General and Health-Related Internet Use Among Cancer Survivors in the United States: A 2013–2018 Cross-Sectional Analysis

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ABSTRACT

Background: A significant proportion of cancer survivors endorse ongoing health information needs and may use the internet to access information. We assessed patterns and predictors of general and health-specific internet use among cancer survivors. **Methods:** Using data from the National Health Interview Survey (NHIS), which was administered in 2013 through 2018, for adults reporting a cancer diagnosis, sample weight-adjusted estimates defined prevalence and multivariable logistic regressions defined adjusted odds ratios (aORs) of general and health-specific internet use, adjusting for relevant sociodemographic covariates, including healthcare satisfaction as the primary independent variable. The analysis for health-specific internet use was also repeated including a sex (female vs male)*healthcare satisfaction (very satisfied/somewhat satisfied vs somewhat dissatisfied/very dissatisfied) interaction term. **Results:** Among 12,970 survivors of cancer, general and health-specific internet use increased from 2013 to 2018 (from 63.2% to 70.8% and from 46.8% to 52.2%, respectively; $P < .05$ for both). Survivors who were very dissatisfied with healthcare were more likely to use the internet for health information compared with those who were very satisfied (59.5% vs 48.0%; aOR, 1.78; 95% CI, 1.20–2.64; $P = .004$). Younger age, female sex, higher educational attainment, and higher socioeconomic status were all associated with increased reported use of the internet for both general and health-specific purposes ($P < .001$ for all). There was a significant sex*healthcare satisfaction interaction ($P = .009$) such that for female survivors, healthcare dissatisfaction was associated with higher odds of health-specific internet use (61.4% vs 52.5%; $P < .001$; men, $P = .97$). No association was found between healthcare satisfaction and general internet use ($P = .42$). **Conclusions:** The increasing proportion of survivors of cancer using the internet for health-specific information may be associated with self-reported dissatisfaction with healthcare. Efforts are needed to improve both access to the internet and the quality of cancer-relevant online health information, and to enhance patients' online health literacy.

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Background

Most individuals diagnosed with cancer in the United States survive ≥ 5 years,¹ contributing to an increasing population of cancer survivors.² A significant proportion of these individuals endorse ongoing health information needs,³ which may be different for patients with newly diagnosed cancers, who may seek information regarding treatment options and acute adverse effects, versus those who have completed treatment and may be more concerned about risks of recurrence, follow-up care, and long-term toxicities.^{4–6} Among cancer survivors, unmet information needs exist and access to high-quality and relevant health information has been associated with improved psychosocial outcomes and overall health-related quality of life.^{7–10} Over the past several decades, the internet has played an increasing role in providing cancer survivors with health information¹¹ and has revolutionized the way in which information is shared and accessed. Currently, approximately 90% of the general US population reports internet use.¹²

Although medically sponsored websites with evidence-based guidelines exist, the internet can also serve as a platform for dissemination of potentially harmful medical misinformation.^{11,13} Studies regarding the quality of online health information in oncology^{14–17} and other fields^{18,19} have shown the accuracy of such pages to be variable, with many online resources with poor-quality information garnering high-volume readership.²⁰ In addition, commercial websites, some of which are run by companies that pay to rank themselves among the top hits for health-related searches,¹⁸ may provide information biased toward the use of particular products or treatments.²¹ Furthermore, evidence-based academic online resources may require educational attainment above the national average in order to comprehend the information, possibly leading to confusion.²²

Given that online information can positively or negatively affect one's decision to seek care, engage in screening,

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See page 1586 for related commentary.

or practice healthy lifestyle choices,^{23–25} it is important to understand how patients and survivors of cancer use the internet as a source of health information. Therefore, we used a nationally representative survey to assess recent patterns and predictors of internet use to obtain health information, compared with general internet use, among patients and survivors of cancer.

Methods

Data Source

The National Health Interview Survey (NHIS) is a cross-sectional household survey that collects data on a range of health indicators for noninstitutionalized, civilian adults.²⁶ The NHIS, administered by the National Center for Health Statistics (NCHS) and the CDC, conducts in-person interviews with a multistage probability-selected and nationally representative sample of >100,000 US participants spanning 45,000 households.²⁶ Sample weights allow inference on national prevalence; harmonized data were obtained through the Integrated Public Use Microdata Series (IPUMS) Health Survey database.²⁷

Study Cohort

The study population included adults aged ≥ 18 years sampled from 2013 through 2018 reporting a history of cancer. This 6-year time interval represents the only years the NHIS included questions regarding both internet use and healthcare satisfaction. The population was specifically defined as patients who were queried regarding their cancer history and responded yes when asked if they had ever been told “by a doctor or other health professional that [they] had cancer or a malignancy of any kind.” Those who reported a diagnosis of nonmelanoma skin cancer were excluded, consistent with other cancer survivorship studies.^{28–31} We included relevant sociodemographic variables captured via NHIS interview, including year of survey, age, sex, sexual orientation (straight or nonstraight), region of residency (Northeast, North Central/Midwest, South, or West), years since cancer diagnosis (calculated as age at time of survey minus age at cancer diagnosis), self-identified race/ethnicity (White, Black/African American, American Indian/Alaska Native, Asian, or multiple race), marital status (married or not married), highest educational degree (grade 8, grade 12 without diploma, high school diploma, some college, completed bachelor’s degree, or advanced degree), citizenship status (US citizen or noncitizen), socioeconomic status (ratio of family income to poverty threshold), self-reported health status, and insurance status (with or without insurance coverage).

Internet Use and Healthcare Satisfaction

From 2013 through 2018, the NHIS included the following questions regarding internet use: “Do you use the internet?”

and “Have you looked up health information on the internet in the past 12 months?” Responses were binary (yes or no). Participants were also queried regarding general healthcare satisfaction via the question, “How satisfied are you with healthcare in the past 12 months?” Responses to this question included “very satisfied,” “somewhat satisfied,” “somewhat dissatisfied,” and “very dissatisfied.”

Statistical Analyses

Multivariable logistic regression defined adjusted odds ratios (aOR) with 95% confidence intervals for general and health-specific internet use. The primary independent variable was healthcare satisfaction (very satisfied [referent] vs somewhat satisfied vs somewhat dissatisfied vs very dissatisfied). Other sociodemographic variables included in the model were year of survey, age, sex, sexual orientation, region of residence, years since diagnosis, race/ethnicity, marital status, educational attainment, citizenship status, socioeconomic status, self-reported health status, and health insurance status. In a separate model, given previous studies suggesting associations between healthcare satisfaction and sex,^{32,33} the analysis for health-specific internet use was repeated including a sex (female vs male)*healthcare satisfaction (very satisfied/somewhat satisfied vs somewhat dissatisfied/very dissatisfied) interaction term to assess whether the association between healthcare satisfaction and internet use varied by sex.

Analyses were performed with STATA/SE, version 15.1 (StataCorp LLP). The Dana-Farber/Harvard Cancer Center and University of Texas Southwestern Medical Center Institutional Review Boards deemed the study exempt given the use of public deidentified data. Methods are subject to reporting bias due to the nature of the NHIS. Data and analyses are presented in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cross-sectional studies.³⁴

Results

Patient Population

Among 12,970 cancer survivors surveyed from 2013 through 2018, 7,615 (53.3%) were aged ≥ 65 years, 7,762 (57.4%) were women, and 1,839 (13.0%) did not self-identify as White. More than two-thirds ($n=8,730$; 66.3%) were diagnosed >5 years before the survey. Furthermore, 12,584 (97.0%) had health insurance and 5,008 (40.3%) described their health status as “excellent” or “very good” (Table 1).

Variables Associated With General Internet Use

Among 12,970 adult survivors of cancer, 8,151 (67.9%) reported general internet use. The proportion of cancer survivors reporting general internet use increased over

Table 1. Baseline Cohort Demographics

Characteristic	Raw n (Raw%/Weighted%)
Total, n	12,970
Year of survey	
2013	2,042 (15.7/15.0)
2014	2,315 (17.9/15.4)
2015	2,168 (16.7/15.8)
2016	2,426 (18.7/17.7)
2017	2,057 (15.9/18.2)
2018	1,962 (15.1/18.0)
Age, y	
18–39	810 (6.3/7.2)
40–64	4,545 (35.0/39.6)
≥65	7,615 (58.7/53.3)
Sex	
Male	5,208 (40.2/42.6)
Female	7,762 (59.9/57.4)
Sexual orientation	
Straight	12,614 (97.3/97.5)
Nonstraight	356 (2.7/2.6)
Region	
Northeast	2,262 (17.7/18.3)
North Central/Midwest	3,052 (23.5/23.6)
South	4,559 (35.2/37.2)
West	3,097 (23.9/21.0)
Years since diagnosis	
≤2	2,900 (22.4/23.0)
3–5	1,340 (10.3/10.7)
>5	8,730 (67.3/66.3)
Race/Ethnicity	
White	11,131 (85.8/87.0)
Black/African American	1,198 (9.2/8.1)
American Indian/Alaska Native	95 (0.7/0.7)
Asian	305 (2.4/2.7)
Multiple race	241 (1.9/1.4)
Marital status	
Married	5,878 (45.3/59.3)
Not married	7,092 (54.7/40.7)
Highest educational degree	
Grade 8	668 (5.2/4.4)
Grade 12, no diploma	1,135 (8.8/7.9)
High school diploma	3,419 (26.4/26.3)
Some college	3,963 (30.6/30.0)
Bachelor's degree	2,223 (17.1/18.6)
Advanced degree	1,562 (12.0/12.9)

(continued)

Table 1. Baseline Cohort Demographics (cont.)

Characteristic	Raw n (Raw%/Weighted%)
Citizenship status	
US citizen	12,727 (98.1/97.8)
Non-US citizen	243 (1.9/2.2)
Socioeconomic status ^a	
<1.00	1,624 (12.5/9.4)
1.00–1.99	2,641 (20.4/17.3)
2.00–3.99	3,972 (30.6/30.7)
≥4.00	4,733 (36.5/42.6)
Self-reported health status	
Excellent	1,541 (11.9/13.0)
Very good	3,467 (26.7/27.3)
Good	4,334 (33.4/32.6)
Fair	2,611 (20.1/19.3)
Poor	1,017 (7.8/7.8)
Insurance status	
Coverage	12,584 (97.0/97.0)
No coverage	386 (3.0/3.0)
Satisfaction with healthcare	
Very satisfied	9,386 (72.4/72.6)
Somewhat satisfied	2,864 (22.1/22.1)
Somewhat dissatisfied	473 (3.7/3.4)
Very dissatisfied	247 (1.9/1.9)

Abbreviation: NHIS, National Health Interview Survey.

^aRatio of family income to poverty threshold.

time, from 63.2% in 2013 to 70.8% in 2018 (aOR for 2018 vs 2013, 1.48; 95% CI, 1.21–1.82; $P<.001$). Younger age (18–39 vs ≥65 years), female sex, White race (vs Black/African American), higher educational attainment, and higher socioeconomic status were all associated with increased reported use of general internet use ($P<.001$ for all; Table 2). There was no association between years since diagnosis and general internet use ($P=.38$). Lastly, those describing their overall health status as poor were less likely to report general internet use compared with those describing excellent overall health status (44.0% vs 85.3%; aOR, 0.28; 95% CI, 0.21–0.37; $P<.001$).

Variables Associated With Health-Specific Internet Use

Among 12,970 adult survivors of cancer, 5,818 (48.9%) reported health-specific internet use. Health-specific internet use in this population also increased from 46.8% in 2013 to 52.2% in 2018 (2018 vs 2013 aOR, 1.22; 95% CI, 1.03–1.46; $P=.023$; Figure 1). Younger age (18–39 vs ≥65 years), female sex, White race (vs Black/African American), higher educational attainment, and higher socioeconomic

Table 2. Preference of and Multivariable aORs for Internet Use in Past 12 Months (N=12,970)

Characteristic	General Internet Use, Raw n (Raw % of Row Total/Weighted%)	Multivariable Adjusted Odds		Health-Specific Internet Use, Raw n (Raw % of Row Total/Weighted %)	Multivariable Adjusted Odds	
		aOR (95% CI)	P Value		aOR (95% CI)	P Value
Total, n	8,151 (62.9/67.9)			5,818 (44.9/48.9)		
Year						
2013	1,185 (58.0/63.2)	Ref		862 (42.2/46.8)	Ref	
2014	1,387 (59.9/67.2)	1.24 (1.01–1.51)	.037	922 (39.8/45.3)	0.91 (0.76–1.09)	.31
2015	1,281 (59.1/64.4)	1.12 (0.91–1.37)	.28	928 (42.8/46.7)	1.02 (0.85–1.23)	.81
2016	1,592 (65.6/70.2)	1.34 (1.10–1.64)	.004	1,130 (46.6/50.8)	1.11 (0.93–1.33)	.26
2017	1,386 (67.4/70.3)	1.34 (1.09–1.64)	.005	999 (48.6/50.3)	1.09 (0.92–1.30)	.33
2018	1,320 (67.3/70.8)	1.48 (1.21–1.82)	<.001	977 (49.8/52.2)	1.22 (1.03–1.46)	.023
Age, y						
18–39	728 (89.9/90.1)	Ref		559 (69.0/69.4)	Ref	
40–64	3,543 (78.0/81.2)	0.35 (0.25–0.50)	<.001	2,659 (58.5/61.2)	0.58 (0.46–0.73)	<.001
≥65	3,880 (51.0/55.0)	0.084 (0.058–0.120)	<.001	2,600 (34.1/37.0)	0.24 (0.19–0.30)	<.001
Sex						
Male	3,075 (59.0/65.1)	Ref		2,022 (38.8/43.2)	Ref	
Female	5,076 (65.4/70.0)	1.38 (1.22–1.55)	<.001	3,796 (48.9/53.1)	1.68 (1.50–1.87)	<.001
Sexual orientation						
Straight	7,864 (62.3/67.4)	Ref		5,575 (44.2/48.4)	Ref	
Nonstraight	287 (80.6/84.9)	1.69 (1.13–2.52)	.011	243 (68.3/68.2)	1.59 (1.14–2.21)	.006
Region						
Northeast	1,432 (63.3/68.0)	Ref		1,030 (45.5/49.8)	Ref	
North Central/Midwest	1,932 (63.3/68.8)	1.13 (0.94–1.36)	.18	1,366 (44.8/48.9)	1.02 (0.87–1.20)	.82
South	2,674 (58.7/64.5)	1.03 (0.87–1.22)	.76	1,883 (41.3/45.8)	0.95 (0.81–1.10)	.50
West	2,113 (68.2/72.9)	1.19 (0.98–1.45)	.071	1,539 (49.7/53.5)	1.07 (0.90–1.27)	.44
Years since diagnosis						
≤2	1,798 (62.0/67.7)	Ref		1,327 (45.8/50.3)	Ref	
3–5	881 (65.8/72.0)	1.13 (0.91–1.39)	.27	633 (47.2/54.5)	1.12 (0.92–1.36)	.25
>5	5,472 (62.7/67.3)	0.94 (0.81–1.08)	.38	3,858 (44.2/47.5)	0.85 (0.75–0.97)	.013
Race/Ethnicity						
White	7,239 (65.0/69.7)	Ref		5,194 (46.7/50.3)	Ref	
Black/African American	538 (44.9/51.0)	0.61 (0.50–0.74)	<.001	350 (29.2/35.1)	0.69 (0.57–0.83)	<.001
American Indian/Alaska Native	55 (57.9/67.8)	0.80 (0.46–1.41)	.45	34 (35.8/39.7)	0.54 (0.28–1.05)	.068
Asian	179 (58.7/63.4)	0.57 (0.39–0.83)	.003	124 (40.7/46.5)	0.71 (0.49–1.02)	.063
Multiple race	140 (58.1/59.9)	0.76 (0.47–1.24)	.27	116 (48.1/51.6)	1.24 (0.83–1.84)	.30
Marital status						
Married	4,205 (71.5/74.5)	Ref		3,005 (51.1/53.7)	Ref	
Not married	3,946 (55.6/58.2)	0.67 (0.59–0.75)	<.001	2,813 (39.7/41.8)	0.77 (0.70–0.86)	<.001
Highest educational degree						
Grade 8	77 (11.5/14.4)	Ref		38 (5.7/8.5)	Ref	
Grade 12, no diploma	336 (29.6/33.4)	2.24 (1.51–3.33)	<.001	194 (17.1/19.2)	1.95 (1.21–3.16)	.006
High school diploma	1,620 (47.4/52.8)	3.92 (2.71–5.67)	<.001	1,047 (30.6/34.4)	3.78 (2.40–5.97)	<.001
Some college	2,879 (72.7/76.7)	9.93 (6.85–14.39)	<.001	2,069 (52.2/55.1)	7.66 (4.86–12.08)	<.001
Bachelor's degree	1,860 (83.7/86.4)	15.20 (10.27–22.50)	<.001	1,374 (61.8/64.2)	10.27 (6.44–16.37)	<.001
Advanced degree	1,379 (88.3/91.0)	23.24 (15.33–35.23)	<.001	1,096 (70.2/73.7)	17.17 (10.67–27.63)	<.001

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Table 2. Preference of and Multivariable aORs for Internet Use in Past 12 Months (N=12,970) (cont.)

Characteristic	General Internet Use, Raw n (Raw% of Row Total/Weighted%)	Multivariable Adjusted Odds		Health-Specific Internet Use, Raw n (Raw % of Row Total/Weighted %)	Multivariable Adjusted Odds	
		aOR (95% CI)	P Value		aOR (95% CI)	P Value
Citizenship status						
US citizen	8,031 (63.1/68.2)	Ref		5,737 (45.1/49.1)	Ref	
Non-US citizen	120 (49.4/55.9)	0.92 (0.59–1.43)	.70	81 (33.3/36.8)	0.86 (0.55–1.35)	.52
Socioeconomic status ^a						
<1.00	647 (39.8/43.4)	Ref		450 (27.7/29.1)	Ref	
1.00–1.99	1,096 (41.5/44.8)	1.22 (1.00–1.50)	.051	789 (29.9/32.6)	1.42 (1.17–1.73)	<.001
2.00–3.99	2,441 (61.5/63.7)	2.10 (1.72–2.56)	<.001	1,656 (41.7/43.0)	1.83 (1.51–2.22)	<.001
≥4.00	3,967 (83.8/85.7)	3.94 (3.18–4.87)	<.001	2,923 (61.8/64.1)	2.87 (2.35–3.52)	<.001
Self-reported health status						
Excellent	1,253 (81.3/85.3)	Ref		841 (54.6/57.5)	Ref	
Very good	2,571 (74.2/77.9)	0.74 (0.59–0.94)	.013	1,817 (52.4/55.2)	1.15 (0.96–1.37)	.13
Good	2,643 (61.0/66.4)	0.55 (0.44–0.69)	<.001	1,853 (42.8/46.8)	1.07 (0.89–1.28)	.47
Fair	1,286 (49.3/54.2)	0.40 (0.32–0.51)	<.001	974 (37.3/41.9)	1.13 (0.93–1.38)	.22
Poor	398 (39.1/44.0)	0.28 (0.21–0.37)	<.001	333 (32.7/38.1)	1.07 (0.84–1.36)	.60
Insurance status						
Has coverage	7,878 (62.6/67.7)	Ref		5,610 (44.6/48.7)	Ref	
Has no coverage	273 (70.7/73.4)	1.06 (0.77–1.47)	.71	208 (53.9/53.5)	1.11 (0.83–1.48)	.48
Satisfaction with healthcare						
Very satisfied	5,973 (63.6/68.9)	Ref		4,127 (44.0/48.0)	Ref	
Somewhat satisfied	1,761 (61.5/66.0)	1.07 (0.93–1.23)	.33	1,339 (46.8/50.5)	1.26 (1.11–1.43)	<.001
Somewhat dissatisfied	265 (56.0/58.1)	0.79 (0.59–1.06)	.11	224 (47.4/49.8)	1.39 (1.07–1.82)	.014
Very dissatisfied	152 (61.5/69.2)	1.18 (0.79–1.77)	.42	128 (51.8/59.5)	1.78 (1.20–2.64)	.004

Abbreviations: aOR, adjusted odds ratio; NHIS, National Health Interview Survey.

^aRatio of family income to poverty threshold.

status were all associated with increased reported use of internet for health-specific purposes ($P<.001$ for all; Table 2). In contrast to general internet use patterns, health-specific internet use was lower among patients >5 years from their cancer diagnosis, compared with those who were ≤2 years from diagnosis (47.5% vs 50.3%; aOR, 0.85; 95% CI, 0.75–0.97; $P=.013$). There was no difference in health-related internet use among cancer survivors reporting poor versus excellent overall health status (38.1% vs 57.5%; aOR, 1.07; 95% CI, 0.84–1.36; $P=.60$).

Notably, cancer survivors who were very dissatisfied with healthcare were 77.7% more likely to use the internet for health information compared with those who were very satisfied (59.5% vs 48.0%; aOR, 1.78; 95% CI, 1.20–2.64; $P=.004$; Figure 2A). Furthermore, there was a significant sex*healthcare satisfaction interaction ($P=.009$) such that for female survivors of cancer ($n=7,762$), healthcare dissatisfaction was associated with higher odds of health-specific internet use (61.4% vs 52.5%; aOR, 1.74; 95% CI, 1.32–2.29; $P<.001$) but not for male survivors of cancer ($n=5,208$) (39.2% vs 43.4%; aOR, 1.01; 95% CI, 0.68–1.50;

$P=.97$) (Figure 2B). In contrast, there was no association between general internet use and healthcare satisfaction (69.2% vs 68.9%; aOR, 1.18; 95% CI, 0.79–1.77; $P=.42$).

Discussion

In this nationally representative US survey of 12,970 adult cancer survivors surveyed from 2013 through 2018, approximately half use the internet as a health information source, with the proportion increasing over time. Sociodemographic factors associated with higher odds of reporting both general and health-specific internet use included white race, younger age, female sex, greater educational attainment, and higher income. Notably, greater dissatisfaction with healthcare was associated with higher odds of reporting health-specific internet use only, and not general internet use.

Because of increasing access to health information facilitated by the internet, healthcare providers may no longer represent the primary source of medical information.^{24,35} We found important sociodemographic disparities in internet use among cancer survivors. By distributing

Figure 1. Sample weight-adjusted prevalence of general and health-specific internet use among 12,970 cancer survivors from 2013 through 2018.

* $P \leq .05$ on multivariable logistic regression-defined adjusted odds ratio with referent group = 2013. Solid bars represent 95% confidence intervals for sample weight-adjusted estimates.

health information²⁴ and empowering patients,³⁶ the internet can help satisfy ongoing health information needs, which has been associated with improved coping skills, satisfaction, and overall quality of life.^{7-9,37} Therefore, access to online health information may help patients obtain greater awareness and engage in active participation in their survivorship care.³⁸ However, our study found that certain sociodemographic groups, notably those traditionally representing medically disadvantaged populations, report lower odds of internet use. These findings suggest unequal access to the internet among already vulnerable groups. Prior work has shown that survivors of cancer who experienced

greater difficulty in accessing health information reported decreased confidence in their own ability to address health-related issues.^{7,39} Identifying and addressing these information disparities is important, because cancer survivors with unfulfilled information needs may be more likely to experience psychosocial distress.^{7,10} Efforts therefore should be undertaken to understand barriers to internet use, improve accessibility of the internet, and equip patients who are unable to use the internet to obtain health information with other sources of patient education.

Cancer survivors often integrate information from multiple sources when assessing the credibility of information found online.^{40,41} The utility of increased access to health information is incumbent upon appropriate use by its consumers. eHealth literacy, defined as “the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem,” is an increasingly important parameter of health literacy, evidenced by the prevalence of internet use among cancer survivors.⁴² Therefore, efforts should be made to both assess and enhance eHealth literacy. For example, validated scales^{43,44} on eHealth literacy may help measure and therefore mitigate potential gaps in this increasingly important mechanism for information gathering among cancer survivors.

Although the internet may contain useful health information, the quality of many websites is unregulated.^{14-19,22,45,46} Perhaps ironically, peer-reviewed medical information, such as in the form of journal articles or society guidelines, may be financially restricted and therefore not easily accessible to the general population. Given that misinformation or inappropriate interpretation of information may impact health-related choices among patients with cancer,²³⁻²⁵ our finding of increasing health-specific internet use among cancer survivors with later year of survey underscores the value of improving the quality of health information websites.^{14,15,46}

Notably, our findings showed that cancer survivors who were very dissatisfied with healthcare were 78% more likely to use the internet as a health information source compared with others, an association that was greater among women who reported dissatisfaction with healthcare. Previous research has shown that patients with cancer are often dissatisfied with the quality and extent of information provided by healthcare providers,⁴⁷ and as a result may integrate information from multiple other sources when making decisions regarding their care.^{40,41} These findings further underscore the value of efforts to make quality online health information available and to enhance eHealth literacy.^{11,48}

Our findings must be interpreted in light of the study’s limitations. First, the survey design is subject to participant recall bias. Specifically, history of cancer diagnosis was self-reported and not physician-verified.

Figure 2. Adjusted odds ratios of (A) general and health-specific internet use, and (B) health-specific internet use stratified by sex. The primary independent variable with adjusted odds ratios displayed in the figure is healthcare satisfaction. Other variables included in the model were year of survey, age, sex, sexual orientation, region, years since diagnosis, race/ethnicity, marital status, educational attainment, citizenship status, socioeconomic status, self-reported health status, and health insurance coverage status.

* $P \leq .05$ (referent group = very satisfied with healthcare). Solid bars represent 95% confidence intervals.

However, participants who reported a history of cancer were subsequently asked for their cancer type and age at diagnosis, thus potentially limiting the rate of errors in self-report. Second, there was no information on whether “health information” online searches were specifically related to cancer diagnosis or treatments. However, given the ongoing information needs among the cancer survivor population,³ it is likely that cancer-related queries represent a large proportion of their online health-information searches. Third, there was no detail on how long or how frequently cancer survivors used the internet for their general or health-specific information. Fourth, the NHIS survey does not provide information on cancer status and treatment details, which could affect both information needs and healthcare satisfaction. Furthermore, internet use, both general and health-specific, were self-reported in the NHIS survey, and not verified by methods such as tracking internet browsing history. It is possible that participants could have forgotten previously conducted online health searches or even purposefully chosen not to reveal this to the person conducting the survey, although we cannot readily surmise a rationale for withholding this information.

Conclusions

We found that an increasing proportion of survivors of cancer use the internet for health-specific information, an association that was greater among women who reported dissatisfaction with healthcare. Given the

overall high prevalence of internet use to obtain health information among cancer survivors, physicians, healthcare organizations, and other cancer advocacy groups should participate in efforts to produce high-quality, reliable online health-related materials. As online health information-seeking becomes more pervasive, strategies should be implemented to help providers better care for internet-informed patient, including directing patients to peer-reviewed, reputable web pages. In addition, efforts should also be made to improve cancer survivors’ ability to appraise and integrate online health information into their care.

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