well or Flatlining? Findings From 10 Years of the Health Information National Trends Survey

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ABBY PRESTIN[1,2], SANA N. VIEUX[1], and WEN-YING SYLVIA CHOU[1]

[1]*Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Rockville, Maryland, USA*
[2]*Office of Science, Center for Tobacco Products, U. S. Food and Drug Administration, Rockville, Maryland, USA*

The Internet increasingly enables diverse health communication activities, from information seeking to social media interaction. Up-to-date reporting is needed to document the national prevalence, trends, and user profiles of online health activities so that these technologies can be best used in health communication efforts. This study identifies prevalence, trend, and factors associated with seeking health information, e-mailing health care providers, and using social media for health purposes. Four iterations of HINTS survey data, collected in 2003, 2005, 2008, and 2012, were analyzed to assess population-level trends over the last decade, and current prevalence of Internet-based health communication activities. Sociodemographic and health correlates were explored through weighted logistic regression modeling. Findings demonstrated that Internet use has steadily increased, with 78% of U.S. adults online in 2012; however several digital divide factors—among them education, age, and race/ethnicity—still predict access. Once online, 70% of adults use the Internet as their first source for health information, and while 19% have e-mailed health care providers, engagement in health communication on social media is still relatively low. Distinct user profiles characterize each type of communication, with age, population density, and gender emerging as important predictors across online health activities. These findings have important implications for health communication research and practice.

Recent rapid advances in the online landscape have shaped the participatory media, characterized by interactivity and user-generated content, and have facilitated communication between and among individual users and health stakeholders. This new social communication age has revolutionized the context in which health information is communicated (Ratzan, 2011; Blake, Chou, Prestin, & Hesse, 2013). As peer-to-peer health communication grows, health researchers and practitioners are increasingly using this evolving communication environment for disease prevention and control, public health interventions, and patient support (Chou, Prestin, Lyons, & Wen, 2013). Thus, accurate, up-to-date knowledge of the prevalence, trends, and user profiles of health-related Internet use is needed to inform health communication agendas.

The current online environment facilitates numerous health communication opportunities. First, the Internet is a repository where people can search for health information for themselves or others (Fox & Duggan, 2013; Sadasivam et al., 2013). Although most individuals prefer to rely on physicians as first source for health information, they most frequently turn to the Internet when initiating a search, a tendency that has increased over time (Hesse et al., 2005; Hesse, Moser, & Rutten, 2010). Second, many health care systems have integrated information technologies, such as online patient portals and e-mail, into care delivery (McGeady, Kujala, & Ilvonen, 2008; Zhou, Kanter, Wang, & Garrido, 2010). Although not yet routine (Menachemi, Prickett, & Brooks, 2011), e-mail communication between patients and physicians is becoming more common, driven by patient age, education, and health status (Beckjord et al., 2007; Houston, Sands, Jenckes, & Ford, 2004). Third, the Internet facilitates the exchange of social support for patients and caregivers on numerous platforms, including blogs, social networking sites (hereafter SNS), and forums. These sites provide benefits such as anonymity, time and space independency, and access to heterogeneous peer groups with shared health concerns (Eysenbach, 2004).

National data indicate continued increases in Internet access (Fox & Duggan, 2013; Thackeray, Crookston, & West, 2013); however, findings on whether access is increasing equitably across populations are mixed. A digital divide (i.e., gaps in access to online technologies among social groups) persists in that lower socioeconomic status, minority race/ethnicity, older age, poorer health, and residence in geographically isolated locations are associated with lower

Address correspondence to Wen-ying Sylvia Chou, Health Communication and Informatics Research Branch, Division of Cancer Control and Population Sciences, National Cancer Institute, 9609 Medical Center Dr. 3E614, Rockville, MD 20892, USA. E-mail: chouws@mail.nih.gov

likelihood of Internet access (Chou, Hunt, Beckjord, Moser, & Hesse, 2009; Jackson et al., 2008; Jansen, 2010; Wang, Bennett, & Probst, 2011). These uneven patterns of Internet penetration can result in differential access to health information that could intensify health disparities (Richardson & Norris, 2010). Beyond access, sociodemographic factors and health literacy levels also influence Internet *use* (Sarkar et al., 2011), in what is termed the second-level digital divide (Hargittai & Hinnant, 2008). For example, racial/ethnic disparities in frequency of using online resources to obtain health information have been repeatedly identified (Laz & Berenson, 2013; Miller, West, & Wasserman, 2007; Nicholson, 2003).

Conversely, among Internet users, social media penetrate the population independent of factors commonly predicting the digital divide. Recent national estimates document that about 67% of the population participate in SNS and no differences by income, race/ethnicity, or health care access are apparent (Chou et al., 2009; Duggan & Brenner, 2012; Kontos, Emmons, Puleo, & Viswanath, 2010). Overall, younger age tends to be the most consistent predictor of social media use, including participation on SNS, online support groups, and blogs (Chou et al., 2009; Duggan & Brenner, 2012). Lastly, it is noteworthy that health-related factors can influence Internet use and online health communication. For example, poorer health and personal cancer experience predict both online support group use and e-mailing health care providers (Beckjord et al., 2007; Chou et al., 2009) and psychological distress predicts SNS use (Kontos et al., 2010).

As data on Internet user profiles continue to emerge, there is a need to understand characteristics of individuals engaging in health-related online interactions. Initial nationally representative data report that many online platforms may not yet be spaces where people congregate to discuss health (Fox, 2011). In particular, online adults are more likely to consume health content on social media than they are to contribute content (Thackeray et al., 2013).

Up-to-date evidence enables accurate mapping of this online health communication environment. In this article, data for selected online health communication variables from the first four iterations of HINTS data—HINTS 1 (2003), HINTS 2 (2005), HINTS 3 (2008), HINTS 4-Cycle 1 (2012; hereafter referred to simply as HINTS 4)—are analyzed to report on trends in online health communication. HINTS 4 data are also analyzed to report on the prevalence of online health communication activities, and identify sociodemographic and health-related factors associated with engagement in these activities.

Method

Data Source

Data from the first four iterations of the Health Information National Trends Survey (HINTS) were analyzed. Now in its 11th year, HINTS is a National Cancer Institute–sponsored, nationally representative survey of non-institutionalized U.S. adults that tracks the Americans' access to and use of health information and health-related knowledge, attitudes, and behaviors (Cantor et al., 2009; Finney Rutten et al., 2012). Details on survey design, sampling strategies, and response rates for HINTS 1, 2, and 3 are published elsewhere (Cantor et al., 2009; Davis, Park, Covell, Rizzo, & Cantor, 2005; Nelson et al., 2004). Table 1 summarizes key methodological information on HINTS administration across all iterations.

HINTS 4 data were collected between October 2011 and February 2012 using a mailed questionnaire ($N = 3,959$) using a comprehensive national listing of addresses from the United States Postal Service. Response rates from two respondent selection methods were 37.9% and 35.3%, and within-household response rate was 84.6%. The final response rate, determined by combining response rates across both respondent selection methods in proportion to the allocated sample, was 36.7%.

Table 1. HINTS administration across all four iterations

	HINTS iteration			
	HINTS 1 (2003)	HINTS 2 (2005)	HINTS 3 (2008)	HINTS 4-Cycle 1 (2012)
Dates survey was in the field	10/2002–04/2003	02/2005–08/2005	01/2008–04/2008	10/2011–02/2012
Mode(s) of data collection	RDD	RDD	RDD/Mail	Mail
Measures used in trend analysis included across HINTS iterations				
Internet use	✓	✓	✓	✓
First source of health/medical information: Internet			✓	✓
First source of cancer information: Internet	✓	✓	✓	
Use e-mail/Internet to communicate with a doctor or doctor's office	✓	✓	✓	✓
Participate in an online support group for people with a similar health or medical issue	✓	✓	✓	✓

Note. RDD = random digit dialing.
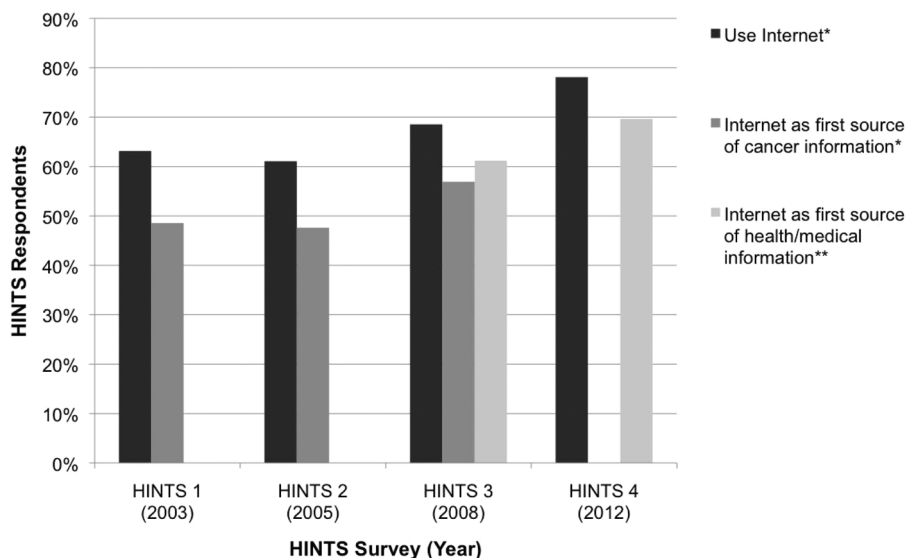
Fig. 1. Trends in Internet use, Internet as first source for cancer information, Internet as first source for health or medical information.

*Significant positive linear trend across all iterations.

**Significant change between HINTS 3 and HINTS 4.

Measures

Internet Use and Online Health Communication Activity

Internet use was assessed by asking respondents if they ever go online to access the Internet or World Wide Web, or to send and receive e-mail. Among online adults, the use of the Internet as their first source the most recent time they searched for either health information or cancer information was assessed (coded as Internet or other).[a] Internet users' interactive online health communication behavior was measured by asking whether they (a) use e-mail or the Internet to communicate with a doctor or doctor's office; (b) participate in an online support group for people with a similar health or medical issue; (c) visit an SNS, such as Facebook or LinkedIn, to read and share about medical topics; or (d) write in an online diary or blog about any type of health topic.

Sociodemographic and Health-Related Variables

Sociodemographics included gender, age, education, race/ethnicity, and population density (i.e., geographic residence in an urban area or a rural area). Health-related variables included general health, psychological distress, cancer experience, insurance status, and access to a regular health care provider. All items are available on the HINTS website (hints.cancer.gov).

Data Analysis

Data analysis was conducted with SUDAAN 10.0.1 and SAS 9.3. Data were weighted according to U.S. population estimates in the American Community Survey to provide

nationally representative estimates. Jackknife replicate weights were computed to obtain accurate variance estimates. Respondents from the same household were assigned to the same replicate weights to account for clustering within the primary household sampling unit and address nonindependence of responses.

Internet use, Internet as the first source for seeking either health/medical information or cancer information, e-mailing or using the Internet to contact a health care provider, and online support group participation were separately examined for significant changes overtime. Trend data were not available for health-related SNS use or blogging. To test for trends, we combined data points from four iterations on the following variables: Internet use, online support group participation, and e-mailing a doctor, integrating sampling variables and weights from all iterations. HINTS 3 used a dual-frame design, including random digit dialing and mailed questionnaires (Cantor et al., 2009). A cross-tabulation with chi-square of mode of administration for Internet use revealed statistical, but not meaningful, mode effects, while there was no significant mode effect for online support group participation and e-mailing a health care provider. Since no gold standard reference value exists to compare the differences against, combined data and composite sample and replicate weights from HINTS 3 (the average of the two modes) were used for the combined HINTS 1–4 data file (combined $N = 23,588$) for trend analysis.

Use of the Internet as the first source of cancer information was trended from HINTS 1 to HINTS 3. A *t*-test assessing mode effects revealed no significant difference; thus, combined data and composite sample and replicate weights were used for the combined HINTS 1–3 data file (combined $N = 19,629$). Use of the Internet as the first source of health/medical information was combined across HINTS

[a] In HINTS 1 and 2, a single item focuses specifically on cancer information seeking; in HINTS 3, two single items separately assess cancer information seeking and general health information seeking; in HINTS 4, a single item assesses general health information seeking.

3 and HINTS 4 using the mail sample and replicate weights to create the combined HINTS 3–4 data file (combined $N = 7,541$). A t test assessed significant change in Internet as the first source of health/medical information between HINTS 3 and HINTS 4.

Using HINTS 4 data, cross-tabulations, chi-square tests of association, and regression analyses were conducted for online health communication outcomes by sociodemographic and health-related variables. Specifically, multivariable logistic regression analyses were run to examine independent associations of predictor variables on (a) Internet use, (b) Internet as first source of health/medical information, (c) using e-mail or the Internet to communicate with health care providers, (d) participating in an online health-related support group, (e) using SNS for health communication, and (f) blogging about health. Missing data were recoded as missing. Significance was determined at an alpha level of .05.

Results

Trend and Prevalence of Internet Access and Health Information Seeking

The proportion of U.S. adults who reported using the Internet has significantly increased since 2003, $F(1, 196) = 168.49$; $p < .0001$. In 2012, approximately 78% reported having Internet access, a figure consistent with other recent estimates of Internet use (Fox & Duggan, 2013). The proportion of U.S. adults who used the Internet as a first source for cancer information significantly increased from 2003 to 2008, $F(1, 916) = 10.61$, $p = .0014$. Similarly, there was a significant increase in Internet as the first source of health information between 2008 and 2012, with 70% U.S. adults turning first to the Internet to seek health information in 2012 (see Figure 1).

Factors Associated With Internet Use

Bivariate (chi-squared) analyses and multivariate logistical regression models were conducted to identify and predict sociodemographic and health-related factors associated with Internet use (see Table 2).

Consistent with previous literature, a number of sociodemographic factors predicted Internet use, including younger age, higher education, and non-Hispanic White race/ethnicity. In contrast, health and health care–related factors—including cancer experience, psychological distress, health insurance, and regular health care provider—were not significantly associated with Internet use.

Trend and Prevalence of Health-Related Internet Use

Trend analyses indicated a significant, positive linear trend in the past decade for e-mailing health care providers, $F(1, 196) = 124.07$, $p < .0001$, but not for online support group participation (see Figure 2).

In 2012, the most common interactive health communication activity in which online adults engaged was e-mailing doctors online (19%), followed by communicating about health on SNS (17%), participating in online support groups (5%), and blogging about health (3%).

Table 2. Weighted sample characteristics and multivariate logistic regressions of Internet users in HINTS 4

Sample characteristics	Internet users ($N = 2,914$; 78.10%)	
	Weighted frequencies	Multivariable OR (95% CI)
Age (years)	$p < .001$	$p < .001$
18–34	90.02%	1.00
35–49	86.97%	0.46 (0.21–1.03)
50–64	76.60%	0.15 (0.07–0.30)
65–74	59.74%	0.08 (0.04–0.16)
75+	30.59%	0.02 (0.01–0.04)
Gender	$p = .21$	$p = .21$
Female	79.83%	1.00
Male	77.65%	0.80 (0.57–1.14)
Education	$p < .001$	$p < .001$
Less than high school	44.32%	0.12 (0.06–0.24)
High school graduate	64.19%	0.32 (0.23–0.44)
Some college	86.92%	1.00
College graduate or more	94.14%	2.66 (1.70–4.16)
Race/ethnicity	$p = .003$	$p < .001$
Non-Hispanic White	81.52%	1.00
Non-Hispanic Black	71.74%	0.48 (0.32–0.71)
Hispanic/Latino	74.93%	0.41 (0.24–0.68)
Non-Hispanic other[a]	78.23%	0.32 (0.14–0.73)
Rural-urban designation	$p = .14$	$p = .05$
Urban	78.76%	1.00
Rural	74.57%	0.64 (0.41–0.99)
General health status	$p < .001$	$p = .05$
Excellent/very good	84.98%	1.00
Good	75.64%	0.69 (0.43–1.10)
Fair/poor	64.79%	0.55 (0.34–0.90)
Psychological distress	$p = .69$	$p = .26$
Normal	80.03%	1.00
Mild	79.88%	1.35 (0.82–2.21)
Moderate	78.82%	1.85 (0.91–3.79)
Severe	75.67%	1.15 (0.60–2.17)
Cancer experience	$p < .001$	$p = .90$
Personal or family cancer experience	64.06%	1.00
Family cancer experience only	81.93%	0.98 (0.63–1.52)
No cancer experience	75.87%	0.93 (0.64–1.34)
Health insurance	$p = .61$	$p = .64$
Yes	79.10%	1.00
No	76.96%	1.15 (0.63–2.10)
Regular health care provider	$p = .88$	$p = 0.57$
Yes	78.58%	1.00
No	78.19%	0.88 (0.55–1.40)

[a]Other includes American Indian, Asian American, Pacific Islander, Native Hawaiian, Alaskan Native, and multiple races mentioned.

Factors Associated With Health-Related Internet Use

Given the distinct nature of each online health activity under investigation, we conducted separate bivariate and multivariate logistic regression analyses the each outcome (see Table 3). Each model adjusted for age, sex, education,
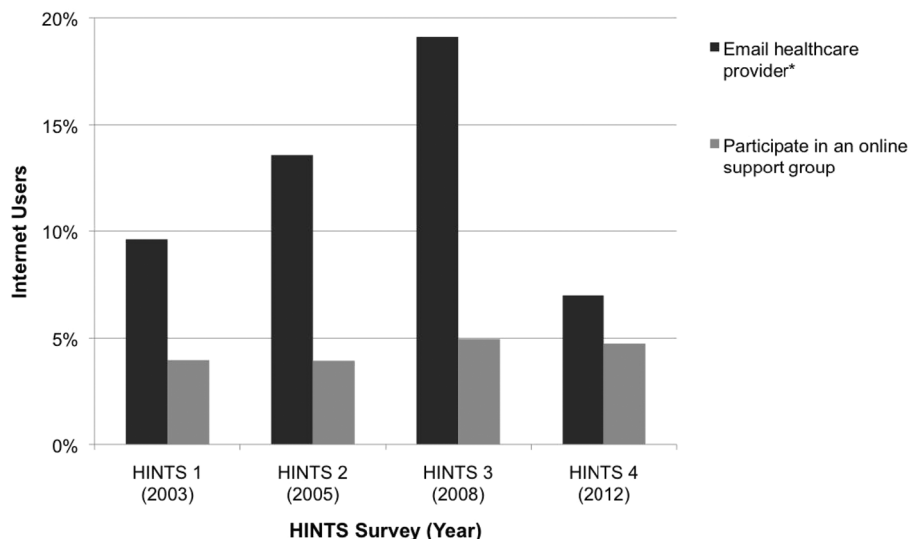
Fig. 2. Trends in e-mailing health care providers and participating in online support groups.
*Significant positive linear trend across all iterations.

race/ethnicity, population density, general health status, and cancer experience. Because covariates were chosen based on their significance in the bivariate associations, models for e-mailing doctors and Internet as the first source for health/medical information also included health insurance and regular health care provider.

Internet as First Source of Health Information
Among Internet users, age was significantly associated with using the Internet as a first source for health information ($p < .001$), as each younger age stratum increased the odds of Internet use as the first source of health information. Education was also significantly associated with this outcome ($p < .001$), but conversely, increases in each education stratum were linked to greater odds of Internet use as the first source of health information. Race/ethnicity was a significant predictor ($p < .001$), as non-Hispanic Black respondents ($OR = 0.61$, 95% CI [0.39, 0.96]) and non-Hispanic respondents of other racial/ethnic backgrounds ($OR = 0.50$, 95% CI [0.28, 0.90]) were less likely to use the Internet as their first source or health information compared with non-Hispanic white respondents.

Using E-Mail or the Internet to Communicate with Health Care Providers
Among Internet users, education was linked to the likelihood of e-mailing or contacting health care providers online: compared with those with a college degree or more, those with only some college education were less likely to use online technology to contact doctors ($OR = 0.59$, 95% CI [0.39, 0.89]). Rural residents were less likely than urban residents to e-mail providers ($OR = 0.47$, 95% CI [0.28, 0.78]). Health care factors also mattered: Internet users without a regular health care provider were less likely to e-mail physicians than those with a regular provider ($OR = 0.57$, 95% CI [0.41, 0.80]) and those who rated their health as fair/poor are 1.44 (95% CI [0.60, 3.45]) times more likely to contact

their providers online than those who reported excellent health. Health insurance status and gender had borderline significant associations with this outcome.

Participation in Online Health-Related Support Groups
Among Internet users, adults in rural areas were less likely than those in urban areas to participate in online health-related support groups ($OR = 0.35$, 95% CI [0.13, 0.94]). Education was an overall significant factor ($p < .0001$), such that adults with less than a high school diploma had a 0.09 (95% CI [0.02, 0.40]) times lower odds of participating in online support groups than those with at least a college degree. However, the other levels of education did not reach statistical significance. Cancer experience was also a significant factor: compared with those with a personal or family cancer experience, those without personal or family cancer experience had a 0.25 (95% CI [0.09, 0.65]) times lower odds of participating in an online support group.

Health-Related Social Networking Site Use
Male Internet users had a lower likelihood of using SNS for health ($OR = 0.57$, 95% CI [0.33, 0.99]). In addition, age was a significant predictor: each younger age stratum increased the odds of using SNS for health. Education was overall significantly associated with health-oriented SNS use ($p = .03$). Specifically, adults with some college education had a 1.66 (95% CI [1.14, 2.43]) times greater odds of health-related SNS use than adults with a college degree or more. However, the other levels of education did not reach statistical significance.

Blogging About Health
Among Internet users, men had a 0.23 (95% CI [0.09, 0.60]) times lower odds of blogging about health topics than did women. Age was also significantly associated with this outcome ($p < .0001$): each younger age stratum increased the odds of blogging about health.

Table 3. Multivariate logistic regressions for online health communication activities among Internet users in HINTS 4

	Using Internet as first source of health information		Emailing doctor		Participating in online support group		Using social networking sites		Blogging about health	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Age (years)		**<0.001**		0.13		0.19		**0.002**		**0.000**
18–34	1.00		1.00		1.00		1.00		1.00	
35–49	0.50 (0.28–0.88)		0.72 (0.47–1.11)		0.80 (0.28–2.30)		0.63 (0.40–0.99)		0.39 (0.18–0.84)	
50–64	0.36 (0.20–0.64)		0.75 (0.48–1.17)		0.41 (0.14–1.17)		0.43 (0.26–0.72)		0.25 (0.11–0.54)	
65–74	0.15 (0.08–0.26)		0.82 (0.44–1.51)		0.64 (0.22–1.88)		0.25 (0.13–0.50)		0.15 (0.03–0.71)	
75+	0.06 (0.03–0.11)		1.39 (0.59–3.26)		0.3 (0.00–36.28)		0.23 (0.05–1.01)		0.10 (0.05–0.22)	
Gender		0.14		0.05		0.16		**0.04**		**0.004**
Female	1.00		1.00		1.00		1.00		1.00	
Male	0.97 (0.72–1.31)		0.70 (0.49–1.00)		0.52 (0.21–1.30)		0.57 (0.33–0.99)		0.23 (0.09–0.60)	
Education		**<0.001**		**<0.001**		**<0.001**		**0.03**		0.70
Less than high school	0.19 (0.10–0.39)		0.34 (0.11–1.09)		0.09 (0.02–0.40)		2.53 (0.67–9.46)		1.79 (0.41–7.72)	
High school graduate	0.46 (0.29–0.75)		0.38 (0.26–0.57)		1.29 (0.35–4.72)		1.02 (0.53–1.97)		0.83 (0.27–2.56)	
Some college	0.51 (0.37–0.71)		0.59 (0.39–0.89)		1.24 (0.60–2.56)		1.66 (1.14–2.43)		1.31 (0.50–3.45)	
College graduate or more	1.00		1.00		1.00		1.00		1.00	
Race/ethnicity		**<0.001**		0.45		0.64		0.62		0.69
Non-Hispanic White	1.00		1.00		1.00		1.00		1.00	
Non-Hispanic Black	0.61 (0.39–0.96)		0.66 (0.35–1.24)		0.72 (0.33–1.56)		1.50 (0.61–3.69)		1.03 (0.26–4.08)	
Hispanic/Latino	0.79 (0.45–1.37)		0.90 (0.47–1.72)		1.86 (0.31–11.01)		0.91 (0.38–2.16)		0.68 (0.14–3.26)	
Non-Hispanic other[a]	0.50 (0.28–0.90)		1.46 (0.76–2.80)		1.15 (0.32–4.17)		0.68 (0.31–1.52)		1.90 (0.46–7.94)	
Population density		0.05		**0.004**		**0.04**		0.58		0.25
Urban	1.00		1.00		1.00		1.00		1.00	
Rural	0.59 (0.41–0.84)		0.47 (0.28–0.78)		0.35 (0.13–0.94)		1.14 (0.71–1.84)		0.53 (0.18–1.57)	
General health status		0.11		**0.04**		0.29		0.90		0.44
Excellent/very good	1.00		1.00		1.00		1.00		1.00	
Good	0.85 (0.64–1.12)		1.45 (1.09–1.95)		1.42 (0.80–2.51)		1.08 (0.69–1.68)		1.48 (0.75–2.93)	
Fair/Poor	0.59 (0.35–0.99)		1.44 (0.60–3.45)		2.26 (0.39–12.89)		1.17 (0.58–2.33)		0.72 (0.26–1.99)	
Cancer experience		0.94		0.18		**0.01**		0.60		0.06
Personal or family cancer experience	1.00		1.00		1.00		1.00		1.00	
Family cancer experience only	1.29 (0.86–1.94)		0.86 (0.55–1.34)		0.81 (0.40–1.66)		0.78 (0.44–1.38)		0.33 (0.12–0.91)	
No personal or family cancer experience	1.09 (0.70–1.69)		1.25 (0.73–2.13)		0.25 (0.09–0.65)		0.90 (0.45–1.81)		0.24 (0.06–0.92)	
Health insurance		0.45		0.05							
Yes	1.00		1.00							
No	1.54 (0.81–2.93)		0.50 (0.25–0.99)							
Regular health care provider		0.36		**0.002**							
Yes	1.00		1.00							
No	1.05 (0.72–1.52)		0.57 (0.41–0.80)							

[a]Other includes American Indian, Asian American, Pacific Islander, Native Hawaiian, Alaskan Native, and multiple races mentioned.
Bold indicates statistically significant p values.

Discussion

Consistent with recent publications, findings demonstrate continued increases in Internet use. In addition, the Internet is becoming the first resource for health and medical information for an increasingly larger proportion of the population, and more online adults are e-mailing health care providers. There are distinct user profiles for each type of interactive online health communication; these results are discussed below.

Shifting Patterns of Internet Access

Patterns of Internet use are changing: while in 2008, sociodemographic factors such as population density and gender provider predicted access, they were not significant in 2012 (Chou et al., 2009; Wang et al., 2011). Moreover, health-related factors previously linked to Internet use, such as general health, health insurance status, cancer experience, and having a regular health care provider, did not predict Internet use, suggesting that health care access disparities do not mirror disparities in access to online health information. This observation is promising for efforts utilizing online platforms for disease prevention and control.

Despite these changes, Internet access remains patterned by race/ethnicity, age, and education. These gaps are consequential given that populations most likely to lack access to information technology are also subject to disparities in health outcomes (Agency for Healthcare Research and Quality, 2011). Policies and infrastructure to expand Internet access are needed to reduce these gaps; this includes the development of equitable broadband access across the country (Federal Communications Commission, 2010). Moreover, the proliferation of mobile technology, including smart phones, may narrow access inequity, particularly as online health content increasingly becomes mobile compatible (Jaeger, Bertot, Thompson, Katz, & DeCoster, 2012; Smith, 2012).

The observed inequalities in Internet access have public health implications. Despite opportunities for the Internet to enhance health communication outreach, multifaceted strategies are needed to connect populations less likely to be online with important health information. For example, the Internet may be the best platform to reach young adults with messages about drug abuse or sexual health, but should be only one of several channels used to communicate colorectal cancer screening information to older adults. Another strategy may involve partnering with younger adults who can serve as *information surrogates* that pass along health messages to older adults in their social networks. As the online environment continues to develop, research is necessary to understand how individuals make use of online health resources so that health promotion efforts can be designed to better meet their needs.

Low Prevalence of Online Health Communication Activities

Whereas increases in online health information seeking and e-mailing doctors were observed over the past decade,

participation in health-related online support groups did not significantly increase and prevalence of other online health communication activities was low. Although Pew data showed 67% of U.S. adults using social media, HINTS 4 found that only 17% of online adults were communicating on SNS about health, with participation in health blogs or online support groups even lower. The overall low prevalence and the absence of an upward trend may temper enthusiasm for the utility of social media for health communication.

Several factors might account for this relatively low prevalence. First, SNS, like Facebook, primarily sustain contact with existing friends, family, and acquaintances (Ellison, Steinfield, & Lampe, 2007), making SNS similar to "digital living rooms" and challenging the utility of generic health messaging on SNS. Conversely, given that most individuals prefer physicians as their first source for health information (Hesse et al., 2005, 2010), and that doctor-patient e-communication is on the rise, inclusion of disease prevention messages in provider e-mails could be an effective messaging strategy. Second, although online support group participation remains low, this may be partly attributable to the increase in patient-driven online health communities (e.g., patientslikeme.com). These sites combine Web 2.0 features—forums, blogs, profiles, photo and data sharing—to support multifaceted health dialogue among individuals with chronic disease.

User Characteristics Associated With Online Health Communication Activities

With few exceptions, health-related variables were not associated with online health communication. This finding diverges from research documenting the influence of health status and psychological distress on support group participation (Chou et al., 2009), the link between having a regular health care provider and health-related SNS use (Thackeray et al., 2013), and the association between cancer experience and e-mailing doctors (Beckjord et al., 2007). Although race/ethnicity predicted use of the Internet as the first source of health information, Internet users were equally likely to engage in health communication across all four interactive online channels regardless of race/ethnicity. A recent review of Web 2.0 health interventions found few programs targeted to the needs of underserved groups (Chou et al., 2013), indicating the need to connect diverse racial and ethnic groups with online health communication programs.

In contrast, age, education, gender, and population density emerged as predictors across multiple outcomes. Of note, younger age increased the odds of using SNS and blogs for health, consistent with reports describing Millennials (individuals born after 1980) as a generation that embraces digital technology and outpaces older adults in almost every type of Internet use (Taylor & Keeter, 2010). Yet, younger age did not predict e-mailing doctors, a departure from the literature (Beckjord et al., 2007; Houston et al., 2004) that may signify a shift in clinical health care communication.

With regard to the influence of gender on online health communication, women remained more likely to engage in

health-related blogging and SNS use, yet men were equally likely to contact doctors online and to participate in online health support groups. This represents a shift from previous literature documenting the tendency of men to be less likely to seek help (Galdas et al., 2005). The online environment could be mitigating these gender differences. For example, although women are more likely to participate in face-to-face support groups (Owen, Goldstein, Lee, Breen, & Rowland, 2007), features of online support groups (e.g., anonymity) may allow men to feel comfortable seeking support.

Online respondents in urban environments were more likely than those in rural regions to e-mail doctors and participate in online support groups. This finding is perhaps counterintuitive, as rural areas are often medically underserved and their residents may benefit most from online health communication tools. However, it could be that even online resources, such as support groups and health care providers, are linked to local health care facilities, and consequently more widely available to urban residents. As an example, rural hospitals continue to adopt electronic health record systems—which typically include capabilities to e-mail health care professions—more slowly than other types of hospitals (DesRoches, Worzala, Joshi, Kralovec, & Jha, 2012). Scholars have argued that access to accurate health information, health literacy training, and support from those with similar health conditions can improve quality of life for rural residents with chronic illness (Merten, Walsh-Childers, Rodman, Young, & Birchwood, 2013; Wilson, Baker, Brown-Syed, & Gollop, 2000); accordingly, greater efforts to connect these populations to health care services and support resources online is critical. Furthermore, theoretical frameworks, such as diffusion of innovations (Rogers, 2003), can be brought to bear in research seeking to better understand adoption and use of online health communication tools in rural communities.

Limitations

This study does have some notable limitations. First, HINTS is a cross-sectional survey that does not allow for causal inferences about observed relationships. Second, the response rate, though comparable with other national surveys, is relatively low—a common challenge in survey research. HINTS administrators have taken steps to boost response rates and protect against biases stemming from modality, coverage, and sampling (Cantor et al., 2009; Finney Rutten et al., 2012). Third, recall bias and differential comprehension can influence the accuracy of self-reported Internet usage. However, this study's prevalence estimates of Internet and social media penetration are consonant with the literature, and estimates from HINTS data are generally more conservative compared with online market surveys. Fourth, item interpretation can influence Internet usage figures. For example, respondents' backgrounds (e.g., generational differences in Internet experience) may influence perceptions of the Internet as an information source or a medium for communication, potentially resulting in differential understandings of the same survey item and variation on particular data points. This issue speaks to the benefit of

both continued cognitive testing of online health communication items and of complementary methods (e.g., observation, ecological momentary assessment) to supplement surveys. Fifth, in covering a wide breadth of topics, HINTS inevitably sacrifices depth on any given topic to limit respondent burden. This study is constrained by single-item assessments of online health activity, which do not capture the multidirectional nature of engagement and omit common online activities (e.g., watching videos, sharing photos). Last, this analysis does not address important topics, such how individuals assess online health information accuracy and whether or not they act on the information they receive. These and other open questions offer directions for future research.

Conclusions

This analysis provides up-to-date information on health-related Internet activities. The findings offer several implications for health communication scholars and practitioners. Whereas Internet and social media penetration continue to rise throughout the United States, health-related Internet use does not appear to be keeping pace. The digital divide, while becoming more nuanced, continues to affect online information access, with education as a major predictor of health-related online communication. Complementary large- and small-scale quantitative and qualitative data will continue to bring the evolving communication environment into focus so that public health experts can leverage its features to reach diverse populations with targeted health communication programs and interventions.

Acknowledgments

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