

Health-related Internet use among cancer survivors: data from the Health Information National Trends Survey, 2003–2008

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Received: 4 January 2011 / Accepted: 26 March 2011 / Published online: 20 April 2011
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Abstract

Introduction Increasing prevalence of Internet and new technologies are changing the communication pattern for patients and caregivers across the cancer care continuum. To date, little is known on how cancer survivors in the USA utilize the Internet for health-related purposes. This knowledge is crucial in developing effective communication programs to achieve quality and equitable cancer care.

Methods Data from 2003, 2005, and 2008 iterations of the NCI-sponsored Health Information National Trends Survey (HINTS) were analyzed to: (1) compare health-related Internet use (hereafter HRIU) between individuals with and without a cancer diagnosis, (2) report trends, prevalence, and user profiles of HRIU, including support group participation, emailing provider, buying medicine online, and cancer information seeking on the Internet. Descriptive

analyses and weighted multivariate logistic regression analyses were performed.

Results While Internet penetration is growing over the years across the USA, cancer survivors access the Internet at a lower rate than general population (49.4% to 56.4% vs. 63.1% to 66.3%). Once on the Internet, they are more likely to use it for health-related purposes. Disparities in Internet access persists, as higher likelihood of Internet access is associated with younger age, higher education, non-Hispanic White race/ethnicity, metropolitan residence, and better self-rated health. On the other hand, among Internet-accessing survivors, socio-demographic, and health factors do not play a significant role in determining the pattern of HRIU.

Conclusions The study identifies an increasing trend in HRIU among survivors, though the digital divide remains in Internet access. The findings also point to opportunities for narrowing the divide and using Internet to better serve survivors' needs, as individuals from wide-ranging backgrounds and experiences are equally engaging in health-related activities on the Internet.

Implications for survivors To increase equity and effectiveness in communication and cancer care, Internet access, functions, and technology literacy are important factors to be considered.

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Keywords Internet · Web 2.0 technologies · Cancer survivors · Cancer communication · Health behavior

Introduction

Over the past decade, the Internet and Web 2.0 technologies have changed the way cancer patients and caregivers interact with health information and engage in their care.

In addition to searching for health information online, individuals are participating in online health-related activities, including participating in online support groups, blogs, and social networking sites, purchasing medication, and emailing their physician [1–3]. With the growth of Internet-based communication, it is important to identify how individuals who have had a cancer diagnosis (hereafter simply referred to as cancer survivors) use the Internet for health-related purposes. We are beginning to see survey data showing the trend of health-related information needs and communication pattern among survivors and those with chronic illnesses [2]. For example, a recent study by the Pew Internet Project and the California HealthCare Foundation found that differences in health-related Internet use (HRIU) exist for individuals with chronic diseases, compared to others. Specifically, individuals with chronic diseases are “among the least likely to have Internet access, yet once online they often dive deeply into gathering, sharing, and creating health information” [3]. Among cancer survivors, data suggest increasing HRIU in all age and socio-economic groups [4]. Moreover, while survivors generally express a preference for receiving health information from their healthcare providers, they report using the Internet as a first and primary source of health information [5–7].

Recent research has documented how HRIU changes throughout the cancer care continuum from diagnosis to survivorship. It is found that newly diagnosed patients use the Internet primarily to gather information about cancer, to help understand their diagnosis and make sense of information provided by their doctors, to find out about available test and treatment options, and to make anonymous inquiries and seek second opinions in order to make treatment decisions [4, 8–12]. Once treatment has been initiated or concluded, survivors report using the Internet to look up for treatment side effects and long-term outcomes, obtain information about complementary and alternative therapies, participate in support groups and chat rooms to share experiences and gain support and assurance, and purchase medical products [4, 8, 10, 13]. In terms of the types of health-related activities survivors engage in on the Internet, a small number of studies have documented specific Internet-based activities [14]. Among them, online support groups have been most extensively reviewed, though the intervention studies have yielded mixed results in efficacy and effectiveness [15]. Emailing with physicians has shown to be desired by cancer survivors; however, despite expressed enthusiasm, only a small proportion of survivors have reported using email to communicate with their physicians [16–18]. Furthermore, purchasing cancer-care products online has been noted, though there is little data on its use by cancer survivors.

Another area of focus in the advent of the health information is the clinical impact of survivors' HRIU.

Current literature points to increased patient empowerment and engagement due to HRIU. For example, Bylund et al. found that sharing online health information has been associated with survivors experiencing higher involvement in decision making, greater satisfaction with treatment choices, improved coping skills, and reduced anxiety [19]. In addition, online health information has been found to empower survivors to discuss information with their providers and meet their psychological needs; and discussions of online health information have been shown to positively affect the patient–provider relationship [19–21]. However, one caveat to note is that in spite of these advantages, a survey revealed that 62% of survivors reported sometimes or never discussing Internet information with their healthcare providers [19].

The above findings point to several tendencies about the use of the Internet among cancer survivors. First, in addition to being an information source, the Internet serves as a gateway to services and support throughout cancer care [7, 11]. It also suggests that the nature of HRIU is driven by individuals' health status. Most importantly, types of HRIU must be separately examined in addition to overall Internet penetration when considering how Internet-based communication efforts may be designed and implemented to inform and support individuals affected by cancer. To this end, nationally representative data is urgently needed to provide up-to-date report on the trend and user profiles of cancer survivors' health-related Internet use.

Using three iterations of the Health Informational National Survey (HINTS 2003, 2005, 2008), this study aims to: (1) compare HRIU between cancer survivors and those without a cancer diagnosis; and (2) report trends, prevalence, and user profiles of HRIU, including online support group participation, emailing physicians, and purchasing medications online among cancer survivors.

Methods

Data source

We use data from three iterations of the National Cancer Institute's HINTS administered in 2003, 2005, and 2008 respectively. The HINTS is a nationally representative, general population survey of non-institutionalized adults in the USA. The survey's broad aims are to assess the American public's use of health-related information and cancer-related knowledge, attitudes, and behaviors to inform social scientists and program planners about current health communication usage across populations, and to assist in developing effective health communication strategies [22]. Minorities were oversampled and data were

weighted to represent the non-institutionalized US adult population [23].

The sample designs for the HINTS 2003 and 2005 were random-digit dialing (RDD) of telephone interviews, resulting in nationally representative samples of US households. During the household screener, one adult aged 18 years or older was sampled from each household and recruited for the extended interview. For HINTS 2003, 6,369 respondents completed the interview. The household screener response rate was 55% and the extended interview response rate was 60.1%, yielding an overall response rate of 33.1%. HINTS 2005 had a sample of 5,586; response rates for the household screener and extended interview were 34% and 61.3%, respectively, yielding an overall response rate of 20.8%.

In an effort to address dropping RDD response rate, HINTS 2008 used a dual-frame design with mixed mode data collection (telephone and mail). In addition to RDD, a second frame used a national listing of addresses available from the United States Postal Service. The RDD frame, collected using computer-assisted telephone interview (CATI), resulted in 4,092 interviews. Response rate for household screener was 42.4%, and 57.2% for extended interview, resulting in an overall RDD response rate of 24.2%. Under the address frame it had a final sample size of 3,582. The household response rate was 40% and the within household response rate was 77.4%, resulting in an overall response rate of 31%. Further details around survey design and operations have been published elsewhere [23].

Study variables

The study population for this report includes cancer survivors across three survey years, defined as those who answered “Yes” to the question, “Have you been diagnosed as having cancer?”. Study variables included cancer survivors' prevalence of Internet use, three HRIU (i.e., communicating with doctors, buying medicine, and participating support group) and the use of Internet as the first source for cancer information. Internet use was measured by response to the question, “Do you ever go online to access the Internet or World Wide Web, or to send and receive e-mail?” Among those whose responses was “Yes”, health-related online activities were measured by response to the following questions: “In the past 12 months, have you done the following things while using internet: Used e-mail or the Internet to communicate with a doctor or a doctor's office? Bought medicine or vitamins on-line? Participated in an on-line support group for people with a similar health or medical issue?” Finally, using Internet as the first source of cancer information was measured by two questions posed to individuals who reported using the Internet: (1) “Have you ever looked for information about

cancer from any source?” (2) Respondents who answered “Yes” were then asked, “The most recent time you looked for information on cancer, where did you look first?” Responses mentioning “the Internet” were considered using Internet as first source for cancer information.

We included the following socio-demographic variables in our study: age, gender, race/ethnicity, education, and metropolitan status. Age was categorized into three groups: 18–49, 50–64, and 65+. Race/ethnicity included four categories: Hispanic, non-Hispanic White, non-Hispanic Black, and other non-Hispanic. Education level was classified into three categories: high school degree or less, some college, Bachelor's degree or above. We also included four health-related variables in our study: self-rated general health (excellent/very good/good/fair/poor), distress level (Yes or No, measured by a summed score of six-item assessment of depressive symptoms borrowed from the National Health Interview Survey, 1997, Adult Core Questionnaire), health insurance coverage (Yes or No), and time since diagnosis of cancer was classified into four categories: less than 1 year, 2 to 5 years, 6 to 10 years, and 11 plus years.

Analytic methods

We combined HINTS data from the three iterations into one data set. Given that HINTS 2008 contains dual modes of administration (RDD and mail), we tested potential mode differences for all of the Internet-related outcome variables. No significant mode effect was found at $\alpha=0.01$ level. Thus, we included both RDD and mail samples from HINTS 2008 in the combined data. A new set of sample weights (with 150 jackknife replicate weights) was created for the combined dataset following the examples in Rizzo et al. [24]. The weighted combined data represent non-institutionalized US adult population during the time period of 2003 to 2008. To calculate the correct variances, we analyzed with the full HINTS combined sample and used the SUBPOP statement in SUDAAN to restrict the specific domains the calculations were based on.

To accommodate the complex sampling design of HINTS and to utilize the full sample and replicate weights, analyses were conducted using SUDAAN, version 9.0.1 (Research Triangle Institute, Research Triangle Park, NC, USA). Both descriptive statistics and logistic regression results were produced. Missing values including “refusals” or “don't know” of our four outcome variables were excluded from the analyses. To preserve sample size and reduce potential bias, missing values for each covariate were treated as a separate category in the logistic regression analyses and were not interpreted in the results.

Prevalence of each analysis variable was produced by survey year and trend analysis was further performed. We

also compared the prevalence of each analysis variable with and without age adjustment between the cancer survivors and two other types of respondents: not diagnosed with cancer but have family members diagnosed with cancer; not diagnosed with cancer and no family members diagnosed with cancer using the combined data. *T* statistics was used to test for significant differences. We then compared the socio-demographic characteristics and four health-related variables of cancer survivors between Internet users and non Internet users using the combined data. Chi-square tests were conducted to test for independent associations between HRIU and socio-demographic characteristics and health-related factors. Finally, we used binary logistic regression to examine cancer survivors' reported use of the Internet (Yes/No), emailing doctors (Yes/No), buying medicine online (Yes/No), participating online support groups (Yes/No), and cancer information seeking behavior. Covariates were survey year, age, gender, race/ethnicity, education, metro status, self-rated general health, distress level, health insurance coverage, and time since diagnosis.

Results

We begin with descriptive characteristics of cancer survivors stratified by self-reported Internet usage. As shown in Table 1, approximately half of cancer survivors surveyed in HINTS reported having ever accessed the Internet. The majority of Internet-using survivors are non-Hispanic white (86%), live in metropolitan areas (82%), have good self-rated general health (78%), have insurance coverage (92%), and do not suffer from psychological distress (92%). Comparing survivors who reported using the Internet to those who don't, we find that with the exception of gender, insurance coverage, and length of time since diagnosis, all of the characteristics included in the analysis are significantly associated with Internet use.

We further examined the prevalence and trend of Internet and four forms of HRIU among cancer survivors. Table 2 presents the prevalence estimates by survey year and the trend analysis results. Overall, over half of the sampled cancer survivors ($n=2631$) reported using the Internet. HRIU remained mostly in the teens in proportion among Internet-using survivors. Over half of Internet-using survivors who searched for cancer information reported using the Internet as the first source. In terms of trend across survey years, an age-adjusted analysis showed a significant increase in Internet use as well as in the prevalence of emailing doctors and buying medicine online. Support group participation, on the other hand, did not increase but rather experienced a dip in 2005. Internet cancer information seeking also did not show a significant increase across survey years.

How do cancer survivors differ with others in terms of their Internet use and HRIU? We compared survivors' prevalence of these behaviors to individuals with family members as cancer survivors, and those with no personal history of cancer. The results are reported in Table 3. We found that cancer survivors are less likely to report Internet access (~51% as compared to ~69% and ~58%). However, among those who reported accessing the Internet, the odds of survivors engaging in health-related activities online were persistently highly than the other groups (an average of 13% reported emailing the doctors as opposed to 10% and 9%; 15% reported buying medicine online as opposed to 12% and 10%; 6% reported participating in a support group as opposed to 4% and 3%). In terms of cancer information seeking, despite the high prevalence estimate, survivors are less likely to use the Internet as first source of cancer information as compared to the other groups.

Concerned that the comparison of crude estimates may not be reliable given the average older age of cancer survivors compared to the other groups, we further conducted an age-adjusted comparison to ascertain differences in Internet use. The only difference in the comparison was on online medicine purchase, where the difference between survivors and the other two groups disappeared after age adjustment.

Finally, we conducted multivariate logistic regression analyses to identify factors associated with outcome variables. The results are presented in Table 4. First, higher odds of Internet use are associated with younger age, being non-Hispanic White, higher education, metropolitan residency, and better self-reported health. Among Internet-accessing survivors, higher odds of emailing a doctor are predicted by a later survey year, younger age, higher education, and worse self-reported health. Online purchase of medicine is only predicted by later survey year, whereas online support group participation is predicted only by poorer self-reported general health and the 2005 year dip in reported participation. Moreover, the use of the Internet as the first source of cancer information is predicted by being of younger age, higher education, and 2–5 years since diagnosis. Finally, contrary to previous studies on the differential pattern of HRIU along the cancer care continuum, time since a cancer diagnosis did not play a significant role in the regression model for all types of HRIU except for the variable using Internet as first source of cancer information.

Discussion

This study described the prevalence and trend of health-related Internet use among cancer survivors, compared their usage with other Americans, and examined the socio-demographic and health-related factors associated with HRIU. Several key findings have potential implications

Table 1 Characteristics of cancer survivors stratified by internet use (3 years combined)

Characteristic	Total ^a (n=2,637)	Internet users (n=1,379)	Non-Internet users (n=1,252)	p value ^b from Chi-square test
	n (weighted%)	n (weighted%)	n (weighted%)	
Age				<0.0001
18–49	461 (23.4)	350 (32.8)	111 (13.6)	
50–64	798 (31.9)	552 (40.1)	244 (23.1)	
65+	1,191 (37.2)	436 (23.5)	751 (51.6)	
Missing	187 (7.54)	41 (3.6)	146 (11.7)	
Gender				0.5931
Male	919 (40.7)	497 (41.5)	419 (39.9)	
Female	1,718 (59.3)	882 (58.6)	833 (60.2)	
Race/ethnicity				0.0015
Hispanic	111 (4.7)	46 (3.2)	65 (6.3)	
Non-Hispanic White	2,187 (80.5)	1,198 (86.3)	986 (74.7)	
Non-Hispanic Black	142 (6.45)	58 (4.3)	84 (8.8)	
Other non-Hispanic races	104 (4.3)	42 (3.5)	60 (5.0)	
Missing	93 (4.0)	35 (2.8)	57 (5.2)	
Education				<0.0001
High school or less	1,012 (46.7)	294 (28.4)	714 (65.8)	
Some college	719 (26.7)	423 (32.7)	296 (20.5)	
Bachelor's degree or higher	851 (24.0)	645 (37.4)	205 (10.1)	
Missing	55 (2.6)	17 (1.5)	37 (3.7)	
Metropolitan status				0.0001
Metro	2,087 (79.0)	1,146 (82.7)	936 (75.0)	
Non-metro	550 (21.0)	233 (17.3)	316 (25.0)	
Self-rated gender health				<0.0001
Excellent/very good/good	1,894 (67.4)	1,111 (78.3)	781 (56.1)	
Fair/poor	688 (30.1)	250 (20.2)	435 (40.3)	
Missing	55 (2.6)	18 (1.5)	36 (3.5)	
Insurance coverage				0.2515
Yes	2,424 (90.7)	1,275 (92.1)	1,145 (89.4)	
No	146 (6.2)	78 (5.7)	67 (6.7)	
Missing	67 (3.1)	26 (2.2)	40 (3.9)	
Distressed				0.0001
Yes	160 (6.8)	63 (5.2)	96 (8.5)	
No	2,377 (88.8)	1,284 (92.5)	1,090 (85.3)	
Missing	100 (4.33)	32 (2.3)	66 (6.2)	
Time since cancer diagnosis				0.0526
Less than 1 year	333 (14.7)	176 (13.5)	157 (16.1)	
2 to 5 years	643 (25.7)	366 (28.8)	277 (22.5)	
6 to 10 years	508 (18.9)	266 (18.0)	241 (19.8)	
11+ years	1,098 (39.1)	552 (38.6)	541 (39.5)	
Missing	55 (1.6)	19 (1.2)	36 (2.1)	

^a There were six survivors who had missing internet use status. They were only included in the total column.

^b The Chi-square test is to test the independence between the characteristics and internet use status. A p value less than 0.05 means the given characteristics and internet use status are significantly associated.

for communication researchers, clinicians, and public health practitioners serving cancer survivors. First, mirroring the broader population, the digital divide persists in Internet penetration among cancer survivors. After adjusting for age, survivors without Internet access are more likely to be

racial/ethnic minorities, less-educated, non-metropolitan residents, and report worse general health. All of these attributes suggest a more vulnerable population. This finding further confirms the current digital divide literature, citing the association between access to technology (i.e.,

Table 2 Internet access and health-related Internet use in cancer survivors: Prevalence estimates (95% Confidence Interval) and trend across years

Activity	Variable description	2003 (n=761)	2005 (n=872)	2008 (n=998)	A significant trend? ^a
Internet use ^b	Internet access	49.4 (44.9, 54.0)	49.3 (45.2, 53.3)	56.9 (53.3, 60.5)	Yes (p=0.0002)
Health-related activities among internet users ^c	Emailing doctors	9.4 (6.3, 12.5)	14.6 (10.3, 18.9)	16.4 (12.7, 20.2)	Yes (p=0.0206)
	Buying medicine online	11.4 (7.7, 15.1)	14.5 (10.2, 18.7)	22.3 (8.2, 26.3)	Yes (p=0.0022)
	Support group	8.8 (4.6, 13.0)	3.5 (1.8, 5.3)	8.1 (4.6, 11.5)	Yes (p=0.0176)
Cancer information seeking	From any sources ^c	80.6 (75.8, 85.4)	80.0 (74.9, 85.0)	77.6 (73.6, 81.6)	No (p=0.4505)
	Internet as the first source ^d	51.7 (45.7, 57.8)	48.7 (41.7, 55.7)	52.0 (46.9, 57.1)	No (p=0.5736)

^a Age was adjusted for linear trend testing

^b Among all cancer survivors

^c Among all cancer survivors who are internet users

^d Among all cancer survivors who are internet users and have ever searched cancer information from any sources

Internet) and socio-demographics, health status, and health literacy levels [3, 25, 26]. Movement towards technologically enhanced and Internet-based cancer information communication must seriously consider the risk of further disenfranchising a vulnerable population with little or no connection to the Internet. To this end, large-scale improvements in technology infrastructure also play a key role in enabling technology accessibility, reducing cost and barriers, and increasing equitable mobile and broadband connection across the population. On the other hand, among survivors who responded that they do have access to the Internet, the study's findings point to a very different picture than the digital divide phenomenon. First, in the multivariate regression models, we found no statistical racial/ethnic and education-level differences in general HRIU patterns with the exception of emailing the providers. The lack of racial/ethnic differences in specific health-related Internet usage echoes previous findings on participation in social media and health information seeking online [3, 27]. One exception is that higher education is associated with likelihood of emailing the providers, after

controlling for the other study variables. The independent association with patients' education attainment suggests that efforts to facilitate Internet-based patient-provider communication must carefully consider the target client's preference and Internet usage pattern in addition to system-level issues from the providers' end.

Thirdly, in spite of the rapid surge in Internet access and social media, the HINTS survey over the three iterations suggests that the use of Internet for health-related purposes remain relatively low and keep at a steady rate among cancer survivors as well as the general US population. For instance, among Internet-using cancer survivors, prevalence of emailing doctors and participation in support group hovered approximately around 10–16% and 4–8%, respectively. The minor changes suggest that while overall Internet and social media usage is increasing and projected to continue growing, more data is needed to ascertain the extent to which the Internet is being used for health-related purposes, particularly for those with chronic illnesses. This knowledge is crucial in informing the design and implementation of social media-based health and cancer control interventions.

Table 3 Comparison of cancer survivors, those with family members as cancer survivors, and those with no personal history of cancer: prevalence estimates (95% CI) of Internet access and HRIU (3 years combined)

Activity	Variable description	Cancer survivors (A)	Family with cancer (B)	Not diagnosed and have no family with cancer (C)	Significant difference between A and B or A and C?
Internet use ^a	Internet access	51.2 (48.8, 53.7)	69.4 (68.2, 70.5)	58.9 (57.1, 60.7)	Y
Health related activities among internet users ^b	Emailing doctors	13.3 (11.0, 15.5)	10.4 (9.5, 11.3)	9.0 (7.7, 10.4)	Y
	Buying medicine online	15.5 (13.2, 17.9)	12.7 (11.8, 13.5)	10.4 (8.9, 11.9)	Y
	Support group	6.6 (4.7, 8.5)	4.3 (3.6, 5.0)	3.3 (2.6, 4.0)	Y
Cancer information seeking	From any sources ^b	79.5 (76.8, 82.3)	56.9 (55.3, 58.4)	34.7 (32.5, 36.9)	Y
	Internet as the first source ^c	50.7 (47.0, 54.3)	63.8 (61.8, 65.7)	65.3 (61.2, 69.4)	Y

^a Among all cancer survivors

^b Among all cancer survivors who were internet users

^c Among all cancer survivors who were internet users and had ever searched cancer information from any sources

Table 4 Multivariate logistic regression of cancer survivors' health-related Internet activities in the past 12 months

	Internet use ^a	Health-related online activity ^b			Ever seeking cancer information ^c
		Emailing doctors	Buying medicine online	Support group participation	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Survey year					
2003	1	1	1	1	1
2005	0.9 (0.6, 1.2)	1.7 (1.0, 3.1)	1.3 (0.7, 2.4)	0.4 (0.2, 0.8)	0.9 (0.6, 1.3)
2008	1.3 (0.9, 1.8)	2.1 (1.2, 3.5)	2.3 (1.3, 3.8)	1.0 (0.4, 2.1)	1.0 (0.7, 1.5)
Age					
65+	1	1	1		
50~64	4.9 (3.7, 6.6)	1.7 (1.0, 3.1)	1.2 (0.7, 1.8)	1.4 (0.6, 3.2)	1.8 (1.1, 2.8)
18~49	8.7 (5.7, 13.3)	1.9 (1.2, 3.2)	1 (0.6, 1.7)	1.4 (0.6, 3.5)	2.3 (1.3, 4.2)
Gender					
Female	1	1	1	1	1
Male	1.1 (0.9, 1.4)	1.1 (0.7, 1.7)	1.2 (0.9, 1.8)	0.8 (0.4, 1.6)	1.0 (0.6, 1.5)
Racial/ethnic					
Hispanic	1	1	1	1	1
NH White	2.6 (1.4, 4.9)	0.6 (0.2, 1.7)	1.3 (0.2, 8.8)	1.2 (0.1, 11.9)	1.3 (0.6, 2.9)
NH Black	1.0 (0.5, 2.0)	0.4 (0.1, 1.7)	0.7 (0.1, 8.5)	0.9 (0.1, 11.2)	2.0 (0.7, 5.7)
Other NH races	2.0 (0.9, 4.5)	1.0 (0.2, 4.6)	1.4 (0.1, 24.1)	1.1 (0, 27.5)	1.5 (0.4, 5.1)
Education					
High school or less	1	1	1	1	1
Some college	3.3 (2.5, 4.4)	2.1 (1.1, 3.9)	1.1 (0.6, 1.9)	1.1 (0.5, 2.6)	1.3 (0.8, 2.2)
Bachelor's degree or higher	7.3 (5.2, 10.2)	3.1 (1.6, 6.1)	1.2 (0.8, 2.0)	1.2 (0.5, 2.8)	1.7 (1.1, 2.4)
Metro status					
Non-metro	1	1	1	1	1
Metro	1.5 (1.1, 2.0)	1.4 (0.6, 2.9)	0.8 (0.5, 1.4)	0.8 (0.3, 1.8)	0.7 (0.5, 1.1)
Self-rated general health					
Fair/poor	1	1	1	1	1
Excellent/very good/good	2.3 (1.7, 3.2)	0.5 (0.3, 0.9)	0.8 (0.5, 1.2)	0.4 (0.2, 0.8)	1.5 (1.0, 2.4)
Insurance coverage					
No	1	1	1	1	1
Yes	1.6 (0.9, 2.8)	1.2 (0.3, 4.3)	3.8 (0.9, 16.0)	0.7 (0.1, 5.8)	0.9 (0.4, 1.9)
Distressed					
No	1	1	1	1	1
Yes	1.2 (0.7, 1.9)	0.5 (0.2, 1.4)	0.5 (0.2, 1.2)	0.4 (0.1, 1.1)	0.5 (0.2, 1.1)
Time since diagnosis of cancer					
11+years	1	1	1	1	1
6 to 10 years	0.8 (0.6, 1.2)	1.1 (0.6, 2.0)	0.9 (0.6, 1.6)	1.4 (0.5, 3.7)	1.5 (1.0, 2.3)
2 to 5 years	1.1 (0.7, 1.6)	0.8 (0.5, 1.4)	0.8 (0.5, 1.4)	1.3 (0.6, 2.8)	1.7 (1.2, 2.4)
Less than 1 year	0.7 (0.5, 1.0)	1.1 (0.5, 2.4)	0.9 (0.5, 1.8)	1.2 (0.5, 2.7)	1.5 (0.9, 2.5)

^a Among all cancer survivors

^b Among all cancer survivors who were Internet users

^c Among all cancer survivors who were Internet users and had ever searched cancer information from any sources

We noted also that for cancer survivors included in the survey, the variable “time since diagnosis” does not affect Internet access and most forms of health-related Internet use. This is contrary to our original hypothesis of differential access

and usage patterns across the cancer care continuum. One major reason may be due to selection bias for the cancer survivor population: a national survey targeting the general population like HINTS contains necessary selection bias when

trying to capture cancer survivors. In particular, those battling cancer symptoms and/or face poor prognosis were much less likely to participate in the survey. On the contrary, the study population may represent the healthier sub-population among all individuals who are diagnosed with cancer.

In addition to selection bias described above, the study has a number of limitations. Firstly, the results are based on self-reported cross-sectional data, which merely report association among survivor characteristics and HRIU. Secondly, in order to go further and address why and how various Internet technologies are adopted across the survivor population, other research methodologies (e.g., observational studies, RCTs, qualitative analyses) are needed to complement survey data. Finally, in addition to the four types of HRIU described in this study, there remain a number of HRIU unaccounted in the HINTS data to date. This includes social networking site participation/discussion surrounding a health topic, mobile devices for health purposes (“mHealth”), among others. HINTS IV, to be administered in 2011, will offer up-to-date data on these new and emerging technologies as related to health.

In sum, the Internet and Web 2.0 technologies pose tremendous potential to serve cancer survivors throughout the continuum of care. This analysis of the three iterations of HINTS data offer a broad look at the way the Internet has been accessed for health-related purposes and points to several areas for consideration for communication efforts at the service of cancer survivors.

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